

Husbandry Guidelines for



Arabian Camel

Camelus dromedarius

Family: Camelidae

Class: Mammalia

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DISCLAIMER

The following document contains guidelines, for the care of the Arabian (Dromedary) Camel (*Camelus dromedarius*) in captivity based on scientific research of wild animals and experience of captive husbandry. The author of the following guidelines cannot be, and are not, legally, financially or in any other way, responsible for the application of techniques described within this document. When undertaking any procedures or techniques outlined in this document, it is up to individual workers to assess the unique circumstances of their situation, apply common sense, and subsequently apply any procedures or techniques at their own risk. In all cases, the reader of this document are cautioned not to use this handbook as an exact step-by-step guide, but rather as a starting reference point for further work.

OCCUPATIONAL HEALTH AND SAFETY RISKS

Risk Rating

Male: Dangerous

Female: Hazardous

The Arabian Camel, although normally well-tempered and manageable as a collection species is rated as dangerous and hazardous for male and female specimens respectively because they have the ability to cause significant injury and possibility of death.

The Camel is a tall, heavy mammal weighing in at 400-600kg. Servicing their enclosures can be risky, especially during the rutting (breeding) season when males, if housed with females, may undertake in fights to show dominance or they may become very pushy with keeping personnel.

The solution to that problem, as long as specimens are not wanted for breeding, is to castrate them, as this eliminates the aggressive behaviours. However if the camels are wanted for breeding, it is best to keep the sexes separate until the most opportune moment for breeding. To service them safely during this time, it is recommended to have facilities to separate them from keepers whilst in the exhibit (holding pen).

Even when not in breeding season, both male and female camels still have the equipment to cause serious harm. Camels have the extraordinary ability to kick in obscure directions, even to the side, which means one must give a camel a wide berth in all directions when walking near them.

Another tool the camel has is their ferocious looking teeth. A camel possesses quite large incisors and canine teeth that direct back in towards the mouth. This gives them the ability to scalp the skin of a keepers head or inflict a very nasty bite if given the opportunity.

One of the most well known risks of working with camels is their 'reputation' for spitting a foul smelling stream of stomach contents when aggravated or annoyed. This can hopefully be avoided though if your camels are housed in a calm environment and respected.

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1 Introduction

The Arabian camel originated in North America but became extinct in this area around 11,000 years ago.

Camelids migrated to Asia and South America during the Pliocene and Pleistocene periods. They have been a domesticated animal within Asia for around 3000 years. The South American descendants of the Camelids are the Llama (*Lama glama*), Guanaco (*Lama guanicoe*), Alpaca (*Vicugna pacos*) and Vicuña (*Vicugna vicugna Molina*). The two true remaining Camels left are the Arabian (*Camelus dromedaries*) and the Bactrian (*Camelus bactrianus*).

The Arabian Camel makes up around 90% of the world's 20 million camels.

The Arabian camel is also known as the one-humped camel, relating to its physical description. Not to be confused with the closely related Bactrian camel, who has 2 humps. An easy way to remember the names of the two species is that Dromedary (Another common name for the Arabian camel) begins with 'D', which turned on its side has only one hump. Whereas Bactrian begins with a 'B', which turned on its side has 2 humps¹.

Information used below was taken from the Australasian Species Management Program (ASMP) Regional Census and Plan. Edition 2009 (REGASP)

1.1 ASMP Category

ASMP Artiodactyl TAG
No Regional Program

1.2 IUCN Category

Low Risk – Least Concern

1.3 EA Category

Vertebrate Pest Classification: E

1.4 NZ and PNG Categories and Legislation

Freely available from private market in Australia only. New Zealand would need the Import Health Standard developed.

¹ <http://en.wikipedia.org/wiki/Dromedary>

1.5 Wild Population Management

Management level 3

1.6 Species Coordinator

N/A

1.7 Studbook Holder

N/A

2 Taxonomy

2.1 Nomenclature

Class	Mammalia
Order	Artiodactyla
Family	Camelidae
Genus	<i>Camelus</i>
Species	<i>dromedarius</i>

2.2 Subspecies

There are no sub-species of Arabian camel, but often there is a distinction made separating the species into two (2) breeds. One is of a leaner shape and the other must stockier and more often used as a beast of burden.

2.3 Recent Synonyms

None

2.4 Other Common Names

Dromedary Camel
One-humped Camel

3 Natural History

There are several other species in the family 'Camelidae' but the Arabian and Bactrian Camels are the only true surviving camels today.

The Arabian camel is a tall, lean and fast moving camel, being able to travel at speeds of 13-15km/h for hours at a time. The stockier Bactrian camel is a slower traveller reaching speeds of only 4km/h.

The Arabian camel has been domesticated and used for travelling and moving cargo for thousands of years. They are capable of carrying a 200kg load for up to 40 miles per day.

What also makes these animals such good travelers is their incomparable ability to lose up to 40% of their body weight without serious consequences. The hump on a camels' back actually serves as a reservoir of fatty tissue, which the camels' body can access when food and water are scarce. When water is available to them again though, they have another amazing ability to drink 100 litres of water in just 10 minutes.

In many countries, Camel racing is a big part of the culture. Camels run similar to Giraffes with both legs on one side moving simultaneously. This gait results in them being named the 'Ship of the Desert'.

Arabian Camels has a reputation for loathing man and work and spitting foul smelling stomach contents when annoyed. This could not be further from the truth, as most camels are good tempered and very tolerant of hard work. The ability to spit stomach contents however, is very true and is possible because, like cows, when annoyed they can burp up semi-digested contents from their fore stomach.

3.1 Morphometrics

3.1.1 Mass and Basic Body Measurements

Male: Height – approx. 1.8m to 2.0m

Length – approx 2.2m to 3.4m

Weight – approx 400 to 600kg (including 20-200kg of hump weight)

Female: Height – approx 1.7m to 1.9m

Length – approx 2.0 to 3.0m

Weight – approx 300 to 500kg (estimated roughly 10% lighter than males)

3.1.2 Sexual Dimorphism

Between the two sexes the male is larger and heavier than the female. The two sexes are also shaped differently (see pictures below). The female is much leaner whereas the male is a stocky build. The male also has a soft palate which hangs out the side of the mouth when inflated, producing a deep pink sack that is used to attract females during the breeding season.



Female Arabian camel²



Male Arabian Camel³



Inflated soft palate only found in male Arabian Camels, called the Dulaa⁴

3.1.3 Distinguishing Features

The Arabian camel can be told apart from the Bactrian camel by these physical differences:

- Only has one hump, Bactrian has two humps
- Shorter, lighter tan coloured coat, Bactrian has a thick, long shaggy dark brown coat
- Arabians' originate from North and east Africa
- Bactrians' originate from the deserts of China and Mongolia

² http://www.animaldreaming.com/images/albino_camel.jpg

³ <http://www.oaklandzoo.org/animals/mammals/camel-dromedary-arabian/>

⁴ http://farm1.static.flickr.com/8/8754761_5d0ca4ebf6_o.jpg

- Bactrian camel is slightly taller than the Arabian standing at approx 2.1m compared to 2.0m.

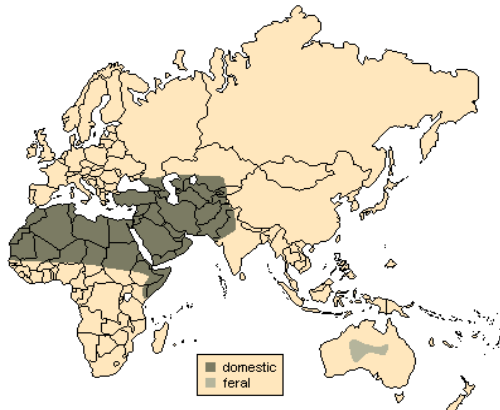
3.2 *Distribution and Habitat*

The Arabian camel was first domesticated about 4000 BC in central to southern Arabia. Although none still survive in the wild throughout their original range, there is an estimated 13 million domesticated Arabian camels from the area of Western India through to Iran, then to Northern Africa.

The Arabian camel was introduced to Egypt and North Africa around the second millennium BC and introduced into Australia in the mid-nineteenth century. Australia now has the only known feral population of Arabian Camels living throughout the arid regions in Central and Western Australia.

They inhabit sand plain and arid shrub land areas with numbers estimated around 250 000. The Arabian camel has also just recently been introduced as a domesticated species in the Canary Islands.

Arabian Camels are highly mobile and rarely stay in one place. They can easily travel up to 50km per day. This pattern means they rarely have a harsh impact of their habitat. Their nomadic wanderings allow vegetation to regenerate whilst they travel. The only effect they do have, is that because they are selective grazers, some experts feel that they may have a more long-term effect on ecosystems (Newman 1975)



Worldwide Distribution⁵



Distribution in Australia⁶

3.3 *Conservation Status*

STATUS:	Common (Although none in wild populations, large domestic population)
IUCN:	Low Risk – Least Concern
CITES:	No special Status

⁵ http://ultimateungulate.com/Artiodactyla/Camelus_dromedarius.html

⁶ <http://www.ozanimals.com/Maps/dromedary.gif>

3.4 Longevity

3.4.1 In the Wild

Average: 30-40 years

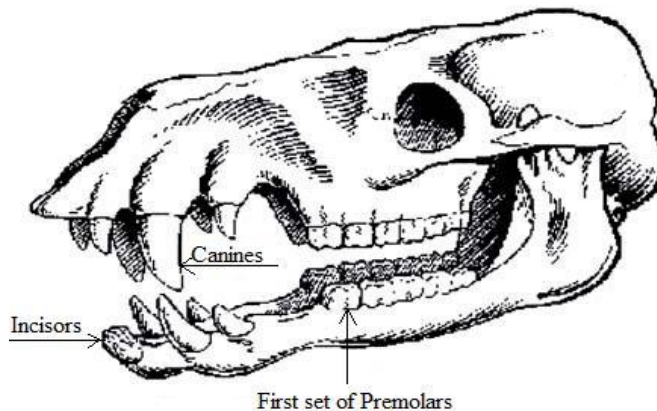
3.4.2 In Captivity

Average: 40-50 years

Maximum: 50 years

3.4.3 Techniques Used to Determine Age in Adults

Camels can be aged by examination of the incisors (front teeth), the Canines and the first set of premolars.



Teeth used to age Arabian Camels⁷

The easiest teeth to examine on an Arabian Camel are the incisor teeth, although they still need to be examined closely and a camel restraint is needed.

The incisor teeth, as shown in the above picture, run along the front of the mouth. Camels have 6 incisors in the lower jaw and only 2 in the upper jaw. The 2 upper jaw incisors are less developed than those in the lower jaw and are often absent in adult females.

To estimate the age of a camel by examining these teeth, you must look at the growth and wear and tear on the teeth in comparison to a graph or sheet explaining what they should look like at different ages.

So using the incisor teeth as an example, following is what the teeth should be doing at certain ages.

⁷ http://ncse.com/files/images/18_6camel-f1_0.jpg

The two central incisors erupt from the gums between birth and 14 days old, the lateral (2) incisors at 4-5 weeks old and the corner incisors at 6-12 weeks. Wear on the incisor teeth will start to occur from 6 months old.

By 2 years of age, the camels deciduous (first set that falls out) incisor teeth will show progressive wear and separation. By 3-3.5 years they will be well worn and loosening in the gums in preparation for its permanent teeth.

By 5 years old the permanent central incisor teeth will have erupted from the gums and the lateral incisors will be shed.

At 6-7 years, the corner permanent incisors will appear and the permanent central and lateral incisors are in wear.

By 8 years of age, all teeth are now permanent and in wear. As the camel ages you will see a progressive wear of the teeth at a rate relevant to the type and amount of food it is eating.

At 15 years there is definite separation of the permanent incisor teeth and again progressive wear on the teeth.

4 Housing Requirements

4.1 Exhibit/Enclosure Design

General Principles and Inclusions to Exhibit Design:

- A paddock/yard environment is ideal for displaying these large animals.
- The exhibit should be open to the sunlight with shaded areas provided throughout all daylight hours.
- A shelter shed must be included to shield from climatic extremes. It must be positioned to protect the animals from the direction of the worst weather in the area. E.g. Symbio Wildlife Park gets its worst seasonal weather from the South off the coast. To protect our camels, their shelter opening was constructed to face the North.
- The enclosure should not allow animals' access to any harmful plants/materials. Camels tend to be indiscriminate browsers and may consume toxic plants without regard to consequences.
- The enclosure must be constructed to limit or stop the access of:
 - Predators [E.g. Snakes]
 - Pests [E.g. Rats, Kangaroos]
 - Wild animals of same/similar species [Especially important for any open range parks known to have wild hooved stock in the area]
- Enclosure must be constructed so that:
 - It is made of material to safely contain the animals and is kept in good condition.
 - Public members are safe and kept at a good distance away from animals.
 - Have adequate warning/safety signage is displayed.
 - Signage on SOP's (Standard Operating Procedures) for staff are adequate and easily viewed.
 - The animals contained are not able to escape.
 - Risk of injury to the animal within the enclosure is minimised.
- Keeper access to the enclosure must be adequate and safe. Should be large enough to allow access by keepers with a wheelbarrow (minimum standard) and have an airlock to minimise escape.
- If access is large enough to allow entry of a drivable vehicle, then entry should be through successive gates to minimise animal escape.
- The enclosure must:
 - Include natural looking furniture
 - Include exhibit enrichment tools (Ideas listed below)
 - Allow freedom of movement to all individuals housed.

- Have a stand-off barrier so that contact between public and animal is avoided.
 - Not allow visitors (especially children) to evade the barriers in place and have contact with the animal.
- If animals are contained within an exhibit that allows the public to drive-thru:
 - It must have adequate signage warning the public that they must stay in cars with doors and windows closed at all times.
 - The area must continuously be supervised by a competent and responsible member of staff.

Feeding/Watering Areas:

- To avoid accumulation of faeces around water/feeding points:
 - They must have an easy to clean substrate around feeding stations [E.g. Concrete, Grass, Shavings that are replaced weekly]
 - Have portable feeding stations that can be moved whilst old feeding areas are cleaned and substrates dried out [E.g. Sand, Mulch]
 - Enclosure should have adequate drainage, especially around feeding stations so that the animal can always access these points easily.

Exhibit Enrichment Ideas:⁸

- Rubbing/scratching posts [E.g. Telegraph poles, rock work]
- Substrate variety [E.g. Sand, grass, dirt, mulch, concrete]
- Lying down/resting areas [E.g. Mulch pits, dirt patches, mud wallows]
- Natural water opportunities [E.g. Ponds, streams]
- Feeding stations at varying lengths
- Objects suspended from high locations [E.g. Browse]
- Raised keeper platforms used for conditioning and training
- Pulley systems for enrichment devices
- Live local native/habitat native trees [E.g. Large palm trees]
- Artificial trees with browse pots
- Mixed species exhibits for social stimulation
- Misting/watering systems
- Varied ground level [E.g. Mounds, hillocks, dips]
- Visual barriers to public and neighbouring animals
- Areas for scatter feeds
- Large clear area for free run/play away from objects

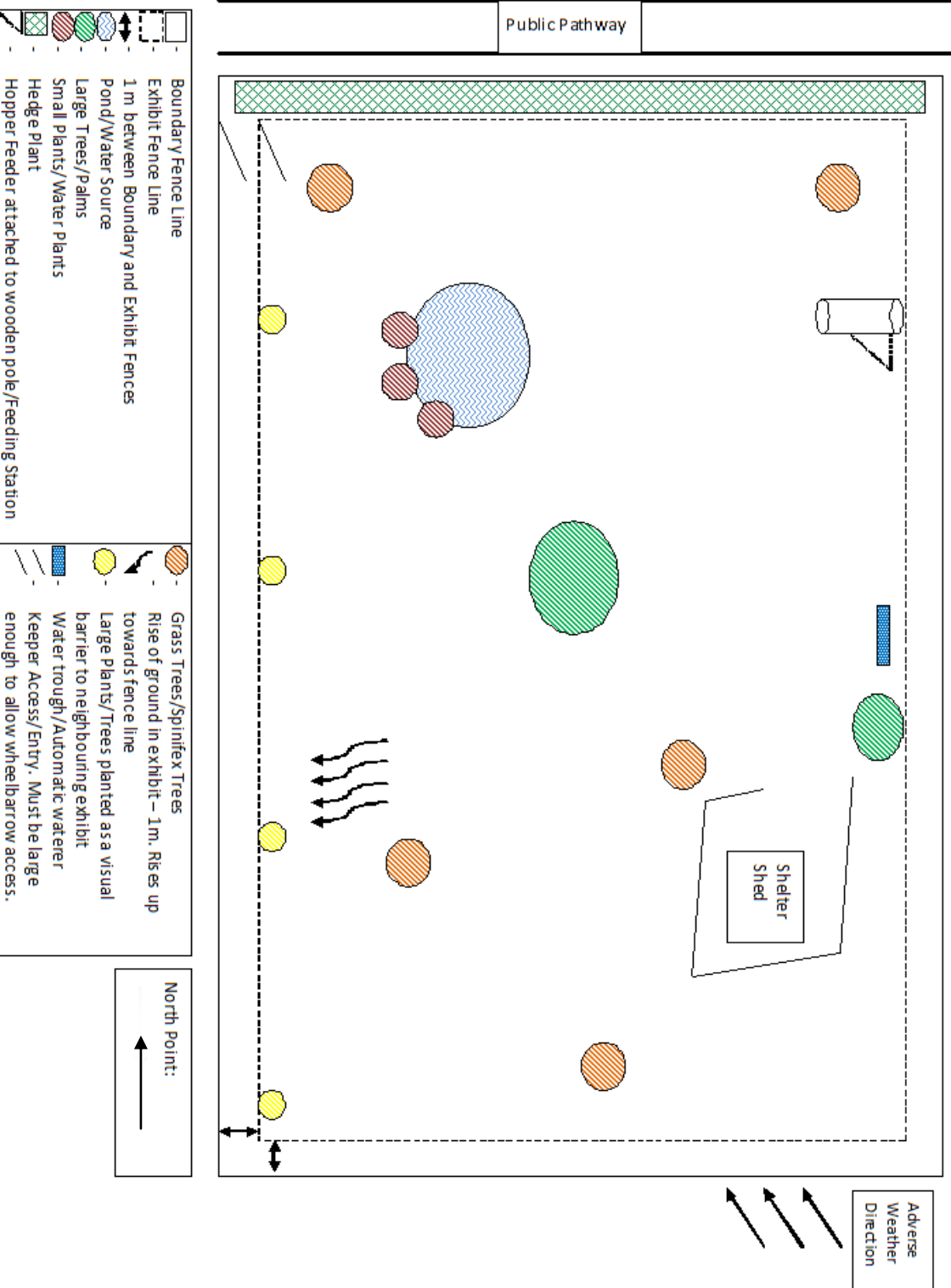
⁸ http://www.torontozoo.com/meet_animals/enrichment/ungulate_enrichment.htm

An example of a Camel exhibit design, completed as a renovation idea based on an enclosure at Symbio Wildlife Park.

Arabian Camel

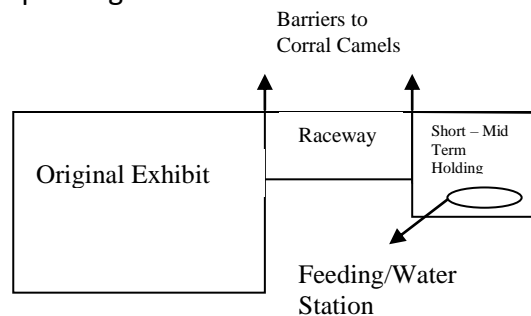
Camelus dromedarius

0.1.0



4.2 Holding Area Design

- A holding area must always be available for a number of reasons including:
 - Health and Quarantine
 - Social constraints
 - Pre-departure
 - Reproduction
 - Additional housing
 - Enclosure maintenance
- For temporary or short – midterm, the holding areas should be located nearby the original exhibit and allow for the Camels to be easily moved between exhibit and holding yard.
- This holding area can be done by creating a raceway from the exhibit into a smaller designed enclosure. This smaller area can be used whilst cleaning or maintenance is being done on the original yard, or for overnight security as a sleeping den.
- This would also prove beneficial as a capture location for transport or medical reasons.
- This type of holding design should be large enough to allow the camel full movement in all directions, including turning, standing or stretching.
- A good rule for this would be of approximately three (3) times the camels length (L) by approximately one and a half (1½) times the camels length (W).
- It should also have adequate protection from the weather. E.g. roof or shade cloth. It must also include a feeding and water station.
- Example diagram:



- NOTE: If Camels need to be held in a holding area for long term (>90 days) the following requirements must also be met:
 - Must meet exhibit sizes prescribed in standards
 - Only the Director-General has the power to vary the size requirements of a long-term holding facility.

4.3 Spatial Requirements

- Rules for deciding the spatial requirements of an enclosure are as follows:
 - Size and shape must provide enough room for freedom of movement, both horizontally and vertically.

- Large enough to avoid undue domination of an individual if housed as a herd (more than two Camels)
 - If housed as a mixed species exhibit, it must be large enough to accommodate any territorial needs of animals and avoid aggressive behaviours
 - Allow for the Camel or other species to avoid or withdraw from the rest of the animals in the exhibit and the public
 - Ensure that the EAPA (Exhibited Animals Protection Act) carry standards are not exceeded.
- Camel Spatial Requirements:⁹

Number of Camels	Space Required	Minimum Width
1	100m ²	6m
For every additional Camel	50m ²	6m

4.4 Position of Enclosures

- For camels, it would be advisable to position their shelter shed/night den in a particular position. This would be, ideally, to have the opening of the shed facing north, as this protects the Camel from the South, East and Westerly winds.
- It would also be advisable to position it in such a way so that in the summer it can be sheltered from the sun and in winter it can get the winter sun. This positioning will vary of the style and design of the enclosure and surrounding areas.

4.5 Weather Protection

- Camels, being desert ungulates, are able to withstand adverse weather conditions. Therefore the enclosure would be suitable as a semi-open or open exhibit.
- Sufficient shelter must be provided to protect Camels from wind, rain and extremes in temperatures.
- Sufficient shade must also be provided during the hottest parts of the day.
- Shelter from the weather can be ensured by providing a large enough shelter shed, which can also double as a night den that will accommodate the number of camels in the enclosure.
- A separate shelter shed, or multiple sheds, can also be provided. Preferably these sheds should be covering feeding stations. This both allows the camels to feed in adverse weather and protects their food from weather damage.

⁹ EAPA: Circus Animal Standards, Page 19; See Bibliography

- To provide shade for camels, you can also plant numerous amounts of large trees. For example: Palms or Gums. Another alternative would also be to erect shade sail cloths.

4.6 Heating Requirements

- Camels do not have any particular heating requirements.
- The only temperature regulation methods they would benefit from would be protection from extreme heat or cold as stated in 4.5.

4.7 Substrate

- For the majority of substrate in the enclosure, you should avoid anything abrasive or irritating to the Camels.
- However, as Camels are Ungulates (hooved animals), it is necessary to provide some abrasive substrate to curb excessive hoof growth.
- For example; some substrates that could be used for this benefit would include textured cement or concrete, crushed gravels, asphalt or sand.
- Sand would be a highly recommended substrate for the majority of the exhibit as it is a part of their natural habitat and is therefore anesthetically pleasing to the public. It is also beneficial to the health of the Species (hoof growth).
- A warning with the use of sand however is to ensure feeding stations are off the ground and fixed not over sand. For substrate under feeding stations, concrete would be more appropriate. This is because if a Camel consumes too much sand with their diet and is not getting enough fibre, it may lead to a health problem known as sand impaction of the gut.
- Substrate used must allow for the easy collection of faecal matter, without the removal of too much substrate. E.g. Grass can also be used as it provides grazing enrichment and can readily be raked up for the removal of debris and faecal matter.
- Another point for substrate around feeding and water stations, it must be easily cleanable to avoid a buildup of faeces or urine around fixed points.

4.8 Bedding Material

- Bedding material must be provided and is recommended to be put into a shelter or night den.
- Appropriate substrate for bedding would be mulch, sand, soil, straw, hay or substrates similar in texture.
- Bedding must be readily cleanable from faeces.
- Bedding that is not recommended is abrasive substances like concrete, gravel or asphalt. Not only will it be uncomfortable for a Camel to lie down on, e.g. gravel, but it would also prove difficult to clean of faecal matter without removing large amounts of substrate each time.

4.9 Enclosure Furnishings

- Any furniture included in this exhibit should be of naturalistic replication. Furniture also includes items such as bedding material (4.8) and enrichment and behavioural encouragement.
- Some furniture that could be included are:
 - Small pond – doubles as a second water source
 - Branch Hanging Areas – can hang browse for natural enrichment
 - Sandy Areas – substrate allows Camels to display natural behaviours. E.g. sand bathing
 - Trees – e.g. palm trees. Camels scratch up against the bark, natural behavior, and is also aesthetically pleasing to the public

5 General Husbandry

5.1 Hygiene and Cleaning

- **Daily:**
 - Raking and cleaning of the enclosure for removal of faecal matter
 - Changing of water and scrubbing water containers
 - Removal of faeces and urine soaked bedding material
 - Feeding troughs/buckets washed and scrubbed
 - Removal of old browse and debris
- **Weekly:**
 - Empty and clean hay feeders to reduce accumulation of old feed
 - Weeding exhibit and surrounding pathways (presentation)
- **Monthly:**
 - Complete bedding change. E.g. remove all soiled and unhygienic material and replace with new, clean bedding
 - Maintenance of plantation. E.g. mowing exhibit grass, trimming trees
- **Annually:**
 - Maintenance on enclosures. E.g. fencing/shelter repairs
 - Bi-annually Camels will molt. It may be necessary to assist this process and de-fluff the Camels. Cleaning up of the hair will be required after this process
- **As needed:**
 - Exhibit maintenance
 - Spot Cleaning of exhibit
 - Replacing of fixtures/furniture within the exhibit
- **Chemicals used in cleaning**
- **Monthly:**
 - Troughs and water containers should be washed out using general detergent and left to dry in the sun. E.g. DuPont 904¹⁰. This detergent is a wide spectrum virucidal, bactericidal and fungicidal detergent which is proven to be effective in livestock use.
- **Pest Control Maintenance**
- Pests that would be a problem in a yard enclosure would include rabbits and rodents.
- **Rabbits:**
 - For the removal of rabbits a product that comes recommended is Pindone. This is generally used in conjunction with a bait station.¹¹

¹⁰ MSDS Appendix A

¹¹ MSDS Appendix B

- **Rodents:**
 - For the removal of rodents a product that comes recommended is Contrac. This also is generally used in conjunction with a bait station.¹²

5.2 Record Keeping

Record keeping is a vital tool in zoo institutions as it provides a history on each specimen currently held in captivity. Record cards should have instructions on how to individually identify the specimen your recording on. E.g. photo or microchip number. Records should be kept for any notable events that occur. Some that should always be noted are listed following:

- Internal Movements
- Breeding/Reproductive Behaviours
- Acquisitions/Disposals
- Health observations
- Vet checks and treatments
- Behavioural problems e.g. aggression
- Diet updates
- Weights (taken monthly)
- Animals general demeanor (noted daily)

5.3 Methods of Identification

The most preferred method to positively id camel specimens is with an injectable microchip. The issue with microchips though is the need to get up close to the camel in order to scan for the chip. This can get risky, especially if the specimen is aggressive or flighty.

Another preferred way is to identify through physical description or photos. Although this may not be as conclusive as a microchip, it can be used in conjunction with a more advanced technique. The way to identify them this way is through description of head and body markings and body shape. Behaviour can sometimes help to id them this way but it should not be relied upon as behaviours can change for multiple reasons.

At Symbio, the way our two specimens were identified was primarily through visual aid as they are considerably different to one another. One is of very light colouring and much stockier than the other who is darker and has more streamlined facial features. Identification methods like tagging, tattooing or branding can also be used on camel collections, but it is rather unsightly, especially for viewing public.

¹² MSDS Appendix C



Peanut – Darker Fur, smaller ears and Thinner head.

Honey – Lighter Fur, taller height and larger Head.

This is the two camels housed at Symbio Wildlife Park and a general idea of how keepers ID these camels.¹³

5.4 Routine Data Collection

Routine data collection differs from daily record keeping, as the data collected here normally is required for part of a long-term study. Records that could be needed for this type of collection include:

- Weights
- Breeding success/failure
- Major health problems
- Interaction with people, animals and other camels (socialization)
- Growth and development (if notes taken from birth)

¹³ Personal photographs taken at Symbio Wildlife Park, by Jodie Moretti, 25/08/2009

6 Feeding Requirements

6.1 Diet in the Wild

- The Arabian camel is classed as a browser in the wild. They possess a split upper lip that is well suited to this purpose. This split helps them to eat leaves from prickly trees and shrubs.



Camels split upper lip.¹⁴

- Free ranging camels in Australia will browse on trees and select a wide variety of plants to eat. Because of their leathery mouths, they are able to feed on vegetation including thorns, dry vegetation and salt bushes.
- A study done in Alice Springs found that within a 200km radius, camels will select up to 82% of the available plant species¹⁵
- Camels prefer to feed on plants that are high in moisture and mineral contents. This also includes the leaves on trees, shrubs, herbs and forbs. They will browse upon these first and then on grass. Grass, however, is primarily eaten after rain and before herbs and forbs is available.
- Wild camels prefer plants high in salt, this needs to be replicated in their captive diet with salt licks.
- Camels have 3 stomachs for fermenting plant matter and a long large intestine to extract the maximum nutrients out of their diet.
- Although camels can go without water for extended periods, it is necessary to always provide enough clean water daily to fulfill its requirements.

6.2 Captive Diet

- Captive camels require a diet high in bulk. This can be estimated at approximately $\frac{1}{3}$ of a bale per camel per day.
- Camels can be introduced to supplements or pelleted foods in their diet, but care must be taken to gradually introduce fresh cut browse as bloat can result.
- Camels should be fed on a diet of hay, grains, browse and fruit and veg.
- Types of hay that can be fed are barley hay, oaten hay or meadow hay. Lucerne hay can be fed occasionally and only in small amounts as it is very high in nutrients.

¹⁴ <http://aphs.worldnomads.com/BigTripBlog/4289/face.jpg>

¹⁵ *Observations on the Clinical Examination of the Camel (Camelus dromedarius) in the field.*

- Camels that diet includes barley grass or similar should receive regular mouth checks as the seeds can collect in the gums and under the tongue.
- In lactating cows and during breeding, feed amounts must be increased to ensure that there is a minimum weight loss as poor nutrition will result in decreased milk production and a higher mortality rate in calves. Camels calves are highly dependent on milk in their diet, much more so than cattle of a similar age.
- Browse can be fed out daily to camels, although when introducing into the diet this should be done gradually.
- Browse can also double as a good enrichment item and can be recycled out to the camels once other animals have finished eating them. E.g. Koalas eat the tips off the browse but leave many leaves behind. The camels will eat these leaves and also strip the bark off the braches.
- Koala browse is needed daily and so old braches can be given to camels daily or as available.
- Some examples of browse that may be fed out to camels are:
 - Scribbly Gum
 - Eucalyptus Gum
 - Red Gum
 - Melaleuca
 - Swamp Mahogany
 - Grey Gum
- There are many other species of browse that you may come across but generally what your koalas eat will be just as good for your Arabian Camel.
- If your park does not care for koalas, browse can either be missed from the diet of the Arabian Camel, with an increase in hay feeds or fruit/veg feeds. Or browse can be cut occasionally from nearby species of trees.
- **Sample Diet for Arabian Camel (0.1.0)¹⁶**

Monday, Wednesday, Friday, Saturday & Sunday:

3 biscuits of Barley Hay (Morning)

Tuesday & Thursday:

1 biscuit of Barley hay + 1 bucket of grain (½ Chaff & ½ Stud) (Morning)

Daily or as available:

1 black crate of assorted Fruits and Veg (Afternoon)

1 large branch of browse (2x smaller branches) (Afternoon)

Note:

Fruit/Veg trays made up with left over delivered food from that day.

N.B. Increased feed for males/lactating females/pregnant females and social groups. *See 10.11 Breeding Diet.*

¹⁶ Taken From Feeding Guide from Symbio Wildlife Park

6.3 Supplements

- Camels need to be supplemented in their diet with salt licks. These should ideally be a softer type of block then used with other hooved stock as camels have softer tongues.
- Salt licks should be fed out 1 per week per camel. E.g. if you have 4 camels in an enclosure, then 4 per week. (only a rough guide, may vary on individual camels)
- Salt licks contain all mineral nutrients needed by camels and they provide an essential part of daily feeding. Salt licks are long-lasting and cannot be bitten. Some may also come hanging off a rope for easy hanging within the enclosure.
- *(See Appendix D for Manufacturers Details)*
- Other supplements that may be advisable to provide are Vitamin E and selenium. Vitamin E and selenium are common deficiencies in young camel calves and prevention via supplementation should start when young.
- If the mother and calf are fed a diet containing at least 0.1-0.5mg/kg of selenium per day and over 100mg of vitamin E, then problems arising from deficiencies will be avoided.
- The recommended product to use is a daily oral supplement called RAVNET E 1000.
- **Dosage and Administration: (Mix well into feed daily)**
Pregnant & lactating females: 50g/day
Young camels less than 300kgs: 50g/day

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Note: Avoid mixing supplement into feed containing iron supplements as the iron may reduce the potency and bioavailability of the Vitamin E.

- *(See Appendix E for Manufacturers Details)*
- To mimic the digestive process of the camel, some institutions also recommend providing supplements known as 'protected proteins'. E.g. canola or cottonseed meal. It has been found that a diet including these proteins will assist in weight gain for camels in poor condition.

6.4 Presentation of Food

- Feeding facilities should allow for access by all camels housed in an exhibit, e.g. multiple stations. They should be kept clean and in good condition.
- Camels should be fed off the ground as it reduces waste, consumption of dirt or sand and reduces the transmission of internal parasites.
- Camels will mistakenly eat objects like bailing twine or plastic so care must be taken to remove these harmful objects before feeding.
- Camels can be fed via troughs, hopper feeders or grain bags.

¹⁷ http://www.ranvet.com.au/ranvet_e_1000.htm



A grain bag feeder¹⁸

- They should be situated over a concrete base to avoid consumption of dirt and sand. This also allows for easy hose cleaning of troughs and surrounding areas.
- Camels will generally be fed their hay and grains of a morning and behavioral items such as browse and fruit/veg trays of an afternoon.
- Browse when fed out should be hung up in the exhibit where possible, in trees or over fences, or placed on thick grassy sections. Again not feeding on dirt or sand.

N.B. Avoid elevating Feeder bags or hoppers to high as food particles may fall into and irritate the animals eyes.

¹⁸ <http://amibdesigns.com/myPictures/13830.jpg>

7 Handling and Transport

OH&S NOTE:

Capture and restraint of Arabian Camels can pose an OH&S risk as they are a declared dangerous animal (males – bulls) and also as a hazardous animal (females – cows). They have the ability to deliver a kick in all directions and their teeth can cause severe injury.

For more information on the risks involved: see OH&S risks at the beginning of the guidelines.

Risk Rating¹⁹

Male: Dangerous

Female: Hazardous

The Arabian Camel, although normally well-tempered and manageable as a collection species is rated as dangerous and hazardous for male and female specimens respectively because they have the ability to cause significant injury and possibility of death.

The Camel is a tall, heavy mammal weighing in at 400-600kg. Servicing their enclosures can be risky, especially during the rutting (breeding) season when males, if housed with females, may undertake in fights to show dominance or they may become very pushy with keeping personnel.

The solution to that problem, as long as specimens are not wanted for breeding, is to castrate them, as this eliminates the aggressive behaviours. However if the camels are wanted for breeding, it is best to keep the sexes separate until the most opportune moment for breeding. To service them safely during this time, it is recommended to have facilities to separate them from keepers whilst in the exhibit (holding pen). Even when not in breeding season, both male and female camels still have the equipment to cause serious harm. Camels have the extraordinary ability to kick in obscure directions, even to the side, which means one must give a camel a wide berth in all directions when walking near them.

Another tool the camel has is their ferocious looking teeth. A camel processes quite large incisors and canine teeth that direct back in towards the mouth. This gives them the ability to scalp the skin of a keepers head or inflict a very nasty bite if given the opportunity.

One of the most well known risks of working with camels is their 'reputation' for spitting a foul smelling stream of stomach contents when aggravated or annoyed. This can hopefully be avoided though if your camels are housed in a calm environment and respected.

¹⁹ OH&S Risks, Page 3 of Arabian Camel Husbandry Guidelines.

7.1 Timing of Capture and Handling

- **Captive:**

For a captive institution, the best time for capture would be early morning before the public arrive and whilst the Camels are still resting. This is also a good idea if the Camels are held in a secure night den as they will already be in a smaller holding area and partially captured.

- **Wild:**

In a wild environment, it would be beneficial to attempt capture in the early morning or late evening. This is because you do not want to muster a herd of camels in the heat of the day, for their protection and yours.

Early morning would be preferable out of these options as more daylight is available to spot the Camels, which can blend in easily to the environment to the untrained eye.

7.2 Catching Bags

- Not Applicable to the capture and restraint of Arabian Camels

7.3 Capture and Restraint Techniques

- **Captive:**

In a captive environment, Camels can be captured with much less difficulty as they can be easily conditioned using food as a reward and are generally more relaxed around people.

Ideally the camel should be conditioned to crush system. From here, depending on the temperament of the Camel, they can be either led onto a transport vehicle via a halter or through a raceway. Food can act as a beneficial tool and most camels will willingly follow for a bit of their favourite hay or fruit.

If the Camel is particularly stressed, it can be injected with a long acting sedative whilst in restraint and then mechanically transported into a waiting vehicle.



An example portable crush system that can be adapted for use with Camels.²⁰

²⁰ http://whrea.co.uk/20779/20806.html?*session*id*key*=session*id*val*

- **Wild:**

For capture in the wild the following steps should be followed. Remembering that these are wild camels and will pose an increased OH&S risk to the people involved.

In the wild, mobs of camels are scattered and generally need to be mustered into larger herds. This can be done via methods of horse, motorbikes, helicopters, vehicles or traps.

Breeding season occurs during July to December, but bull camels will become increasingly more aggressive in the months of March to August (Autumn & Winter) whilst they are in rut.

Trapping:

Camels can be captured using traps. The way to catch camels via this method is to keep the traps closed over a series of days, allowing the camels to get accustomed to the feeling of the traps on their ribs. Once they are used to the trap, the camels will use the trap without concern and teach others to walk through it. Traps should be placed near a water source and sometimes the use of more attractive foods, e.g. salt licks, may encourage more use.



An Example of a trap yard set up. Closed Vs Open.²¹

NOTE: Some wild caught Camels and occasionally captive camels, may require tranquillising for transportation with a long-acting sedative. Ensure vet treatment is on hand during these situations at all times.

Mustering:

Camels can be captured via mustering using horses, helicopters, vehicles or motorbikes. The most preferred method is using horses as it tends not to stress the camels as other methods may.

Portable or fixed yards should be set up in a location that prevents the camels being herded from seeing them until it is too late for evasion.

For efficient herding the yards should have 100m long wings of hessian or similar material that act as a raceway to herd the group onto the yard.

²¹ <http://www.camelsaust.com.au/chemergency.htm>

If camels are captured as individuals, they must be tied in their normal resting position in a manner that will not cause injury. Whilst tied in this position, the rear legs should not be tied together to allow the camel to partially stand. Camels must not be tied to trees or structures via a halter or ropes around the neck, as strangulation may result. This can occur because once a camel begins to sit down it cannot re-stand until it has sat all the way down.



Mustering using vehicles and motorbikes.²²



Portable Camel Yards.²³

7.4 Weighing and Examination

- **Examination:**

For medical and health examinations, young camels can be examined whilst standing, whereas adult camels will require some form of restraint. They can be restrained standing or in the normal resting position (sternal recumbancy). They may also be restrained in a mechanical restraint, such as a crush. Once restrained, physical examinations (both distant and close) can be undertaken, ideally by an informed professional.

Note: Ensure the legs of a camel are well restrained within the restraint system or injury may occur to the examiner.

- **Weight:**

For taking the weights of camels it would be a good idea to firstly condition the animal using food as a reward. Camels can be conditioned to stand in one place of the enclosure, which can be set up as a weight station.

Here they can either be restrained over the scales or kept there with the offer of food.

A method to note would be to lightly cover the scales with sand (will need to be minused of the total weight) to deaden the noise of walking onto it, which may frighten the camel. Especially young camels or newly handled.

²² http://www.toyota.com/vehicles/minisite/landcruiser/experience/images/australia/camel_muster/LC2008_20070723_13832_out.jpg

²³ <http://www.camelsaust.com.au/chemergency.htm>

7.5 Release

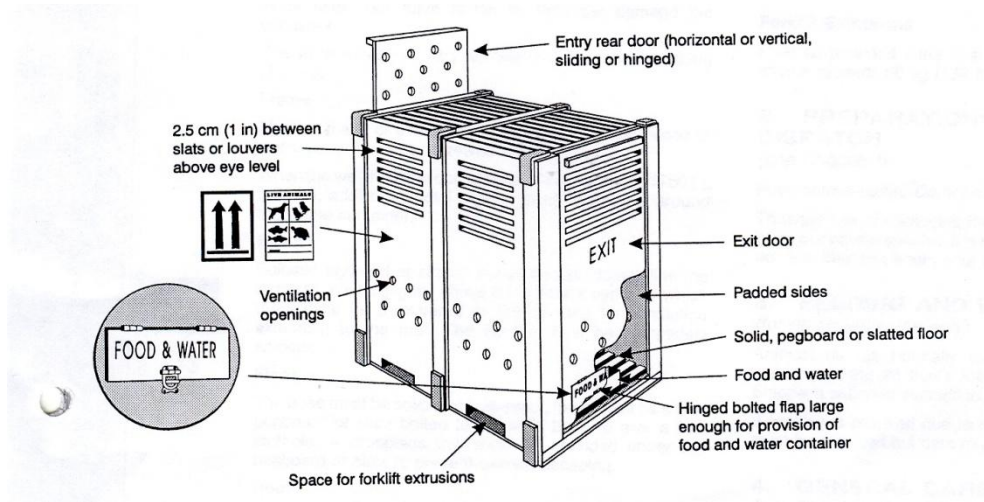
- To release a captive camel into a new enclosure it would be preferable to do so in the early morning. This provides the camel with the entire day to accustom to its new surroundings.
By providing a small amount of feed within its enclosure, this will act as reassurance to calm the camel.
- Camels, depending on their temperament, may arrive at their destination spooked and flighty. To release within the enclosure it would be best to place the transport box into an isolated corner (if truck, may need a ramp, etc) and allow the camel to leave the box itself.
- The size of the enclosure should allow the camel, if need be, to race out of the box and away from it without impaling itself on a fence barrier.
- Any loose enclosure furniture should be removed for the period of release and adjustment.
- It would also be advisable to place visual and physical barriers, e.g. hessian sacks, to the corners of sharp turns or fences within the enclosure.

7.6 Transport Requirements

7.6.1 Box Design

- **Small Camels**
(Size not exceeding 1.5m, 5ft)
- **Materials:**
Must be made out of wood or metal and rubber. Burlap bags or canvas can be used for padding within the box or as light reduction.
- **Dimensions:**
The height and width of the container needs to allow the camel to stand erect with its head extended. The box must restrict movement sufficiently enough so that the camel cannot turn around, nor have the space to kick out and damage the container.
The dimensions will vary depending on the individual sizes of the camels needing transport.
- **Frame:**
Must be made of at least 2.5cm of solid wood, or of metal parts bolted or screwed together.
Additional metal bracing around the entire container will be required if the weight of the container, plus the animal exceeds 60kgs.
- **Sides:**
The sides of the container must be made of suitable plywood or similar material. The material must closely line the frame of the container up to a level slightly above the animals' eyes. Above this level the sides should be louvered or slatted for ventilation extending to the roof.

- The interior of the sides must be completely smooth.
- **Floor:**
The base of the container must be solid and leak-proof. To give the floor a firm foothold, it must be made of either pegboard or slats bolted together.
A droppings tray must be put additionally under the flooring to prevent any excreta escaping.
 - **Roof:**
Must be slatted. If padding is required for the roof of the container, soft materials such as shavings, can be stuffed under the rubber, canvas or burlap coverings.
 - **Doors:**
A hinged or sliding entry/exit door must be provided. They must be fastened in such a way so that they cannot accidentally be opened. The doors must provide the same ventilation requirements as the sides.
 - **Ventilation:**
The ventilations slats or louvers must be spaced with 2.5cm spacing and must be present on all four sides and the roof, above eye level.
Slots and holes must be covered with a fine wire mesh that will not allow any part of the camel to protrude.
If the mesh is on the inside of the container all edges must be protected to prevent injury to the animal.
 - **Spacer bars/Handles:**
Handles must be provided to a depth of 2.5cm and must form the framework of the container.
 - **Forklift Extrusions:**
Must be provided if the total weight of the container plus the animal exceeds 60kgs.



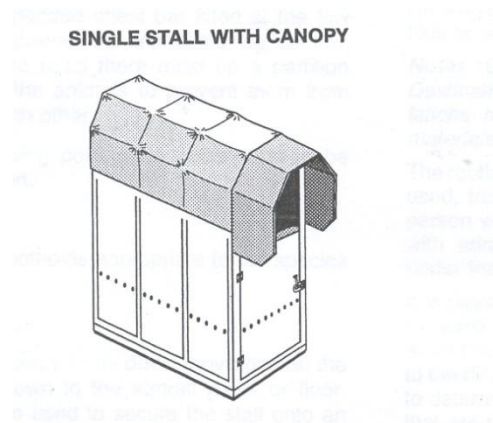
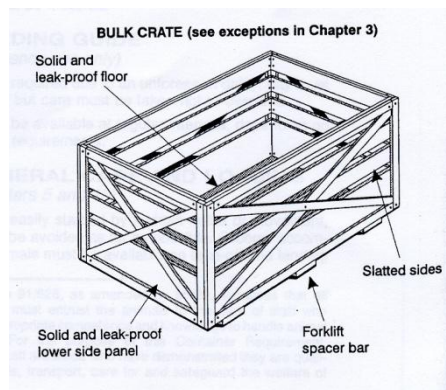
Example of transporting a camel under the height of 1.5m.²⁴

- **Large Camels**
(Size exceeding 1.5m, 5ft)
- **Materials:**
Must be made of metal or wood and have suitable padding
- **Dimensions:**
The dimensions of the stalls must be in proportion to the size of the camel, enough to restrict excessive movement during transport.
The width of the stall must be the width of the camel at its widest point plus an extra minimum space of 7.6cm on each side. 15.2cm extra width in total.
- **Frame:**
Must be made of strong construction, either be welded or bolted together with no projections internally that could injure the camel.
- **Sides:**
The sides of the container must be made of suitable plywood or similar material. The material must closely line the frame of the container up to a level slightly above the animals' eyes. Above this level the sides should be louvered or slatted for ventilation extending to the roof.
The interior must be smooth and all reinforcing plates must be covered with protective material. The whole interior may be padded, but the lower part of the internal sides must be covered with protective matting approximately 5cm thick. Interior padding should be of foam plastic or rubber allowing easy and repeated cleaning.
If transporting in a stall, the head end must be notched and padded to accept the neck of the animal. When closed stalls are being used, there must be a padded chest bar fitted at shoulder height to prevent the camel moving forward. For multiple stalls, there must be partitions between the heads to prevent them from making contact with each other.

²⁴ IATA Live Animal Regulations. Container Requirement 73

Attached to the sides must be a secure point for a halter rope to be fastened during transport if necessary.

- **Floor:**
The base of the container must be solid and leak-proof. To give the floor a firm foothold, it must be made of either pegboard or slats bolted together. A droppings tray must be put additionally under the flooring to prevent any excreta escaping.
- **Roof:**
Must be slatted. If padding is required for the roof of the container, soft materials such as shavings, can be stuffed under the rubber, canvas or burlap coverings.
- **Doors:**
At the head or rear end of the stall, doors must have a secure means of fastening that is easy to operate, smooth and will not cause injury to the camel. There must be enough room for access at the ends for an attendant to reach the head or hindquarters of the camel during transport.
- **Securing Provisions:**
On the outside walls must be tie down provisions to allow the stalls to be tied to an aircraft pallet or floor.
- **Forklift Extrusions:**
Must be provided if the total weight of the container plus the animal exceeds 60kgs.



Examples of transport boxes for large camels.²⁵

7.6.2 Furnishings

- Within the transport containers, furnishings used will be to provide additional padding and protection for the animals.
- Examples of these are: shavings, foam plastic, rubber, canvas or burlap.

²⁵ IATA Live Animal Regulations. Container Requirement 2

- These furnishings can also be used to reduce the amount of light entering the container and assist in keeping the camel calm during transport.

7.6.3 Water and Food

- Food and water containers must be provided in the store and have outside access from a hinged bolted flap.
- **Water:**
Water should be given to the camel up until loading onto the transport container. Water does not need to be provided whilst in transport but should be provided at regular intervals when stopped.
- **Food:**
Before departure, the Camel should be fed a normal ration, but be careful not to overfeed.
Feeding is not required during the first 24 hours of transport. If transport time is longer than this, fodder must be provided at a stopped interval. But again, care must be taken not to overfeed.

7.6.4 Animals per Box

- **Small Camels**
Should be transported singly, due to their size and weight.
- **Large Camels**
Should be transported singly either in a single stall with canopy or in a bulk crate.
- For Large numbers of camels being transported, it may be acceptable, with permission, to transport on a single deck trailer. In this situation camels will tend to sit down for the duration of the journey so enough space is needed to allow all camels to sit comfortably and not lie or trip over one another.



Example of large numbers of wild camels being transported.²⁶

7.6.5 Timing of Transportation

- Loading on to the transport container must occur as close to departure as possible, preferably within 30 minutes, and unloading must begin within 30 minutes of arrival.

²⁶ <http://www.camelsaust.com.au/chemergency.htm>

- If transporting during the day, adequate stops must be made to allow watering of animals.

7.6.6 *Release from Box*

- Unloading from the transport box must occur within 30 minutes of arrival at the destination.
- For normal release purposes, guidelines will be as explained in 7.5: Release.

8 Health Requirements

8.1 Daily Health Checks

Daily Health Checks must be performed whenever entering an exhibit with an animal or whenever passing exhibits. Simply, as a keeper you should be observing your animals at all times of the day.

It is a good idea to begin a health check with a distant examination. This should be done by ensuring that the animal cannot see you as they may not display any signs of illness when they know a keeper is nearby.

- Distant Examination Routine:
 - Check for posture; are they standing correctly or sitting, are they distributing weight evenly on all four limbs, check their body condition, does the coat look healthy and are they of a good weight.
 - Analyse their behaviour, are they alert and active, are they aware of their surroundings, do they seem calm or stressed.
 - Check the surroundings of the enclosure, is all furniture in place, is there anything that looks abnormal.

Once the Camel notices you approaching you should begin your close up exam. If the Camel will allow you close enough to it or it is conditioned to allow you to complete a physical health check then this should be done at this time as well.

- Close Up Examination:
 - Check eyes, nose and ears are clear and free of discharge
 - Check around the genital and anus of the Camel for any abnormal discharge or irritation
 - Check the body condition of the Camel, does it have good weight, are the ribs protruding noticeably or do they look like they are overweight.
 - If possible check the condition of their pads for cracks and injuries
 - Ensure no injuries are present on the camel, or no open wounds or cuts
 - Skin should also be checked for irritations (e.g. Mange), as these things need to be detected early for quick and successful treatment
 - Look around the exhibit, has their food and water been untouched over night, have they been fed inappropriate meals, have they been left without water.

Whilst cleaning the enclosure, exam the faeces you are picking up.

- Faecal Examination:
 - Ensure the faeces is firmly compacted into large, round pellets or as is normal for your Camel

- Does the camel have diarrhoea or abnormal coloured stools,
- Has food been passed out without been fully digested or is there abnormal objects in the faeces
- Is blood present in the faeces or around the enclosure anywhere

If more than one Camel is housed in the same exhibit, observe the dynamics between the animals.

- Dynamics of the Group:
 - Is one individual hording/guarding the food source
 - Are any individuals being 'bullied' by other camels?
 - Camels are a very social animal and will interact with each other. Is this occurring?

Whenever you are in the enclosure with your animals all of these observations must be made. Animals can only show us *signs* of illnesses; they are not able to tell us the symptoms they are suffering. You need to understand what is normal for your Camels individually and use these observations to tell when something does not appear right. In a lot of these circumstances it is your gut feeling you have to go with. It is better to have reported something that ends up insignificant, than to ignore something that is life threatening to your animal.

If any observations are made, it is recommended to immediately advise someone higher up in the chain (e.g. Supervisor) as they can organize for a more thorough and professional health checks (e.g. Vets checks, fecal samples) to be made.

8.2 Detailed Physical Examination

This exam should also be done as an **Annual Medical Check**.

If any observations are made during your daily health checks then the next step, after advising your supervisor, is to perform a more detailed and extensive physical examination, usually done with an experienced Veterinarian.

To begin this exam you may lead your Camel into a crush, if so conditioned, or you may halter the camel and tie to a post to restrain. A crush would be recommended to reduce the probability of injuries that can be sustained from a camel, especially if they are in pain.

8.2.1 Chemical Restraint

If necessary, because of stress reasons, the Camel can be anaesthetised for the physical examination, (Generally only in extreme cases, as they are a hardly and tolerable animal). In general, a Camel should be able to withstand the physical examination with

no great stress, however if the individual is already quite ill, this may be the best option as further stress to the illness could increase the damage.

Keepers must remember though, that anaesthetising an animal can also be quite stressful to an animal itself. If this is a necessary step, you should ensure that their environment is adapted to reduce the stress when coming out of the anaesthetic. E.g. remove objects that could cause the Camel injury, section off a smaller section of the exhibit that is out of the public eye and away from other enclosure occupants.

If as a keeper, you believe sedation will be necessary, ensure the camel does not eat for 24-36 hours prior to avoid it bringing up the contents of the rumen and choke on them. It should also not be allowed to drink for 12 hours beforehand.

Provide plenty of water after the procedure as they may need it as they come around, but do not feed immediately, wait until they have completely recovered and then introduce food slowly. This may take a few hours before they are completely free of any after effects.

The Camel should be monitored regularly for the rest of that day for any adverse affects to the procedure.

8.2.2 *Physical Examination*

- Physical Examination:
 - Firstly the camel should be weighed and the weight recorded. As a general rule your camel should be weighed on acquisition into the collection, and then every 3-4 months, or as deemed necessary. This record keeping will be of benefit as you can compare the weight of the camel now as to how much it weighed at last check. This will also give you an indication of how much the individual should generally weigh.
 - Then a close up examination of the eyes, nose, ears and mouth. Checks for any abnormal discharge, blood present, teeth rotting or ground down, and foreign objects embedded, ensure they are all clear and all mucus membranes are a nice pink, oxygenated colour.
 - A physical rectal and vaginal (with females) exam should also be done, especially in the case where diarrhoea is present. Around these areas ensure no abnormal colouring, discharge, blood or irritations are present. A faecal sample, if not already done, should be taken at this point for testing.
 - Blood collection can be done at this time for testing. This must be done by a Veterinarian and is usually taken from the jugular vein on the underside of the neck. As a keeper you will probably be needed to restrain the camel for successful withdrawal.
 - If skin irritations have been noted, it is also good to take a skin scraping to check for mites or similar. These can be serious as they may cause serious Mange issues.

- At this time, if possible, you should check the Camels hooves. This may be necessary if the individual has been favouring one foot and not distributing its weight evenly. The Camel should have a clear, broad, flat, leathery pad that is free from injuries or irritations.



Top View of a Camels Hoof, note the broad way it sits.²⁷

8.3 Routine Treatments

- Worming:
 - Camels are very susceptible to whipworms which are not covered by the common worming drug Ivermectin. To cover Camels for all worms they should receive both Ivermectin (which covers all other worm parasites) and Panacur (effective against whipworms).
 - Worming is recommended every 2 months in a high risk locale but this can be tailored to suit individual circumstances.
 - TIP: It is recommended to alternate Ivermectin and Panacur each time dosage occurs to prevent whipworm from developing a resistance to the Panacur.

	Ivermectin²⁸ (Sheep formulation 0.8 g/L)	Benzelmin Concentrate²⁹ (Given at Horse Strength)	Panacur³⁰ (25 or Synanthic, Given at double the Horse dose)
Dosage Rate for Camels³¹	<ul style="list-style-type: none"> • 0.25-0.5 ml per kg body weight. • Dosage via food source 	<ul style="list-style-type: none"> • 1 ml per 10 kg body weight. • Dosage via food source 	<ul style="list-style-type: none"> • 1 ml per 5 kg body weight. • Dosage via food source or directly into the mouth.

²⁷ Top view of a Camels Hoof. <http://pro.corbis.com/search/Enlargement.aspx?CID=isg&mediaid=%7B81D06ABD-9DC4-4CF2-B961-0C34EFEB74C%7D>

²⁸ MSDS Appendix M

²⁹ MSDS Appendix N

³⁰ MSDS Appendix O

³¹ Symbio – Preventative Medicine Program, Created by MJC (Vet) on 21/8/2001, Located in food prep room. Refer to Appendix F. Also refer to Appendix G for formula to estimate a Camels weight.

- Skin Tests:
 - Skin scrapings should be taken monthly. This is testing for mites that cause mange in Camels. As mange is visible to the naked eye and can become a serious problem in just 2-3 weeks after contracting it, it is recommended that if your institution has the facilities, scrapings should be taken every 4 weeks as a preventative method.
 - If scraping comes back positive for mites, it is recommended to treat immediately with a pour on treatment of Ivermectin. For more information regarding the signs and treatment in Camels, See Known Health Problems :Mange)
- Vaccinations:
 - All Camels in your care should be vaccinated annually with Clostridium CD/T Vaccine.
 - If vaccinating an animal for the first time they will need a booster shot *one* month after the initial shot.
 - An additional vaccine, not necessary in Australia, but maybe necessary on other Countries (e.g. USA) is the vaccine for Rabies.
- Vaccinations for Pregnant Camels:
 - Pregnant Camels should still receive their annual vaccine as above.
 - It is also recommended to give them a booster shot 2 months before calving to ensure their colostrums contains the antibodies against diseases.
 - It is also necessary to give the pregnant mother an Endovac Bovi vaccine at the same time as their annual CD/T vaccine to protect the calf from contracting gram negative infections (e.g. Salmonella and E.Coli).

8.4 Known Health Problems

SARCOPTIC MANGE

Sarcoptes scabiei var cameli

Mange is a highly contagious skin disease that causes severe itchiness, poor growth and health and can even cause death in Camels. It is one of the most common diseases in Camels, especially if kept in temperate regions or areas with an extended wet season.

- **Cause:**
 - Mange is caused by a parasitic mite that burrows in under the hair follicle and lays its eggs. This begins an allergic reaction that develops into the recognizable signs of Mange.
- **Signs:**
 - Begins as small bumps in the skin surface
 - Hair loss and raw weeping skin
 - Thickening and scabbing of the skin
 - Severe itching or rubbing against objects
 - Weight loss, causing the camel to become weak and anemic
 - Secondary infections → pneumonia, fly strike.
- **Location:**
 - Begins in the armpits or groin area
 - Spreads to the entire body, except the hump
- **Diagnosis:**
 - Take a skin sample from the edge of the scabs from 3 different places on the body and check for mites or eggs under a microscope.
- **Transmission:**
 - If one camel in your collection is diagnosed with mange, chances are your other camels, although not yet displaying signs have been infected also.
 - It is highly contagious and recommendation would be to 'treat one, treat all'.
 - It is transmitted through direct contact between camels or indirect camels through equipment of rubbing posts. This is possible as the mites can survive for up to 2 weeks outside of a host.

- **Zoonotic:**
 - Mange is a zoonotic disease but it is rare for a human to catch it.
 - It often affects us on the palms and in between fingers, though it generally heals itself quickly as the mites will disappear within a few days.
 - Symptoms in humans will disappear in 1-3 weeks after mites have disappeared.
- **Prevention:**
 - Quarantine or isolation of infected animals to protect the rest of your captive herd
 - Remove infected equipment from exhibits.
- **Treatment:**
 - Inject Ivermectin under the Camels skin
 - There are a range of treatments available, although pour-on treatments come highly recommended.

	Amitraz 250 mg/L³²	Quintiphos 0.02%³³	Deltamethrin 1%³⁴	Diazinon 0.05-0.1%³⁵	Gamma BHC 0.025-0.05%³⁶
Mange Treatments	<ul style="list-style-type: none"> • 2 ml per litre of water • Pour on treatment 	<ul style="list-style-type: none"> • 10 ml per 18 litres of water • Pour on treatment 	<ul style="list-style-type: none"> • 2.4 ml per litre of water • Pour on treatment 	<ul style="list-style-type: none"> • Make up per directions on package as a 0.05-0.1% solution 	<ul style="list-style-type: none"> • 8 g sachet in 4 litres of water • Pour on treatment

Apply all treatments 2-3 times over a 7-10 day period. Continue until all signs have disappeared.

**CAUTION: These drugs are all acaricides and are poisonous. Wear appropriate PPE (Gloves, goggles, masks) when using.
Store in correct conditions and in an authorized only area.**

³² MSDS Appendix P

³³ MSDS Appendix Q

³⁴ MSDS Appendix R

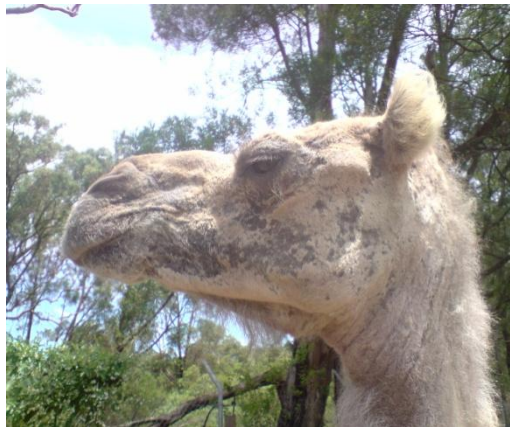
³⁵ MSDS Appendix S

³⁶ MSDS Appendix T

- **Injections:**³⁷

	Ivermectin ³⁸
Mange Treatments Injections	<ul style="list-style-type: none"> • 0.2 mg/kg body weight • (e.g. 1 ml / 50 kg) • Inject Ivermectin under the Camels skin • Repeat after 2 weeks

- Ivermectin Injections are expensive but highly successful. Always store correctly and ensure correct dosage for continued eradication of mange mites.



*Sarcoptic Mange on a Camels Face*³⁹



*Advanced Stage of Sarcoptic Mange on a Camels hind Leg*⁴⁰

³⁷ Formula to estimate a Camels weight. See Appendix G.

³⁸ MSDS Appendix M

³⁹ Photo Taken by Jodie Moretti at Symbio Wildlife Park 19/01/09

⁴⁰ Photo Taken by Jodie Moretti at Symbio Wildlife Park 19/01/09

TICKS

- **Cause:**
 - Ticks are external parasites that attach to the Camels skin and suck blood. The two main types of ticks affecting camels are *Rhipicephalus sanguineus* (Brown Dog Tick), and *Boophilus microplus* (Cattle Tick).
- **Signs:**
 - Ticks on the body
 - Itchiness or irritation at tick locations
 - Bites may become infected
 - Extensive bleeding or anemia (if large number of ticks are present)
 - Weakness or loss of weight
 - Conjunctivitis (if ticks are present around the eyes)
 - Paralysis (if large number of ticks are present)
- **Location:**
 - Base of the Tail and around the anus
 - Groin and armpits
 - Around the eyes and ears
- **Zoonotic:**
 - Ticks can be zoonotic and transfer from Camels to a human host
 - They may carry diseases, harmless in the camel, but that can affect humans. E.g. Q-fever
- **Prevention:**
 - Avoid overcrowding. Stick to EAPA standards and then some.
 - If exhibiting in a tick prone area, regularly smear affected areas with an anti-tick ointment or a pour on.
- **Treatment:**
 - You can remove the ticks by hand by pulling hard on its body and slowly turning and pulling the tick
 - After removal kill the ticks by squashing them or dropping them into a can of mineral oil
 - Use a pour on treatment such as Ivomec (Sheep Brand) that advertises to kill external parasites. Use as the dosage rate suggests or at double the horse strength
 - This same treatment can be used for external parasites such as lice and fleas also.



Brown Dog Tick affecting Camels⁴¹



Cattle Tick affecting Camels⁴²

INTERNAL PARASITES (WORMS)

The internal parasites a Camel can suffer from are Tapeworms, roundworms, stomach worms and helminthiasis.

- **Cause:**
 - The types of worms camels can suffer from vary from area to area. Camels become infected by eating plants that contain worm eggs or larvae.
- **Signs:**
 - General weakness or apathy
 - Diarrhoea, can alternate between constipation also
 - Pain in the gut region
 - May eat sand if available to attain minerals
 - Anemia
 - Lack of appetite
 - Death after several weeks if left untreated (extreme cases)
- **Location:**

<i>Type of Worm</i>	<i>Worm Species</i>	<i>Infective location</i>
Stomach worms (nematodes)	<i>Haemonchus longistipes</i>	Stomach
Other Roundworms (nematodes)	<i>Cooperia pectinata</i> <i>Impalaia tuberculata</i> <i>Oesophagostomum columbianum</i> <i>Strongyloides papillosus</i> <i>Trichostrongylus probolurus</i>	Stomach Intestines
Tapeworms (cestodes)	<i>Moniezia expansa</i> <i>Stilesia vittata</i>	Intestines

⁴³

⁴¹ <http://www.tickalert.org.au/commoniti.htm>

⁴² <http://www.tickalert.org.au/commoniti.htm>

⁴³ A Field Manual of Camel Diseases, Page 140, 2001

- **Diagnosis:**
 - if you suspect your camel has worms, take a faecal sample to check for worm eggs or larvae under a microscope
- **Prevention:**
 - Provide camels with salt licks (sodium chloride)
 - Clean enclosures thoroughly and regularly of faeces
 - Ensure water source is not contaminated by faeces
 - Stick to an organized worming schedule (See Routine Treatments 8.3)
- **Treatment:**

<i>Routine Treatments for Camels to prevent worms</i>	Ivermectin⁴⁴ (Sheep formulation 0.8 g/L)	Benzelmin Concentrate⁴⁵ (Given at Horse Strength)	Panacur⁴⁶ (25 or Synanthic, Given at double the Horse dose)
Dosage Rate for Camels	<ul style="list-style-type: none"> • 0.25-0.5 ml per kg body weight. • Dosage via food source 	<ul style="list-style-type: none"> • 1 ml per 10 kg body weight. • Dosage via food source 	<ul style="list-style-type: none"> • 1 ml per 5 kg body weight. • Dosage via food source or directly into the mouth.

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<i>Treatments to eradicate Internal Parasites</i>	Ivermectin / Ivomec⁴⁸	Panacur⁴⁹
Dosage Rate for Camels	<ul style="list-style-type: none"> • 0.2 mg/kg of body weight • Injection under the skin 	<ul style="list-style-type: none"> • 5-7.5 mg/kg of body weight • Dosage via a paste or liquid into the mouth

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⁴⁴ MSDS Appendix M

⁴⁵ MSDS Appendix N

⁴⁶ MSDS Appendix O

⁴⁷ Symbio – Preventative Medicine Program, Created by MJC (Vet) on 21/8/2001, Located in food prep room. Refer to Appendix F. Also refer to Appendix G for formula to estimate a Camels weight.

⁴⁸ MSDS Appendix M

⁴⁹ MSDS Appendix O

⁵⁰ Refer to Appendix G for formula to estimate a Camels weight.

DIARRHOEA

- **Cause:**

Many things can cause diarrhoea in Camels, these being:

 - Infections of the stomach or intestines (bacterial or viral)
 - Sudden feed changes
 - Internal parasites
 - Plant poisoning
 - Stress (transportation, examination, treatment)
 - Rut (Males only in Breeding season)
- **Signs:**
 - Faeces changes colour and consistency
 - Foul smelling faeces
 - Weakness, loss of condition
 - Fever
 - Swollen belly
 - Sunken eyes
- **Prevention:**
 - Isolate sick animals to prevent transmission to healthy animals
 - Control poisonous plants, do not allow camels to access areas where they might grow
 - Do not allow enclosure or water to be contaminated by faeces
- **Treatment:**
 - Find out what is causing the diarrhoea and treat the underlying cause as well as treat for the effect of diarrhoea
 - Treat with oral rehydration liquid:
 - Mix 200 ml Kaolin with 1 litre of water and give as a drench (Adult dosage/half dosage for calves)
 - Give a commercial anti-diarrhoea treatment by mouth
 - Administer a broad-range, long-lasting antibiotic

TEETH PROBLEMS

- **Cause:**
 - The molars in a camel can develop an irregular surface which prevents the camel from chewing properly.
 - If a tooth is missing the corresponding tooth, above or below, can grow too big and interfere with chewing.
- **Signs:**
 - Does not chew properly, uses one side only
 - Loss of body condition
 - Bad smell from the mouth
 - Grinding its teeth (Note. Males will do this deliberately when in rut)
 - Teeth wearing unevenly
 - One tooth is longer than the others
 - Swelling → if feed accumulates in the space of a missing tooth
- **Prevention:**
 - Providing correct nourishment and roughage to wear the teeth down evenly
- **Treatment:**
 - Sedate the animal if necessary (See Chemical Restraint 8.2.1)
 - File the teeth to make them an even size and smooth sharp edges
 - Provide 50 g per day of extra minerals and vitamins for 3 months, via powder form.
 - Adjust the diet to meet adequate nourishment and roughage requirements to prevent further problems

8.5 Quarantine Requirements

Quarantine is essential as a preventative method of keeping our animals in both the wild and captivity safe from disease. Quarantine employs methods that eliminate the entry of new diseases into Australia, limit the spread of disease around Australia and the transference of diseases out of Australia.

- Quarantine protocols differ depending on the species being acquired and facility you are located at. All transport and quarantine requirements need to be authorized and approved by Australian Quarantine and Inspection Service (AQIS)

- Any individuals arriving into the collection should be housed in a separate, isolated location that follows quarantine standards.
- Housing should be of non-porous environment (e.g. cement), have its own draining and have the ability to be cleaned and disinfected daily.
- Staff maintaining these enclosures must adopt a principle called 'Barrier Nursing'. This involves each quarantine area to have:
 - Its own cleaning tools
 - PPE: gloves, boots, facemasks, surgical gowns (overalls)
 - Footbaths with disinfectant (F10sc/Bleach⁵¹)
 - Disinfecting areas for food bowls
 - Separate waste disposal areas
- Each animal will need to undergo the following procedures before being released into the collection:
 - 90 days quarantine for Camels coming overseas
 - 45 days quarantine for Camels Interstate/Inter institution
 - Vaccinations should be up to date (See Routine Treatments 8.2)
 - 3 faecal floatation's, one week apart with the last 2 coming back negative
 - 2 External/internal parasite treatments
 - A full clinical examination:
 - Health screen
 - Hair collection sample and testing
 - Sex determination
 - Identification
 - Any other test required, e.g. urinalysis, blood test.

NOTE:

Artiodactyla should not be translocated to or from geographic areas or populations which are known to harbour wild or domestic ungulates infected with chronic wasting disease, (Cervidae in USA), brucellosis, bovine tuberculosis, paratuberculosis, foot and mouth disease, rinderpest or septicaemic pasteurellosis.

⁵¹ MSDS Appendix J

9 Behaviour

9.1 Activity

- In their natural habitat, Arabian camels will spend a lot of their time browsing and grazing on food. Their typical eating behaviour is to walk and browse over a large area in the cooler parts of the day (diurnal – dawn/dusk).
- Young camels (<4-5 years) will spend more time than older camels browsing during the daytime.⁵²
- In the hottest parts of the day, camels will rest in the sand to keep their body temperature at a constant temperature to limit water loss and energy usage. This behaviour is how they can survive days and weeks without food and water.
- Camels will not undergo any type of torpor or hibernation period.



Herders will rest their camels during the hottest parts of the day.⁵³

9.2 Social Behaviour

- Camels will normally live in a herd, called a 'caravan'. They can be housed in three different types of ways:
 - As an all male bachelor group.
 - As an all female group. Young included until a max of 5 years if male.
 - As a typical herd of females led by one dominant male. (1:5-7)
 - At bare minimum I would recommend housing a pair of camels together

⁵² http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6T42-4FY3P20-1&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=5d4cd655ab858257661624d083f2c3bd

⁵³ http://upload.wikimedia.org/wikipedia/commons/7/7f/Diffa_region_resting_camels_mules_road_2006.jpg

- If housing all males together, keepers will need to observe closely during the rutting season because once males go into rut they may be increasingly aggressive towards each other and towards keepers.
- If keeping males and they are not needed for breeding, castration is recommended to make them a more manageable display species and to eliminate the OH&S risks involved when male Arabian Camels go into rut.
- Outside of the breeding or rutting seasons males and females will not fight or have any territorial issues.
- **N.B When in rut, a male Arabian camels risk rating increases from Hazardous to Dangerous.**
- Home Range Size:
 - An Arabian camels' home range is determined by how far it will travel in search of food and water. This range can be any where up to a 100 km radius.

9.3 Reproductive Behaviour

- The Breeding season occurs in Australia between the months of July to December.
- The male *rutting* season spans from July to October in Australia.
- Breeding seasons for the Arabian camel are geographically different because of differently timed seasons. A general rule for their breeding season anywhere in the world is that the breeding season normally always occurs in the winter months or the rainy season.
- The breeding season generally can last from 3-5 months.
- Courtship displays in the Arabian camel are all displayed by the male. They are also the signs for keepers to look out for during the breeding season that will alert them of animals coming into rut.
- Courtship Displays/Signs:
 - Making low noises to other males
 - Standing as tall as possible with repetitive swaying of the head in all directions
 - Increased Aggression
 - Sprays urine
 - Frothing at the mouth
 - Loud gurgling sounds
- Males may also inflate a fleshy pouch called the *Dulaa*, which hangs out of the side of the mouth to attract females.



Arabian Camel Bull inflating his *Dulaa*⁵⁴

- Signs in the females that show she will be receptive to the males displays are:⁵⁵
 - Restless
 - Seeks the company of the male
 - Bleats continuously
 - Develops a swollen Vulva that often produces an accompanying discharge
 - Foul smell that comes from the Vulva

9.4 Bathing

- It is necessary to provide captive camels with the ability to have sand or dust baths.
- Not only is this a common behaviour that is observed in wild camels is also assists with the removal of parasites of a camels skin.
- A large area in a camels' exhibit should be maintained as a loose dusty or sandy area to encourage this natural behaviour.



A Camel having a dust bath mid trek.⁵⁶

⁵⁴ http://farm1.static.flickr.com/8/8754761_5d0ca4ebf6_o.jpg

⁵⁵ http://www.ilri.org/InfoServ/Webpub/Fulldocs/Monono5/Reproduc.htm#P120_23886, 2.2.4

⁵⁶ http://farm4.static.flickr.com/3179/2889103395_2cf70a63e1.jpg?v=0

9.5 Behavioural Problems

- As stated above in 9.3, Reproductive Behaviour, Keepers need to be wary of male camels during the *rutting* season as they will become increasingly aggressive towards one another and people entering their enclosure.
- During the rut season keepers should not enter exhibits alone and time spent in them should be kept to a bare minimum. Public interaction must be completely avoided and if any of these animals are used for shows around the zoo, this should be stopped.
- Females can still be able to be used for public interaction during the breeding season, so long as they normally have a good temperament.
- If camels are bored and are not stimulated in their captive environment they may start to display stereotypical behaviours. These include:
 - Continual pacing of the exhibit, wearing down a path
 - Standing at the entrance of their exhibit all day waiting for keepers to enter
 - Complete regurgitation of food and then re-eating it. This is different from the normal camel behaviour of regurgitating food from the foregut to re-chew it, *Cud*; this does not leave the mouth.

N.B. Every Workplace should have a set SOP (Standard Operating Procedure) in place that addresses how to care for, handle and work with a Camel during the Rutting season.

9.6 Signs of Stress

- A sign of stress in camels can be if they are observed trying to escape. Some zoo institutions have had problems where solitary housed animals escape from their enclosure and will walk to another exhibit, normally other hooved stock. This seems like they are looking for company.
- If this situation occurs it would probably be a good idea to either provide more enrichment for the camel so they don't feel lonely, or the easiest way would be to introduce another camel, or other compatible animals.
- If your camel is escaping, it would also be recommended to ascertain how they are getting out of their exhibit and restructure so they are not able to.
- Other signs of stress could be classified under self mutilation. These signs may be things such as:
 - Over use of scratching posts that is causing lacerations to camel; this may also be a sign that the camel has mange (see 8.4 Sarcoptic Mange)

- Lack of appetite – If the camel goes off its food, it may be a sign that it is stressed. This can especially be the case if something has changed near or in the enclosure. Consider if construction is being done nearby or if a new animal has been introduced. Observe the dynamics of your camel herd and see if that particular camel is being bullied and isn't being allowed to feed. If none of these are a problem, it may be a medical issue and I would recommend following steps to eliminate that problem.
- Over-eating – If your camel is gorging itself on food, this again may be either a sign of illness or stress. Follow the steps above to eliminate these behaviours.

9.7 Behavioural Enrichment

- Behavioural enrichment can be provided through a few different approaches: Social grouping, feeding strategies, exhibit furnishings, human interaction, training and conditioning and sensory stimulation.
- I would recommend feeding strategies, human interaction and training and conditioning as being the most rewarding in regards to the enrichment and wellbeing of the camels. These are also the groups camels respond the best to.

Social Grouping:

- Camels are very social animals and I would not recommend housing alone as they will easily get bored and possibly display some stereotypical behaviours.
- Camels will normally live in a herd, called a 'caravan'. They can be housed in three different types of ways:
 - As an all male bachelor group.
 - As an all female and young group.
 - As a typical herd of females led by one dominant male.
- At bare minimum I would recommend housing a pair of camels together.
- Some zoos do only exhibit one camel, but they provide a great deal of enrichment and keeper interaction that eliminates boredom in the camel.



Camels are very social animals and thrive off being housed together as a “caravan”.⁵⁷

Feeding Strategies:

- The easiest methods of enriching animals always involve using food to encourage them to forage and explore as they would do in the wild to search or work for their food.
- For camels such ideas can be:
 - Hay provided in a hopper feeder that is at head height or just above so that they have to reach for their food.
 - Browse that is provided should be strung up around the exhibit so that they mimic trees in the wild that the camels would strip the bark off.
 - Provide a softer type of salt lick that can be strung up in the exhibit that swings around as the camel tries to lick. Will provide some harder feeding strategies.
 - Provide a plastic container that has had holes cut out of it. This can then have hay and veg stuffed in it that will fall out as the camel rolls it and plays with the container.
 - Scatter feeds of fruit/veg, hay and grain around the exhibit. (This can be a way of feeding out feed out trays.)

⁵⁷ <http://camel-boy.com/images/camels1.jpg>



Pictured is both the methods of stringing up browse in the exhibit and also providing a container with holes that has hay inside.⁵⁸

Exhibit Furnishings:

- Furnishings are a great way to enrich an animals' life as replicating their natural habitat is the easiest and best way.
- Furniture that could be included are:
 - Small pond – doubles as a second water source and as an enrichment, if big enough to bath in.
 - Branch Hanging Areas – can hang browse for natural food enrichment.
 - Sandy Areas – substrate allows Camels to display natural behaviours as they are found in very sandy desert areas. E.g. sand bathing.
 - Trees – e.g. palm trees. Camels scratch up against the bark, natural behavior, and is also anethetically pleasing to the public
 - Logs/Hills – they provide more scratching posts and areas for the camel to climb on. Provide a natural looking exhibit.
 - Scratching posts – these can be provided through the trees above but other posts can also be installed.



Examples of exhibit furnishings; scratching posts, logs and sand.⁵⁹

⁵⁸ Personal photograph taken at Australia Zoo 02/05/2009

⁵⁹ Personal photograph taken at Australia Zoo 02/05/2009

Human Interaction:

- Human interaction is not always viable, especially if you have an aggressive camel. Where possible, training and interaction should be included in your enrichment calendar for every animal.
- Some examples of how to allow human interaction with your camels are as follows:
 - Walking the camel around the zoo for shows and education of the public.
 - Having a camel that is trained to give the public camel rides. (Not always applicable in a zoo institution but in other camel specialist places.)
 - Daily brushing down of the camels hair after shows or for removal of their winter coat is a great opportunity to generally interact with the camel.



Photo of a keeper at Aus Zoo walking the camel back to her exhibit.⁶⁰



Photo of a keeper brushing the winter coat of a camel.⁶¹

Training and Conditioning:

- Training and conditioning is a great way of interacting with your camel. Through training it will also be easier for keepers to complete health checks as you can condition the animal to allow this.
- Following are some things that you can train and condition you camels to do:
 - Allow keepers to brush down and remove winter coats (as above).
 - Halter training to allow keepers to lead the camel for walks around the zoo or to off-exhibit areas.
 - Conditioning of the camels to go for walking shows around the zoo.
 - Conditioning of the camels to allow keepers to complete health checks on the animal. Including checking the feet, hooves, eyes, ears, teeth and body condition.

⁶⁰ Personal Photograph taken at Australia Zoo 02/05/2009

⁶¹ Personal Photograph taken at Symbio Wildlife Park 19/01/2009



A keeper checking the feet of a camel after a walk around the zoo.⁶²



A camel wearing a halter lead to be walked.⁶³

Sensory Stimulation:

- Camels are very curious by nature and will come over to investigate anything new and interesting that comes into their enclosure.
- Use this nature to enrich them by stimulating their sense of smell
- Some things keepers can do is spread new and different smells around the exhibit and allow the camels to investigate the smells.
- This type of enrichment can be used once or twice a week, though the smells should be varied to keep animals as interested as possible.
- Types of smells that can be used are:
 - Rose
 - Lavender
 - Vanilla
 - Sandalwood
 - Sage
 - Musk, etc.
- Following this page is also an example weekly enrichment calendar for Arabian camels that I have constructed:⁶⁴

⁶² Personal Photograph taken at Australia Zoo 02/05/2009

⁶³ Personal Photograph taken at Australia Zoo 02/05/2009

⁶⁴ Enrichment calendar taken from own personal work and experiences.

Example Weekly Enrichment Calendar for Arabian Camels

MONDAY	TUESDAY	WEDNESDAY	THURSDAY
<ul style="list-style-type: none"> Scatter Feed of Fruit/Veg 	<ul style="list-style-type: none"> Provide dust/sand bath 	<ul style="list-style-type: none"> Fill pool clam shell 	<ul style="list-style-type: none"> Feed out Trays
FRIDAY	SATURDAY	SUNDAY	
<ul style="list-style-type: none"> Halter and walks training/conditioning 	<ul style="list-style-type: none"> Plastic Container with Hay and Veg 	<ul style="list-style-type: none"> Training. Conditioning for health checks (e.g. hooves, teeth, etc) 	

ALTERNATIVE OPTIONS FOR WHEN ANY OF THE ABOVE ARE UNAVAILABLE:

- String up browse in exhibit whenever available
- Brush hair off camel (esp. important to remove winter coat)
- Daily walks around the zoo for shows

9.8 *Introductions and Removals*

- Any new additions to an established herd of camels should be done gradually.
- Ideally you would have the new camel in an adjacent enclosure to the herd to observe any signs of negative compatibility. If no negative signs are shown over a period of a few days then the new camels should be led into the enclosure in the early morning so that if any aggression is displayed it will be before there is public in the park.
- The new individual should be monitored in the group over the day and you should be confident there will be no aggression before leaving the camels over night.
- If any aggression is displayed in those initial moments, remove the new camel and lead it back to the adjacent enclosure. You can try this routine of introducing the camel in to the exhibit for a few days in a row until the other camels accept it.
- Camels are very social animals and introductions to a new group should not be too difficult as in the wild many different herds will come together to graze or search for water at periods of the year.
- If a camel needs to be removed from the herd, care should be taken to ensure it is not a mother who still has young suckling. Other than that situation you do not need to consider if the camel has a partner that will pine for it as the males are Polygamous; this means the male of the species will mate with numerous females throughout the breeding season.
- The only situation that a camel may pine is if they are only housed as a pair and one is left on its own. In this case I would recommend increasing enrichment for the period it is a solitary animal to eliminate it developing any stress signs or stereotypical behaviours.
- When camels are removed for medical procedures, ensure they are 100% fit to be introduced back into the group and will not be bullied if they are weaker (esp. in the case of a dominant male). These individuals should be introduced back into the herd as above, although the established group should not show any aggressive behaviours towards them.

9.9 *Intraspecific Compatibility*

- Camels being a social species should always be housed with other individuals.
- Camels can be housed in a 3 different group types:
 - As an all male bachelor group.
 - As an all female and young group.
 - As a typical herd of females led by one dominant male.
- If groups are maintained in any one of these three herd types then aggression between individuals should be of a minimum.

- The only time you may get aggression occurring between any animals is if housed in an all male group during the breeding season. Generally there will still be one dominant male that will come into *rut* and this should suppress the other males in the group. Although you may get other males in the same group come into rut as well at this time.
- In this situation it may be best to separate (physically, but not visually) the aggressive male to prevent him causing any injuries to weaker males.
- Caution at this time must also be taken by keepers as a conditioned male may become increasingly aggressive towards camels, keepers and the public.

9.10 Interspecific Compatibility

- As mentioned previously, Arabian camels are a very social species and can be housed with various other species as well as other camels. Species they can be housed with include:

▪ Llama	<i>Lama glama</i>
▪ Giraffe	<i>Giraffa camelopardalis</i>
▪ Zebra	<i>Equus zebra, E.quagga, E.grevyi</i>
▪ Ostrich	<i>Struthio camelus</i>
▪ Scimitar-horned Oryx	<i>Oryx dammah</i>
▪ Addax	<i>Addax nasomaculatus</i>
▪ Slender-horned Gazelle	<i>Gazella leptoceros</i>
- It is important when creating a mixed species exhibit that you consider the following things:
 - Enclosure size – needs to allow for different species to avoid one another if necessary. This can be achieved by using visual barriers.
 - Correct feeding is difficult in a mixed species exhibit and care needs to be taken that there are enough feeding points, relative to different animals heights, that each individual can access without being harassed by other animals.
- It is also important to note that all individuals of a species are different, what may work at one zoo as a mixed species exhibit, will not necessary work at your zoo. Each situation needs to be monitored carefully to ensure there is no aggression or fighting between different species.
- Care must also be taken to monitor any animals for signs of illness. As most species that can be housed together are all ungulates, there is a high possibility that illnesses can be passed in to other species (e.g. Sarcoptic Mange – highly contagious). If an individual specimen is noted to look unwell, they should be quarantined from the group immediately and their condition monitored.



A Group of Giraffe and Arabian camels browsing together.⁶⁵

9.11 Suitability to Captivity

- Arabian camels, although not a very highly published about animal, make a great exhibit display and are very suited to captivity.
- Australia is the only country with a feral population of camels, in their native countries; they are graded as a semi-domesticated animal.
- They are a very friendly and social animal and easy to train and condition. These ideal behaviours mean that they can be trained to interact with the public via live demonstrations that they will enjoy just as much as the crowd.
- They are a relatively easy species to look after in a zoo, with no great diet demands. They can be fed via there enrichment item for the day and they will happily rest for most parts of the day.
- They are not a shy animal so they will spend the majority, if not all the day, out of their night areas and in full view of the public.
- They can establish bonds with keepers and this will help staff to train and condition them and also allow the public to interact closely with them.



A Keeper at Symbio Wildlife Park interacting with Arabian camel 'Honey'.⁶⁶

⁶⁵ <http://z.about.com/d/gouk/1/0/1/K/-/-/giraffscamels.jpg>

⁶⁶ Personal photograph taken at Symbio Wildlife Park 22/09/2008

10 Breeding

10.1 Mating System

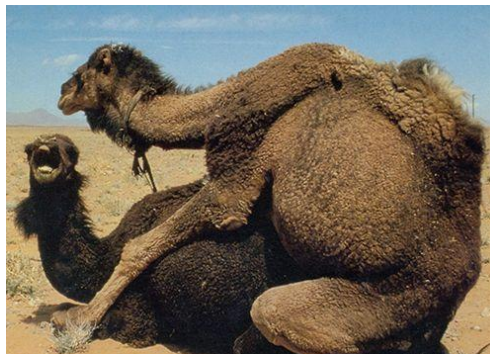
Arabian Camels are Polygamous; this means the male of the species will mate with numerous females throughout the breeding season.

The most ideal breeding ratio of male camels to females (m:f) is 1:5-7. The one male will be able to service these females while retaining his health and well-being. If kept with too many females, the male can lose condition in his eagerness to service all the females.

In captivity, breeding may not be advised due to the increased OH&S risk this presents to keepers, animals and the public. Recommended ratios would be an all female group. If males are desired, they should be castrated.

In the wild, studies have shown that a male Arabian camel will mate with up to 3 females per day, several times a day, at the peak of the breeding season.⁶⁷

Before mating occurs the male will approach a female from behind. He will then sniff her genitalia and expose his teeth. This is called *Flehmen*. To force her down he will bite her neck and front feet. Once she is in a sitting position the bull will mount her and rest on top of her.



Mating Arabian Camels⁶⁸

During mating, the male will gurgle and froth from the mouth. He may also blow out his *dulaa* (See 10.3.2 for details). Copulation time ranges between 7-35 minutes, with an average time of 11-15 minutes.

Once the cow has conceived, she will refuse to lie down for the male and will curl her tail up as he approaches her. This tail up behaviour will appear 14-16 days after a successful mating or earlier if it is the cows first season.

⁶⁷ Burgemeister 1975, Droandi, 1936

⁶⁸ http://www.mediastorehouse.com/image/dromedary-camels-mating_645355.jpg

10.2 Ease of Breeding

Triggers to breed Arabian camels are thought to be increased day length and onset of the wet season. They can also be triggered to breed by the increased availability of vegetation.

Camels are relatively easy to breed. They need to be supplied with plenty of food and water in the pre breeding season months to ensure their reproductive health.

If they are kept in herds of reproductively sound females and a capable bull, then breeding these camels shouldn't be too difficult.



A Herd with their successfully born, week old Calves.⁶⁹

10.3 Reproductive Condition

10.3.1 Females

Arabian camels are induced ovulators. This means that although they come into oestrous, they are only stimulated to ovulate during the mating process.

During the period of oestrous female Arabian camels will show the following signs and behaviours:⁷⁰

- Nervous signs of heat
- Restless
- Seeks the company of the male
- Bleats continuously
- Develops a swollen Vulva that often produces an accompanying discharge
- Foul smell that comes from the Vulva

⁶⁹ <http://fohn.net/camel-pictures-facts/arabian-camels-7.html>


⁷⁰ http://www.ilri.org/InfoServ/Webpub/Fulldocs/Monono5/Reproduc.htm#P120_23886, 2.2.4

- An observation made by herders used to predict a successful pregnancy was the behaviour that a female camel will raise her tail when a male camel or human stranger approached.



A very pregnant Arabian camel will rest often to preserve energy⁷¹


This table is a summary of the behavioural stages or signs during an Arabian camels Pregnancy and Birth:

Pregnancy and Birth⁷²	
20 Days after a successful mating	Female refuses to lie down and curls her tail up. If this continues 2 months into the pregnancy it is a sure sign of positive pregnancy.
45-50 Days after mating	A trained Vet can insert his hand into the females' rectum and feel the enlarged left horn of the womb.
6 months after mating	The females belly will start to grow.
10-14 days before birth	The muscles above the pelvis relax, get softer and appear to sink.
5-7 days before birth	The female becomes increasingly restless, tail is held horizontally and she will walk away from the herd. The Vulva will swell and the udder will enlarge.
First stages of labour	She will frequently pass urine and continuously get up and down. This stage will last from 3-24 hours.
Second stage of labour	<p>The water bag becomes visible in the vulva and breaks.</p> 
30-40 minutes later	The calf is expelled whilst the mother is in a lying down position. The calf should come out forefeet first, with

⁷¹ <http://pics.livejournal.com/singingnbahrain/pic/0001s6e3/s320x240>

⁷² A Field Manual of Camel Diseases, Reproduction Section, Page 183

⁷³ <http://www.toursaudi Arabia.com/birth.html>

	<p>the head between the forelegs. The female will stand up to break the umbilical cord.</p> 
Within the next 1-3 hours	The placenta (afterbirth) is expelled

10.3.2 Males

Males that are in good reproductive condition will go into what is called *Rut* during the breeding season. **During this time they are increasingly aggressive and keepers should take caution when working with these animals.**

Male Arabian camels will go in to rut to compete for the mating rights of the females in the herd. If a dominate male is already present in the herd, he will be the only camel that develops his rut. Other males in the herd will suppress their rut until they are able to compete with the dominate bull.

Males will compete with each other by making low noises, standing as tall as possible with repetitive swaying of the head in all directions. Upon confrontation between bulls, they will attempt to bring each other to ground by biting the legs of the other male and taking the head between their jaws. They will use their neck to try and push each other in to a sitting position.

Signs that a male is coming in to Rut:

- Occipital glands secrete more profusely
- Increased aggression
- Sprays urine
- Frothing at the mouth
- Loud gurgling sounds

Males may also inflate a fleshy pouch called the *Dulaa*, which hangs out of the side of the mouth to attract females.

⁷⁴ <http://www.toursaudi Arabia.com/birth.html>



Arabian Camel Bull inflating his *Dulaa*⁷⁵

An individual bull may continue to be in rut for 2-4 months depending on his health, nutritional status and dominance over the herd.

Whilst males in a captive herd are in rut, they must be continuously monitored as weight loss may occur to the bull as rutting incurs nutritional and physical demands that can extensively exhaust the males.

The male *rutting* season spans from July to October in Australia.

10.4 Techniques Used to Control Breeding

10.4.1 Males

Castration: Castrating a male camel can make them more manageable and easier to work with. Castrated animals sometimes make a better captive display animal as they do not come into rut and will not become aggressive towards keepers or the public.

The ideal age to castrate a male camel is between 4-6 years old. The easiest way to castrate is to simply twist the spermatic cord and tie it off. This procedure will only take a minimum of 2 weeks to heal, as opposed to more surgical options that may take a few months to heal.

Castrated males will develop a much larger hump.

Note. If castrating an older male camel, do not do so during the *rutting* season as more blood is present in the organs at this time and this may cause complications for the camel and increases the chance of a fatal haemorrhage.

Separation: If you still want the camels to have the ability to breed when they are needed to, castration would not be an option as it is irreversible. Another option is just

⁷⁵ http://farm1.static.flickr.com/8/8754761_5d0ca4ebf6_o.jpg

to separate the sexes whilst the breeding season is on. This will require separate yards that are a fair distance away from each other as the males will be able to smell females in oestrous from some distance away.

10.4.2 Females

To control breeding in female camels, the separation technique is also valid. Other techniques like using contraceptive injections are not used in camelids at present, most people preferring to just separate the sexes. In less developed countries that breed camels for produce they will use a more traditional method to stop females becoming pregnant on long burdened journeys.

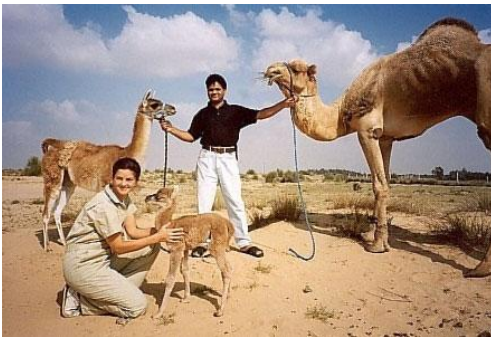
Traditional Methods: A method originally used by Ancient Arabs and still used today is to introduce a round smooth stone, the size of a kidney bean or a chick pea, into the uterus of the camel, which then repulses the advances of the male, as if she were pregnant.⁷⁶

Its success has not been professionally or medically proven.

10.5 Occurrence of Hybrids

The Arabian Camel is closely related to the Llama (*Lama glama*). A cross-breed of the two occurred in Dubai in 1997. This hybrid was called a Cama. It was born through artificial insemination of a female Llama with sperm from a male Camel.

The young Cama has the short ears and long tail of a camel, but has no hump and has Llama like two toed cloven hooves.



Parents of the Cama, Male Camel and Female Llama⁷⁷



The Cama at 2 days old⁷⁸

⁷⁶ <http://www.reproduction-online.org/cgi/content/abstract/10/1/115>

⁷⁷ <http://www.hemmy.net/2006/06/19/top-10-hybrid-animals/>

⁷⁸ <http://www.hemmy.net/2006/06/19/top-10-hybrid-animals/>



The Cama as a young 2 year old adult.⁷⁹

Experimentation is still occurring in Dubai to inseminate a female camel with a male Llamas sperm. Scientists believe they may be able to create a new breed that has the most desirable trait of both Camelidae.

It is unknown if these animals could successfully mate on their own due to the large size difference of the two. They have successfully been housed as mixed species exhibits with no known natural cross breeding occurring.

The Arabian camel is also very closely related to the Bactrian Camel (*Camelus bactrianus*).

Hybrids of the two species occur over in middle eastern areas. There are three hybrids that occur; the F1, F2 and F3 Hybrid.

F1 Hybrid: This hybrid is half-dromedary and half-bactrian. They are the largest of all camels and make for good draft animals. They have only one hump present.



This is a Half Dromedary and Half Bactrian Hybrid⁸⁰

F2 Bactrian Camel Hybrid: This Hybrid is $\frac{3}{4}$ Bactrian Camel and $\frac{1}{4}$ Dromedary Camel. These hybrids occur when breeding a F1 hybrid back with a Bactrian Camel. **They are**

⁷⁹ <http://www.hemmy.net/2006/06/19/top-10-hybrid-animals/>

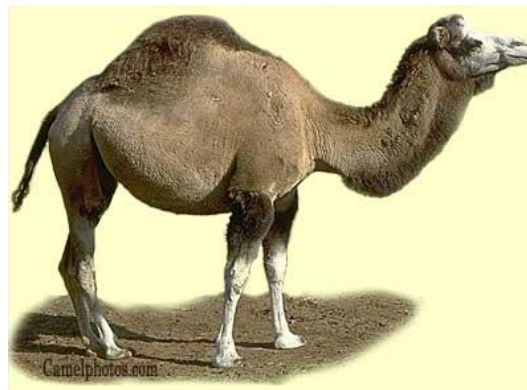
⁸⁰ <http://camelphotos.com/DifferentTypesP1.html>

more like the Bactrian camel as they can walk on slippery surfaces and can handle steep rocky mountain trails.



A F2 Hybrid closely resembles a Bactrian Camel⁸¹

F2 Dromedary Camel Hybrid: This Hybrid is $\frac{3}{4}$ Dromedary Camel and $\frac{1}{4}$ Bactrian Camel. These hybrids occur as an opposite of the F2 Hybrid. I.e. When breeding a F1 hybrid back with a Dromedary Camel.



A F2 Hybrid closely resembles a Dromedary Camel.⁸²

10.6 Timing of Breeding

The breeding season occurs in the winter months or the rainy season. Breeding seasons for Arabian camels are geographically different because of differently timed seasons. In Australia the breeding season spans from July to December, whereas in Egypt it occurs from March to April.

The breeding season generally can last from 3-5 months. Females in the wild try to time their births for the following wet season as this ensures enough vegetation for herself and her offspring.

⁸¹ <http://camelphotos.com/DifferentTypesP1.html>

⁸² <http://camelphotos.com/photos/breeds-5.jpg>

10.7 Age at First Breeding and Last Breeding

Females:

Sexual Maturity	3 years
Reproductive Maturity	4-5 years to 20 years (Max 30 years)
Peak Reproduction	6-7 years to 20 years

Males:

Puberty (Rutting)	3 years
Sexual/Reproductive Maturity	6-7 years
Peak Reproduction	A males' peak reproduction time is determined by his opportunity and length dominating over a harem.

10.8 Ability to Breed Every Year

Females can give birth regularly to young once every 2 years.

After a cow gives birth she can come back into heat as soon as one month after parturition, depending on her health and nutrition. Healthy well-fed cows will usually come into season 3 months later, providing it is still in the breeding season.

The theoretical maximum annual calving rate for Arabian camels is averaged at 50-80%.⁸³

10.9 Ability to Breed More than Once Per Year

If a pregnancy is carried by the female through to term and young are weaned off at the recommended 1 year of age, then Arabian Camels do not have the ability to breed more than once a year.

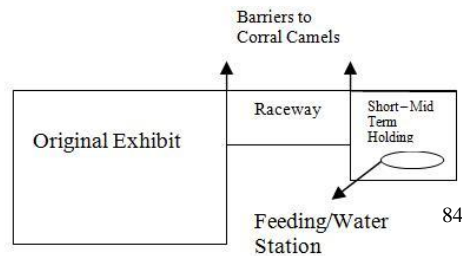
If a female loses her calf before term then she will sometimes return herself to be serviced by the bull a few weeks to months later. If a female does lose her calf whilst in captivity it is generally considered not to rebreed her until the following season for the health of the female.

⁸³ http://www.ilri.org/InfoServ/Webpub/Fulldocs/Monono5/Reproduc.htm#P120_23886, 2.2.1

10.10 Nesting, Hollow or Other Requirements

For pregnant camels an off-exhibit area should be provided where they can escape out of public view and preferably can separate themselves from the rest of the herd.

An example of this type of design would be something similar to the following.



In the days leading up to the birth, the mother should be fed in the holding area so she becomes comfortable within that area. Once keepers observe the signs of labour they should lead the female into the holding area so she can be kept away from the herd.

Within the holding area should be water and food supplied and always available. The floor should have some type of softer substrate especially if the holding floor is concrete. E.g. Sawdust, mulch, sand or substrate of similar texture.

The exhibit holding area should be large enough to allow the camel full movement in all directions, including turning, standing or stretching. A good rule for this would be to make it approximately three (3) times the camels length (L) by approximately one and a half (1½) times the camels length (W). Measure this according to the largest camel in the collection.

10.11 Breeding Diet

One of the triggers to get Arabian camels to breed is to increase of availability of food. If the breeding season comes around and keepers wish to breed, they should begin by increasing the feed provided to their animals.

Food should not be increased in a dramatic amount, but a suggestion could be to change to a lower quality feed for the beginning of the season and increase the amount of that feed. Supplementation should also be provided in the diet, an increase in these is also recommended.

⁸⁴ Exhibit design taken from Holding Area design 4.2

For example; increasing browse supplied, salt licks and fruits/vegetables.
During a camels' pregnancy, the cow will require more nutrition and supplements than the rest of the herd. Generally they can be fed separately from the rest of the herd, i.e. in the holding area.

Example of a normal daily diet per camel:⁸⁵

Monday, Wednesday, Friday, Saturday & Sunday:

3 biscuits of Barley Hay (Morning)

Tuesday & Thursday:

1 biscuit of Barley hay + 1 bucket of grain ($\frac{1}{2}$ Chaff & $\frac{1}{2}$ Stud) (Morning)

Daily or as available:

1 black crate of assorted Fruits and Veg (Afternoon)

1 large branch of browse (2x smaller branches) (Afternoon)

Note:

Fruit/Veg trays made up with left over delivered food from that day.

Example of a Pregnant Camels Diet:

Monday, Wednesday, Friday, Saturday & Sunday:

3 biscuits of Lucerne Hay (Morning), 1-2 biscuits of Lucerne Hay Adlib + bucket of Veg (Afternoon)

Tuesday & Thursday:

1 biscuit of Barley hay + 1 bucket of grain ($\frac{1}{2}$ Chaff & $\frac{1}{2}$ Stud) (Morning), 1 bucket of grain (same as the morning) (Afternoon)

Daily or as available:

1 black crate of assorted Fruits and Veg (Afternoon)

1 large branch of browse (2x smaller branches) (Afternoon)

Note:

Fruit/Veg trays made up with left over delivered food from that day.

The mother camel needs to be of peak reproduction condition to successfully carry her calf to full term. To ensure this is maintained their nutrition and weight must be monitored daily. If the female seems to favour a certain type of veg or grain and does not eat enough of other feed, thought should go into varying quantities given in favour of this, as long as she does not lose any nutritional value from minimizing some foods.

⁸⁵ Diets taken from daily diet sheet at Symbio Wildlife Park

10.12 Oestrous Cycle and Gestation Period

Once the breeding season has begun, a female will come into heat every 20-25 days until she is mated by a male.

Camels are induced ovulators; this means they are stimulated to ovulate when they are mated by the bull.

The gestation period for an Arabian camel is on average 13 months (390-410 days). The pregnancy can last for a minimum of 12.5 months to a maximum of 14 months. Outside of these periods complications may occur with the calf.

10.13 Litter Size

Arabian camels generally only give birth to one calf per season. Although in some areas twins have been recorded.



A Young calf suckles from her mother.⁸⁶



These young twins were actually born through artificially splitting a female's embryo in two.⁸⁷

10.14 Age at Weaning

Camel calves are not independent from the mother until an average age of 1 year. They can be weaned at a minimum age of 3 months or it can be extended to an age of 2 years.

In captivity it is recommended to wean the calf of its mother at 1 year of age.

Calves will begin to graze on solids when they are about 3-4 weeks old.

⁸⁶ <http://fohn.net/camel-pictures-facts/the-pictures/Camel-Calf.jpg>

⁸⁷ http://www.gulfnews.com/images/08/04/15/16_ae_twin_camel_4.jpg

If the mother dies during birth or complications arise, it is not common for other females to accept orphaned young. These calves will have to be hand raised.

Calves can be removed and raised in a nursery situation with other young camels. Once they are weaned off milk they should slowly be re introduced to the herd.



A group of young camels being raised together in a nursery situation.⁸⁸

Once a calf is weaned off its mother, the cow can come back into oestrous a minimum of one month later, although that time frame is quite rare. It is more common for cows to return to oestrous any time from 3-12 months later.

10.15 Age of Removal from Parents

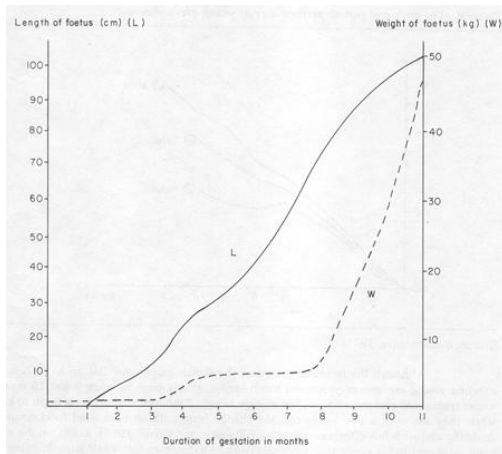
In the wild a calf would be completely weaned off by 2 years of age, although they will remain close to their mothers until the age of 5 years old.

Female calves will generally remain in the same herd as their mother, whereas bull calves will leave as they reach sexual maturity to join a bachelor group until they can mate during breeding seasons.

The earliest time a calf can be taken from its mother and hand raised, with no complications, is 6 weeks. The mother produces colostrums for the first 5 days after parturition and it is not recommended to remove before this time.

⁸⁸ http://image52.webshots.com/152/6/65/76/2744665760058354054wCmClr_fs.jpg

10.16 Growth and Development



Prenatal growth of a Camel fetus.⁸⁹

Young camels are born very precocious.

General Development Stages:

Age:	
Birth	Eyes open, thick wooly coat Weight: 30-40 kgs (66-88 lbs)
1 month	Begins eating solids Development of hump starts
1 year	Age the young is weaned Weight: 150-180 kgs (331-397 lbs)

Camels will reach their mature weight at 4-9 years old. This weight is 400-600 kgs and 300-500 kgs for males and females respectively.

Measurements of a calf should be taken of a morning before being watered so they can be accurate.

Young camels can be aged also by examining their teeth. They have 22 deciduous or milk teeth:

- 1 incisor, 1 canine and 3 premolars on either side – Upper Jaw
- 3 incisor, 1 canine and 2 premolars on either side – Lower Jaw

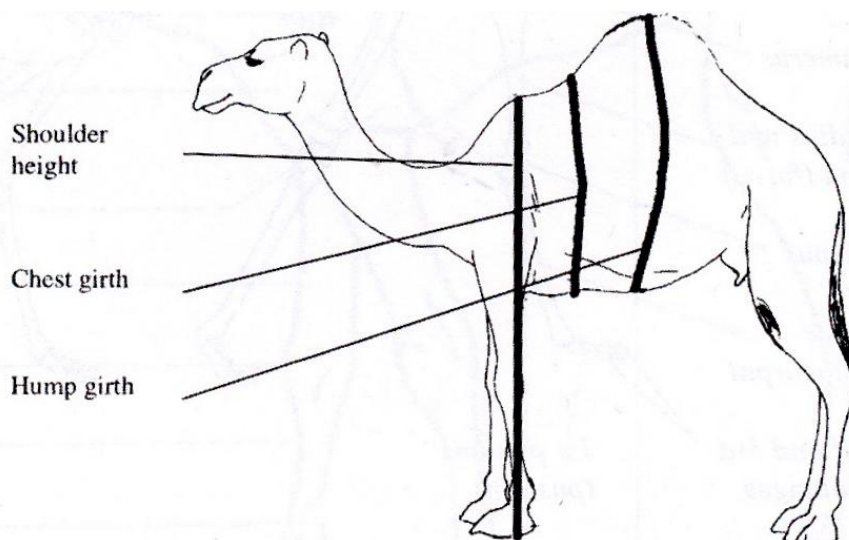
⁸⁹ http://www.ilri.org/InfoServ/Webpub/Fulldocs/Monono5/Reproduc.htm#P120_23886, Source: Adapted from Musa, 1979

Development of front teeth in the lower jaw - Aging technique ⁹⁰	
Birth	No teeth
1 month	2 pairs incisors, 3 pairs emerging
3 months	Canines emerging
1 year	Canines and all 3 pairs grown
2 years	Incisors worn and separated
3 years	Incisors well worn and separated
4 years	Incisors heavily worn, beginning to fall out
5 years	First permanent teeth (incisors 1) emerged
6 years	Permanent incisors 2 emerged and grown
7 years	Permanent incisors 3 emerged and grown, permanent canines growing
8 years	Incisors worn, canines half grown
9 years	Incisors more worn, canines fully grown
Older Camels	Teeth worn, incisors stand vertically

If keepers are unable or do not have access to a weighing mechanism, following is a guide to estimating a camels weight.

FORMULA:

$$\text{Weight in Kg} = \text{Shoulder Height} \times \text{Chest girth} \times \text{Hump Girth} \times 50^{91}$$



Shoulder Height: Height of Shoulder in Metres

⁹⁰ A field manual of Camel Diseases, Page 24

⁹¹ Formula and diagram taken from 'A Field Manual of Camel Diseases, on Page 22.

Chest Girth: Distance in metres around the Camels chest, measured in front of the hump and behind the front legs and chest pad

Hump Girth: Distance in metres around the Camels body, measured at its widest point, from the top of the hump and around the belly

Example:

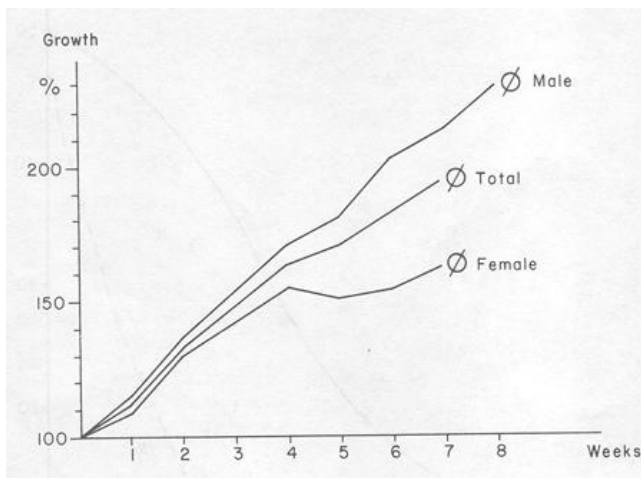
Shoulder Height: 1.95 m

Chest Girth: 2.00 m

Hump Girth: 2.20 m

Weight in Kgs: $1.95 \times 2.00 \times 2.20 \times 50 = 429$ Kgs

Following is another chart that can be used to monitor the growth and development of a young calf. The growth rate is in the percentage of growth relative to their birth weight.



The postnatal growth performance of young dromedaries.⁹²

⁹² http://www.ilri.org/InfoServ/Webpub/Fulldocs/Monono5/Reproduc.htm#P120_23886, 2.5.1, Source: Burgemeister, 1975

11 Artificial Rearing of Mammals

11.1 Housing

- For the housing of a newborn calf it is best for the safety of the calf and supervising keepers if it is kept separate from the rest of the captive herd for the first few weeks of life. This can be achieved by housing the cow and calf in the night den. The den can be sectioned off to provide the protection and privacy a newborn calf will need.
- In the wild, female camels will normally move away from the herd to give birth and will return to the herd once the calf has survived a first few days.
- If the mother has rejected the calf or it has been removed for hand rearing then the calf will need to be housed in a secure, warm environment. An old storage container can work extremely well in this case.
- Storage containers can be used to house a newborn camel. Lining should be placed within the container. This is a good alternate home for a camel as it can protect from cold draughts and adverse weather overnight.
- During warm weather the calf can be housed in an outside pen. This allows the calf to explore and experience the outside world.



Storage containers can be used to house a newborn camel. Lining should be placed within the container. This is a good alternate home for a camel as it can protect from cold draughts and adverse weather overnight.⁹³



An example of an outside pen that a calf can be allowed to roam on during the day.⁹⁴

⁹³ <http://www.buyerzone.com/industrial/storage-containers/images/storage-container.gif>

⁹⁴ Personal photograph taken from Nowra Wildlife Park 23/09/09

11.2 Temperature Requirements

- Camel calves do not generally require any temperature gradients or temperature control if they are being parent raised. The mother should help to keep her calf warm overnight.
- Keepers should assist the mother though by housing them in an overnight shelter that can be closed to adverse weather conditions.
- If the calf is being hand raised it is recommended to provide some type of heating, especially overnight or during cold weather.
- If being housed in a storage container, it should be easy for keepers to run some electricity cables into the container to set up a heat source.



This young calf at Nowra Wildlife Park is being housed within a container, and is provided with a heat source overnight and during cold weather.⁹⁵

11.3 Diet and Feeding Routine

- Newborn calves can weigh in anywhere between 25-50 kgs.
- Weight/height measurements should be taken before administering any type of alternate feed to ensure correct formulas are made up.
- The calf needs to suckle enough colostrum within the first 6 hours of birth. This ensures they get the gut flora and antibody protection from their mothers.
- Complications after birth:
 - Calf won't suckle/Mother won't allow calf to suckle:
 - Halter and restrain the mother and encourage the calf to come up and suckle on its own.
 - Milk the mother separately and bottle feed the calf the colostrums.
 - **Note: Be aware that milking a camel can be very dangerous. A team of experienced keepers should be involved to assist.**

⁹⁵ Personal photograph taken from Nowra Wildlife Park 23/09/09

- Mother's milk not flowing:
 - Massage the udder to encourage milk flow for the calf to suckle. Be aware that the mother may be in pain and as a keeper you may be in danger whilst doing this. Only perform if mother is restrained or conditioned.
 - Some institutions will freeze colostrums from other good breeding species. In the case of an Arabian camel, Bovine colostrums can be used as a supplement.
 - Artificial colostrums can be commercially bought and bottle fed to the calf:
 - Wombaroo⁹⁶
Impact Colostrum Supplement
Will help to provide immunity and intestine protection to young animals.



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Note: Read all directions of feeding charts before feeding to young calf. Ensure the correct dilution is used and the correct amounts are being fed. Feeding should be done in small amounts every few hours. Colostrum replacer is only used in those first few hours. Calves should then be fed an appropriate growth milk replacer. E.g. Wombaroo/Di-vetelact.

- Once the calf has received its first milk, colostrum, it should be fed an appropriate milk replacer:
 - Di-Vetelact⁹⁸
Low lactose milk supplement for orphan and early weaned animals.
For older animals, DiVetelact can be used in powder or liquid form as a general supplement and offers excellent extra nutrition during pregnancy and lactation.
See Appendix H.

⁹⁶ http://www.wombaroo.com.au/impact_colostrum.htm

⁹⁷ http://www.wombaroo.com.au/impact_colostrum.htm

⁹⁸ <http://www.horsesuppliesdirect.com.au/prod1730.htm>. See Appendix H



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- Rearing Formula determined by Western Plains Zoo for Dromedary Camel, Guanaco and Alpaca¹⁰⁰

Formula Mixture:

- 200 grams Full Cream milk powder made up to 1 litre
- 2 egg yolks
- 200 mls thickened cream
- 1 tbspn natural yogurt
- 20 mls Enervol

Feed calf using a Beige calf teat initially or a Black calf teat.

Begin feeding 4x per day for the first 2 weeks, then reduce to 3 times per day.

Weaning Schedule:

Reduce to 2x per day at 6 weeks of age.

Reduce to 1x per day at 16 weeks of age.

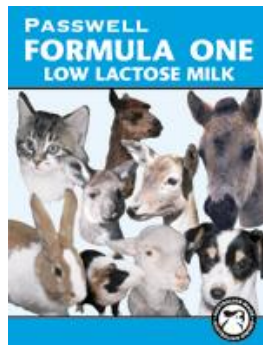
Wean at 28 weeks of age.

See Appendix I.

- Passwells Formula One Low Lactose Milk¹⁰¹

Made from individual ingredients blended together to produce a milk that is low in lactose yet contains more whey protein, unsaturated fat and omega-3 fatty acids than lactase modified cow's milk products.¹⁰²

See manufacturers guide on back of package for feeding instructions.



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⁹⁹ <http://www.horsesuppliesdirect.com.au/prod1730.htm>

¹⁰⁰ Hand Raising Exotic Animals, Western Plains Zoo, Janet Gamble. See Appendix I

¹⁰¹ http://www.wombaroo.com.au/low_lactose_milk.htm

¹⁰² http://www.wombaroo.com.au/low_lactose_milk.htm

¹⁰³ http://www.wombaroo.com.au/low_lactose_milk.htm

- Wombaroo Alpaca Milk Replacer¹⁰⁴
 (Alternate Feeds, Use only when other formulas are unavailable)
 A nutritionally complete substitute for cria. Use when mother's milk is limited or when cria are orphaned.
 Feed Directions: Feed milk every two hours for the first next three days, then four hourly till the end of the first week. The second week feed milk every six hours. The third week feed milk eight hourly until weaning begins. The length of time of lactation differs between animal species. Ask your veterinarian or an experienced carer about when to commence weaning and how long it will take.¹⁰⁵
 These directions will differ when substituting for a camels diet. They lactate longer and are not completely weaned off milk until 1 year old.



- The teats used to feed a camel calf should be either a Beige Calf teat or a black calf teat. These should be fixed onto a bottle and fed to the calf. A Gatorade bottle can be used as it provides a tight hold on the teat.
- Ensure to hold onto the teat as you feed the camel as they can be rough feeders and may pull the teat off the bottle.



Black and Beige Calf Teats¹⁰⁷



Keeper feeding a 3 week old Camel.¹⁰⁸

¹⁰⁴ http://www.wombaroo.com.au/eutherian_milks.htm

¹⁰⁵ http://www.wombaroo.com.au/eutherian_milks.htm

¹⁰⁶ <http://www.wombaroo.com.au/alpaca.htm>

¹⁰⁷ <http://www.specrubbers.com.au/dairy.html>

¹⁰⁸ Personal photograph taken at Nowra Wildlife Park 23/09/09

11.4 Specific Requirements

- Transport of a young camel will be different to transport of adult camels due to their size and vulnerability.
- A young camel can be transported in a large van/4wd/car, if the camel is haltered and restrained appropriately. It may mean that the calves' legs have to be tied to restrict its movement and ensure it remains lying down during the trip.
- Other methods of transportation is a horse float that the compartments inside can be moved to restrain a smaller animal. In this case the camel should again be haltered to ensure it does not turn around in the stall or get caught. It also stops the camel from sitting down and getting injured on the stall walls.

11.5 Data Recording

Keeping records is vitally important in ensuring the correct growth of a young calf. If they develop too fast or too slow, health problems can arise. Records are also important in helping other keepers in the future provide even better care for our young animals.

- Daily records should be kept of the following:
 - Identification
 - Weight (gain/loss)
 - Growth (height/hump measurements)
 - Formula taken in Vs. Formula offered
 - Times fed
 - Observations (behavioural/clinical)
 - Housing conditions (temperature)
 - Faecal output and regularity
 - Stool condition
 - Weaning behaviour and dates

11.6 Identification Methods

- Camels generally only give birth to one calf at a time. This will make identification easy for the first few years of life as they will be considerably smaller than their older relatives in the park.
- Once a camel becomes older, their needs to be consistent identification methods that allow for easy identification within the herd. These methods can be as follows:
 - Physical description and photos
 - Body markings and body shape
 - Microchips

- Other methods that are available but not necessarily used in a captive institution:
 - Tagging
 - Tattoos
 - Branding

11.7 Hygiene

- After feeding ensure that the camel is cleaned up and washed with warm water with no residue milk formula left on the mouth.
- Use pre-boiled warm water when making up formula feeds to remove any bacteria that may harm a young calf.
- Do not microwave formula to re-heat. This will promote bacteria growth. To warm up cold formula, place bottle in a bowl of boiling water until desired temperature of milk is achieved.
- The calf should be cleaned a few times each day to remove faeces, especially if housed in a container. When cleaning the calf should be removed so that the area can be cleaned and sterilized. E.g. F10sc
- Sterilize all utensils used in feeding and cleaning in an appropriate solution. E.g. Viraclean, Milton.¹⁰⁹
- Personal Hygiene: Wash and sterilise hands before and after handling/feeding.

11.8 Behavioural Considerations

- Keepers need to be considerate of how strong and dangerous a camel can be. Some considerations that need to be acknowledged are:
 - Mother of camel may be aggressive and protective of her calf towards keepers.
 - Hand raised camels lose their flight reaction to people and develop a bond with humans. This means that they will want to be interactive with keepers.
 - A large friendly camel can still cause harm to keepers and public as they may try to be too interactive and result in harming people
 - A hand raised camel should be conditioned and trained by keepers to reduce the risks involved when maintaining exhibits.
 - A lot of hand reared animals bond with their human keepers and may mistake themselves for the same species. It is important to re-introduce a camel calf in to a herd or a social group as soon as possible to reduce imprinting behaviours.

¹⁰⁹ MSDS Appendix K & L

11.9 Use of Foster Species

- If a calf is rejected by its mother or she dies while giving birth, it is uncommon for other females in the herd to foster the orphaned calf. In the wild, it will most likely die or fall prey to a predator.
- In captivity, it is left to keepers to pull the calf if rejected and raise it until it is old enough to be returned to the captive herd.
- In captivity when a female calf is hand reared due to complications or rejection, it is likely that she herself will be unsure of how to rear her own young and will be likely to reject the calf. This is due to the fact that she herself was human reared and she did not learn the behaviours that her camel mother would have taught her.

11.10 Weaning

- At approximately 2-3 month old the calf will begin to graze on grass.
- The earliest age a calf can be weaned is 4 months old, though in a captive environment the young can be left with their mother until 1 year old.
- After this age a male calf will need to be castrated if it is to stay with the herd or it should be moved on.
- If the calf is a female, she can be allowed to stay with the captive group. Care must be taken when she reaches sexual maturity so that the dominant male (If it is still her Sire), does not breed with that individual.

Diet & Weaning Schedule:¹¹⁰

Age:	Feeding Regime:
1 day	Colostrum – 4 x daily
2 days – 2 weeks	Milk Replacer – 4 x daily
3 weeks – 6 weeks (1 ½ months)	3 x daily
7 weeks – 16 weeks (4 months)	2 x daily – calf will begin to graze on grass
17 weeks – 28 weeks (7 months)	1 x daily – Supply the calf with solid vegetables/browse to graze on. Slowly introduce hay and other diet items.
28 weeks + (7 months +)	No Milk Formula – Provide a normal diet daily. Monitor the calf to ensure it is still gaining weight. At any sign on weight loss, consult a vet. Calf may not take to a solid diet easily and may need formula supplied for longer than 28 weeks.

¹¹⁰Hand Raising Exotic Animals, Western Plains Zoo, Janet Gamble& Personal comments by Cara Mellington (NWP). See Appendix I

11.11 Rehabilitation and Release Procedures

This species in Australia would not be rehabbed for release back into the wild. This is due to the fact that the Arabian camel is classed as a Pest Animal by the Vertebrate Pest Committee.¹¹¹

¹¹¹ <http://www.feral.org.au/content/species/camel.cfm>

12 Acknowledgements

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Keeper – Referenced on Camel info from Nowra Wildlife Park

15 Glossary

Acaricides

A Pesticide that kills Mites and Ticks

Aesthetically Pleasing

Furniture that replicates the natural habitat and looks pleasing to the public

Anesthetic

A substance that produces anesthesia

Anemic

Suffering from anemia, which cause weakness, breathlessness or listlessness

Antibiotic

Chemical substance used to inhibit or destroy the growth of bacteria or microorganisms

Apathy

Absence or suppression of passion, emotion or excitement

Artificial Insemination

The injection of semen into the vagina or uterus by means of a syringe or the like rather than by coitus

Artiodactyla

An order of hoofed mammal with an even number of toes on each foot

ASMP (Australasian Species Management Program)

The ASMP is the management plan arm of ARAZPA. It allows ARAZPA accredited institutions to access and see collections in other ARAZPA institutions

Booster

A second vaccine given to animals too increase protection against diseases usually before giving birth or breeding

Browsers

An animal that eats from a selection of foliage and plants constantly throughout the day

Castration

The removal of the testes

Camelid

Any member of the Camel Family (Llama, Alpaca, Guanaco, Vicuna, Arabian and Bactrian Camel)

Colostrum

A yellowish liquid rich in immune factors, secreted by the mammary gland of female mammals a few days before and after the birth of their young

Conditioning

A process of changing or training behaviour by rewarding a subject each time an action is performed

Constipation

A condition of the bowels in which faeces are dry and hardened and evacuation is difficult or infrequent

Contagious

Diseases that are transmitted by bodily contact with an infected person or object

Copulation

The act of sexual intercourse

Courtship

The behaviour in animals that occurs before and during mating, often including elaborate displays

Crush Restraint

A restraining device used to hold hooved stock during medical or physical examinations

Cud

The portion of food that a ruminant returns from the first stomach to the mouth to chew a second time

Deficiencies

When an animal is lacking in vitamins or supplements essential to its health

Deciduous

The falling out of teeth at a certain stage of growth

Diarrhoea

An intestinal disorder characterized by the abnormal frequency and fluidity of faecal evacuations

Discharge

An abnormal substance that is excreted or secreted from the body

Diurnal

An animal that is active during the day

Domesticated

To tame an animal to live in association with human beings as a pet or work animal.

Drench

To administer a draft of medicine to an animal by force

EAPA (Exhibited Animals Protection Act)

An act with respect to the exhibition of animals at marine or zoological parks, circuses or other places

Enrichment

The act of providing stimulation to animals in the form of food, social, sensory, behavioural or conditioning

Eradication

The complete removal or destruction of something using chemical substances

Flehmen

A behavioural response of many male mammals (camels, deer, other artiodactyls), consisting of lip curling and head raising after sniffing a female's urine

Fore Stomach

The first stomach of a ruminant that the animal returns the cud from before chewing it for a second time

Gestation Period

The length of time that an animal is pregnant

Gram Negative

Bacteria that does not retain the purple stain used in Gram's method

Hemorrhage

The loss of blood that escapes from a ruptured blood vessel

Hibernation

An animal that spends the winter in close quarters in a dormant condition

Hybrid

The offspring of two animals of different breeds, varieties, species or genera, as produced through human manipulation for specific genetic characteristics

Imprinting

Rapid learning that occurs during a brief receptive period, soon after birth or hatching, which establishes a long-lasting behavioural response to a specific individual or object

Induced Ovulators

The female does not ovulate any eggs until she has been bred by the male. The act of copulation stimulates the female to release eggs for fertilisation

IUCN (International Union for the Conservation of Nature and Natural Resources)

The IUCN runs a species program that implements Global species conservation and manages the IUCN "Red list of Threatened Species".

They promote conservation and research of all endangered species. Through the IUCN, institutions can access the conservation status of the entire world's species.

Lactating

The secretion of milk from udders or teats to support the calf

Lacerations

A jagged wound or cut on the surface of the skin

Larvae

The immature, feeding stage of an insect that undergoes complete metamorphosis

Locale

A place or locality

Louvered

A series of narrow openings framed at their longer edges with slanting, overlapping fins or slats, that adjust to admit light or air

Mammal

Any vertebrate of the class Mammalia, having the body more or less covered in hair, nourishing the young with milk from the mammary glands and giving birth to live young, with the exception of egg laying monotremes

Mortality Rate

The number of deaths per unit of a population in a given place and time

Oestrous

When an animal comes into heat

Orphan

A young animal that has been deserted by or lost its mother

Oxygenated

Blood that has been enriched with oxygen

Parasites:

An organism that lives on (external) or in (internal) an organism of another species, known as the host, from the body of which it obtains nutriment

Parturition

The process of labour and giving birth to young

Pegboard

A board having holes in it, in which pegs can be placed in specific patterns

Placenta

The organ in most mammals, formed in the lining of the uterus by the union of the uterine mucous membrane with the membranes of the foetus, that provides the nourishment of the foetus and the elimination of its waste products

Polygamous

An mating behaviour in which the male of the species will mate with multiple females during the breeding season

Quarantine

A strict isolation procedure imposed to prevent the spread of disease

Raceway

A channel, hallway like structure that guides the direction of animal flow when moving

Regurgitation

The voluntary or involuntary return of partly digested food from the stomach to the mouth

Reproduction

The natural process among animals by which new individuals are generated and the species perpetuated

Reservoir

A cavity or part where anything is accumulated or collected in a great amount

Roughage

Any coarse, rough food for livestock

Rumen

The first stomach of a ruminating animal.

Ruminant

Any even-toed, hoofed animal characterized by the chewing of cud, or of belonging to the order Ruminantia

Rutting

The periodically recurring sexual excitement of hooved animals of the male sex

Self Mutilation

The act of an animal deliberately harming itself

Semi-Domesticated

An animal living in a state of partial domestication

Sexual Dimorphism

The condition in which the male and female of a species are morphologically different. I.e Physically or colour morphs

Solitary

Animals that live habitually alone or occasionally as pairs

Stereotypical

Behaviours displayed by animals that are caused by stress and are not desirable

Sternal Recumbancy

In the position of lying down with legs tucked beneath

Stool

The faecal matter evacuated at each movement of the bowels

Specimens

An individual or representative of a class or genus

Species

A class of individuals having some common characteristics or qualities

Spermatic Cord

The cord by which a testis is suspended in the scrotum

Temperament

The combination of mental, physical and emotional traits of an animal

Torpor

The state of dormancy or hibernation

Transmission

The transference of a disease from one person to another

Udder

A female animals mammary gland, especially when baggy and with more than one teat present

Ungulate

Any hoofed animal

Vaccine

Any preparation used as a preventative inoculation to confer immunity against a specific disease, using weakened or killed bacteria to stimulate antibody production

Vulva

The external female genitalia

Weaned

To accustom a young animal to food other than it's mothers milk

Womb

The uterus of a certain higher mammals

Zoonotic

A disease that can be transmitted between humans and animals

16 Appendix

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Appendix A:

DuPont 904

Material Safety Data Sheet

DUPONT™ 904

Vétoquinol

DISINFECTANT

Poultry Hatchery, Farm Premises and Animal Care Disinfectant

GUARANTEE:	% by weight
Didecyldimethylammonium chloride	9.2%
Alkyl (C ₁₂ , 67%; C ₁₄ , 25%; C ₁₆ , 7%; C ₁₈ , 1%) dimethyl benzyl ammonium chloride	7.6%
Alkyl (C ₁₂ , 40%; C ₁₄ , 50%; C ₁₆ , 10%) dimethyl benzyl ammonium chloride	6.2%

NOTICE TO USER: This product is to be used only in accordance with the directions on the label and attached leaflet.

READ THE LABEL BEFORE USING

AGRICULTURAL

KEEP OUT OF REACH OF CHILDREN

PRECAUTION/DANGER

EYE AND SKIN IRRITANT

DANGER

CORROSIVE, POISON

DIN 2280108

DuPont™ 904 is effective in 400 ppm hard water (as CaCO₃). Disinfects in 5% organic soil load. Recommended for chicken, turkey, duck, quail, goose, ostrich and other avian hatcheries. Effective in poultry, swine and livestock (including equine) premises. Useful in laboratory animal and animal breeder facilities.

DuPont™ 904 contains sequestering agents, to prevent the precipitation of minerals and metals from hard water.

- deodorizes by killing most microorganisms that cause offensive odours.

- contains no perfume to mask or hide any odours that might exist.

BROAD SPECTRUM GERMICIDAL ACTION IN HARD WATER AND UNDER SOIL LOAD CONDITIONS: At 4 mL per litre (1:250) in official <<A.O.A.C. Use-Dilution and Fungicidal Tests>>, DuPont™ 904 is effective in water up to 400 ppm hardness (as CaCO₃) and an organic soil load of 5% serum, against the following organisms:

BACTERIA

Alcaligenes faecalis (ATCC 8748), *Bordetella avium* (ATCC 35086), *Enterobacter aerogenes* (ATCC 63809), *Enterococcus faecium* (ATCC 6569) (*Streptococcus faecalis*), *Escherichia coli* (ATCC 11229), *Klebsiella pneumoniae* (ATCC 4352), *Pasteurella multocida* (ATCC 7707), *Proteus mirabilis* (ATCC 25933), *Proteus morganii* (ATCC 25830), *Pseudomonas aeruginosa* (ATCC 15442), *Salmonella choleraesuis* (ATCC 10708), *Salmonella enteritidis* (ATCC 4931), *Salmonella gallinarum* (ATCC 9184), *Salmonella pullorum* (ATCC 9120), *Salmonella typhosa* (ATCC 6539), *Serratia marcescens* (ATCC 264), *Shigella dysenteriae* (ATCC 13313), *Shigella sonnei* (ATCC 29930), *Staphylococcus aureus* (ATCC 6538), *Streptococcus agalactiae* (ATCC 27916), *Streptococcus pyogenes* (ATCC 9547)

FUNGI

Aspergillus fumigatus (ATCC 10894), *Candida albicans* (ATCC 18804), *Trichophyton mentagrophytes* var. *interdigitale* (ATCC 9533)

VIRUSES/MYCOPLASMA

Using accepted virus propagation and hard surfaces test methods, DuPont™ 904 is effective at 1:250 in 400 ppm hard water and 5% serum against the following viruses and mycoplasma.

Bornavirus (ATCC VR-478), Canine parvovirus canin (ATCC VR-953), Coronavirus (ATCC VR-22), Coronavirus (ATCC VR-763), Herpesvirus (ATCC VR-135), Herpesvirus (ATCC VR-783), Mycoplasma gallisepticum (ATCC 15302), Mycoplasma iners (ATCC 19705), Parainfluenza (ATCC VR-281), Paramyxovirus (ATCC VR-109)

PRECAUTIONS: KEEP OUT OF REACH OF CHILDREN

DANGER: IRRITANT TO EYES. DO NOT GET IN EYES, ON SKIN OR ON CLOTHING. HARMFUL IF SWALLOWED. AVOID CONTAMINATION OF FOOD. WHEN HANDLING THE CONCENTRATE, OR WHEN THERE IS POTENTIAL FOR EYE CONTACT, WEAR GOGGLES. IF THE BUILDING OR ROOM MUST BE ENTERED, THEN THE INDIVIDUALS ENTERING THE BUILDING OR ROOM MUST WEAR A SELF CONTAINED RESPIRATOR APPROVED BY NIOSH/MSHA, GOGGLES, LONG SHIRT SLEEVES AND PANTS. FOR GOOD HYGIENE PRACTICES, WEAR CHEMICAL RESISTANT GLOVES WHEN USING THIS PRODUCT.

Do not spray or apply this product unless the workers are wearing a face mask with spray mist eliminating cartridges. Do not use DuPont™ 904 on feeders or waterers and do not allow contact with food, feed or drinking water. DuPont™ 904 should not be mixed with other cleaning or disinfecting compounds. Do not use DuPont™ 904 on vaccination needles, equipment or diluent bottles as the residual germicide may render vaccines ineffective.

FIRST AID: In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. For contact with eyes, call a physician. Remove and wash contaminated clothing before reuse. If swallowed, promptly drink a large quantity of milk, egg whites, gelatin solution, or if these are not available, drink large quantities of water. Avoid alcohol. Call a physician immediately. Take container, label or product name with you when seeking medical attention.

TOXICOLOGICAL INFORMATION: Probable mucosal damage may contraindicate the use of gastric lavage. Measures against circulatory shock, respiratory depression, and convulsions may be needed. Refer to MSDS sheet.

DISPOSAL

1) Rinse the emptied container thoroughly and add the rinsings to treatment site. 2) Follow provincial instructions for any required additional cleaning of the container prior to its disposal or reconditioning. 3) Make the empty container unsuitable for further use. 4) Dispose of the container in accordance with provincial requirements. 5) For information on the disposal of unused, unwanted product and the clean up of spills, contact the Provincial Regulatory Agency or E. I. du Pont de Nemours and Company (1-302-774-1000).

DIRECTIONS FOR USE

DuPont™ 904 is a complete, chemically balanced disinfectant that provides clear use solutions even in cold water. Kills a broad range of gram-negative and gram-positive bacteria, fungi and viruses associated with the avian hatching industry, poultry, swine and livestock (including equine) premises, laboratory animal facilities and kennels.

DIRECTIONS FOR USE IN AVIAN HATCHERIES: For disinfecting pre-cleaned surfaces: Use DuPont™ 904 to disinfect pre-cleaned non-porous surfaces including hatchers, setters, trays, racks, egg flats, walls, floors, ceilings and other surfaces in the hatchery environment. It is also excellent for chick boxes, egg cases, vans and trash containers.

Pre-clean the surface to be disinfected with a DuPont hatchery cleaner. Rinse and if possible let surfaces dry. Then, apply DuPont™ 904 at 4 mL per litre of water (0.40%) by immersion, by flowing solution over treated surfaces, by use of a soft coarse spray, with a clean mop or cloth, or through a foaming apparatus. Thoroughly wet surfaces. Surfaces should remain moist for 10 minutes for complete disinfection.

NOTE: Do not spray DuPont™ 904 disinfecting solutions unless workers are protected from breathing the spray mist.

SANITIZING HATCHERY ROOMS BY FOG APPLICATION: Close room off so fog is confined to the room to be treated. Mix one (1) part DuPont™ 904 to five (5) parts water. Insert the nozzle of the fogger through a suitable opening into the room. With the setting on maximum output, fog for one (1) to three (3) minutes for each 113 cubic meters of space in the room (4000 ft³). Duration of fogging time is dependant on type of fogging equipment used. Refer to fogger instructions. Under no circumstances should a room or building be entered by anyone within 4 hours or until fog has completely settled.

NOTE: The fog generated is very irritating to eyes, skin and mucous membranes. Under no circumstances should a room or building be entered by anyone until the fog has completely settled, normally 1 - 4 hours after the actual fogging. If feeders and waterers were not removed from the premises during treatment, or were not adequately covered to prevent contact with treatment, they should be washed with detergent and water before use for poultry or livestock.

SANITIZING INCUBATORS AND HATCHERS BY FOGGING: Prepare a stock solution of 45 mL DuPont™ 904 to 1 litre of water. Fog 90 - 240 mL of this into setters and hatchers immediately after transfer. Repeat daily in setters and every 12 hours in hatchers.

Discontinue hatcher treatments approximately 24 hours prior to pulling the hatch. Do not allow people to contact or breathe this fog and do not enter machines until the fog has settled (30 - 60 minutes after fogging is completed). To do this, install permanent fogging nozzles in setters and hatchers and use an air compressor to disperse the sanitizing solution as a fog. Contact your DuPont Technical Representative if you need assistance.

It is also satisfactory to fog setters and hatchers with 4 mL of DuPont™ 904 per litre of water. If this is done, fog for 30 - 90 seconds once per hour or once every two hours. Contact your DuPont Technical Representative for assistance.

DISINFECTING CHICK VANS, EGG TRUCKS, HATCHERY AND FARM VEHICLES: Clean and rinse vehicles and disinfect with 4 mL per litre of DuPont™ 904. Rinse after 10 minutes contact. DuPont™ 904 should not be mixed with other cleaning or disinfecting compounds or products.

DIRECTIONS FOR USE ON POULTRY, SWINE AND LIVESTOCK (INCLUDING EQUINE) FARMS

GENERAL FARM DISINFECTANT USES:

(4 mL per litre, 1:250)

- (a) Remove all livestock and feeds from premises, trucks, coops or crates to be treated.
- (b) Remove all litter, bedding and manure from floors, walls and surfaces of facilities traversed or occupied by animals.
- (c) Empty all feeding devices and watering appliances.
- (d) Clean all surfaces with water or water and a compatible detergent.
- (e) Saturate all surfaces with DuPont™ 904 diluted at 4 mL per litre of water using a brush, cloth, mop or mechanical spraying device. Small items (forks, shovels, scrapers) may be immersed. Treated surfaces must remain moist for at least 10 minutes for proper germicidal action.
- (f) Ventilate buildings, trucks, coops and other closed spaces. Do not house livestock or use equipment until treatment has thoroughly dried.
- (g) Thoroughly scrub treated feeding and watering equipment with detergent and rinse with potable water before reuse.

VEAL, CALVING, HOG, CATTLE AND HORSE OPERATIONS: Between depopulations of facilities, cleaning and disinfection of pens, hutches, aisles, ventilation equipment, utensils and other environmental surfaces may be required. Flush soils from these areas and clean and disinfect with 4 mL of DuPont™ 904 per litre of water. Take care to avoid disinfectant use solution contact with animals, feed, feed equipment, water or watering devices as indicated above. If spray contacts feeders or waterers, scrub them and rinse well with potable water before they are reused.

BOOT BATH: Use 8 mL of DuPont™ 904 per litre of water (1:125) in boot baths. Change solution daily and anytime it becomes visibly soiled. Use a nylon bristled brush to clean soils from boots.

SANITIZING POULTRY HOUSES AND LIVESTOCK BUILDINGS USING DUPONT™ 904 VIA THERMAL FOGGING: After the building has been depopulated and cleaned as in (a) (b) (c) and (d) under <<General Farm Disinfectant Uses>>, double check to be sure all people, poultry, livestock and pets have vacated the building. Close all windows, doors, louvers, curtains, etc. making the building as closed and tight as possible. Mix one (1) part DuPont™ 904 with two (2) parts water in the reservoir of the fogger. With the setting on maximum output, fog the treatment into the room or building to be sanitized. Use a total of one litre of DuPont™ 904 for each 186 square meters of floor space. If the area is more than 8 meters high, use two (2) litres per 186 square meters of floor space. In multi-story buildings, the application must be repeated for each floor that is to be sanitized. The fogger itself may be placed just inside the door of the building to be treated, or the nozzle of the fogger may be inserted through a suitable opening in the door or building. The opening should be just large enough to accommodate the nozzle. After fogging, the building should be kept closed for twenty-four hours. After twenty-four hours the fog should have settled and the building can then be opened and aired. The building should be opened for a minimum of twenty-four hours before it is repopulated with poultry or livestock.

NOTE: The fog generated is very irritating to eyes, skin and mucous membranes. Under no circumstances should a room or building be entered by anyone within 4 hours or until the fog has completely settled. If the building or room must be entered before the fog completely settles, then individuals entering the building or room must wear a self contained respirator approved by NIOSH/MSHA, goggles, long shirt sleeves and pants. If feeders and waterers were not removed from the premises during treatment or were not adequately covered to prevent contact with treatment, they should be washed with detergent and water before use for poultry or livestock.

DIRECTIONS FOR USE IN ANIMAL CARE FACILITIES, ANIMAL RESEARCH CENTERS, ANIMAL BREEDING FACILITIES, KENNELS AND ANIMAL QUARANTINE AREAS:

DuPont™ 904 is a one-step germicide, fungicide, soapless cleaner and deodorant effective in the presence of organic soil (5% serum). It is non-selective and, when used as directed, will not harm tile, terrazzo, resilient flooring, concrete, painted surfaces, varnished wood, glass or metals.

- To clean and disinfect hard surfaces, use 4 mL of DuPont™ 904 per litre of water (1:250). Apply by immersion, flushing solution over treated surfaces or with a mop, sponge, cloth or bowl mop to thoroughly wet surfaces. Prepare fresh solutions daily or when solution becomes visibly dirty.
- To clean badly soiled areas, use up to 12 mL per litre of water (1:83).
- To disinfect, allow treated surfaces to stand for at least 10 minutes before wiping or rinsing.
- To control mold and mildew growth on previously cleaned, hard nonporous surfaces, use 4 mL per litre. Allow to dry without wiping. Reapply as new growth appears.

Manufactured by: E. I. du Pont de Nemours and Company, DuPont Animal Health Solutions, 1007 Market Street, Wilmington, DE 19898 USA

Questions? Call 1-302-774-1000

Distributed in Canada by: Vétquinol N.-A. Inc, 2000, ch. Georges, Lavaltrie, QC, Canada J5T 3S5

1-800-363-1700

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NAC No.: 12342600

Appendix B:

Pindone Rabbit Bait *Material Safety Data Sheet*

Material Safety Data Sheet: RABBAIT® Pindone Oat Bait

Date of Issue: 1 June 2008

© ANIMAL CONTROL TECHNOLOGIES Pty Ltd Page 1 of 4

1. IDENTIFICATION OF THE MATERIAL AND SUPPLIER

Product Name: RABBAIT® Pindone Oat Bait

Recommended Use: For the control of rabbits

To be used in accordance with label instructions and the relevant state of territory government department legislation. Not to be used for the control of hares.

Supplier Details

Company: Animal Control Technologies (Australia) Pty Ltd

Address: 46-50 Freight Drive Somerton Vic 3062, Australia

Telephone number: 03 9308 9688 (Monday to Friday, 8:00a.m. – 5:00p.m. EST)

Emergency telephone number: Poisons Information Centre 13 11 26 (24 hours)

2. HAZARDS IDENTIFICATION

Hazard classification: Not classified as a hazardous substance according to the criteria of NOHSC.

Not classified as a dangerous good according to the criteria of the Australian Dangerous Goods Code.

Risk phrase(s): Harmful: danger of serious damage to health by prolonged exposure if swallowed.

Safety phrase(s): Keep locked up and out of reach of children. Wear suitable gloves. In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).

Poisons schedule number: S6

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Name: CAS Number: Proportion (w/w):

Pindone, sodium salt 83-26-1 0.5g/kg

Other ingredients not determined to be hazardous N/A up to 100%

4. FIRST AID MEASURES

First aid: If poisoning occurs, contact a doctor or Poisons Information Centre. Have this MSDS and or the label with you.

Swallowed: Hazardous, seek medical attention. Effects are cumulative and delayed in action.

Eye: Unlikely to cause intoxication, may cause irritation, flush with flowing water for 5min or until product is removed.

Skin: Remove contaminated clothing. Rinse and wash skin with soapy water.

Inhaled: There is no inhalation risk with this product

Advice to doctor: Vitamin K1 (phytomenadione) only, can be used as an antidote if patient shows signs of anticoagulant poisoning (bleeding, haemorrhage). Repeat as necessary based on monitoring of prothrombin times. It is important to ascertain the route of exposure and the quantity of bait exposed to.

Prolonged (PT) times may not be evident until 48h after exposure but are

Material Safety Data Sheet: RABBAIT® Pindone Oat Bait

Date of Issue: 1 June 2008

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usually prolonged at 24h. PT times generally reach a maximum at 36-72h after exposure. Symptoms include anaemia, shortness of breath during exertion, fatigue, excessive bleeding from minor cuts, nose bleeds and bleeding from the gums. Life threatening symptoms include complications from massive gastrointestinal bleeding and intracranial haemorrhage.

5. FIRE FIGHTING MEASURES

Fire & explosion hazards: The bait is not flammable and will not auto-ignite.

Suitable extinguishing media: Water spray, foam, carbon dioxide, dry chemical powder.

Hazards from combustion: In case of fire do not inhale fumes. Wear mask and gloves.

Special protective equipment: Use individual respiratory equipment to protect from fumes.

6. ACCIDENTAL RELEASE MEASURES

Spills and Disposal: While wearing rubber gloves, sweep-up spilt bait using a broom and shovel.

Dispose of bait by burial below 50 cm. Rinse away residue with excess water.

7. HANDLING AND STORAGE

Precautions for safe handling: To avoid risks for man and environment the instructions for use are to be followed. Avoid all unnecessary contact with the product. Wear suitable gloves when handling this product

Conditions for safe storage: Store in the closed, original container in a dry, cool, well ventilated area out of direct sunlight. Store in a locked room or place away from children, animals, food, feedstuffs, seed and fertilisers.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

National exposure standards: No exposure standard allocated.

Biological limit values: No biological limit allocated.

Engineering controls: The product formulation dilutes the concentration of Pindone and adheres the poison to the husk of the grain.

Personal protective equipment: When opening the container and using baits wear elbow-length PVC gloves.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Oats coloured with a green dye.

pH: Not available

Vapour pressure: Not applicable

Vapour density: Not applicable

Boiling point / range: Not applicable

Freezing / melting point: Not available

Solubility in water: The oat bait is not soluble in water.

10. STABILITY AND REACTIVITY

Chemical stability: Stable under normal storage and handling conditions.

Incompatible materials: None applicable

Hazardous decomposition products: No specific data

Material Safety Data Sheet: RABBAIT® Pindone Oat Bait

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Hazardous reactions: No specific data

11. TOXICOLOGICAL INFORMATION

Acute: Pindone causes a depression in the liver function to activate vitamin K. This in turn causes a decrease in blood clotting factors (II, VII, IX and X) causing an antiprotease effect (the inability for the blood to clot). Large single doses can cause acute poisoning. Pindone has a cumulative effect, causing anticoagulation poisoning with a long latent period between ingestion and symptoms. Anticoagulant effects may persist for days or weeks depending on the dose consumed. Patients with hepatic dysfunction, malnutrition or a bleeding diathesis are at greater risk. Swallowed: Poisonous if swallowed. Symptoms include bleeding from nose, gums, blood in stool, blood in urine, anaemia, bruising, fatigue and shortness of breath during exertion.

Eye: Avoid contact with eyes. No specific data available.

Skin: Avoid contact with skin. No specific data available.

Inhaled: May be irritating or dangerous if inhaled. Risk minimised due to product formulation.

Chronic: Repeated minor exposure may cause anticoagulant effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity: Do not contaminate streams, rivers or waterways with the chemical or used containers.

Persistence and degradability: The product is biologically degradable and will not accumulate in soil or water.

13. DISPOSAL CONSIDERATIONS

Break, crush or puncture and dispose of empty containers in a local authority landfill. If no landfill is available, bury the containers below 500 mm in a disposal pit specifically marked and set up for this purpose clear of waterways, desirable vegetation and tree roots. Empty containers and product should not be burnt.

14. TRANSPORT INFORMATION

This product is not classified as a dangerous good according to the Australian Dangerous Goods Code 6th Edn. (1998).

UN number: Not applicable UN proper shipping name: Not applicable

Dangerous Goods Class: Not applicable Subsidiary Risk: Not applicable

Packing group: Not applicable Hazchem code: Not applicable

15. REGULATORY INFORMATION

Poisons schedule number: S6

Material Safety Data Sheet: RABBAIT® Pindone Oat Bait

Date of Issue: 1 June 2008

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16. OTHER INFORMATION

Date of Preparation of this MSDS: 1 June 2008

This Material Safety Data Sheet (MSDS) has been developed using the following references:

National Code of Practice for the Preparation of Material Safety Data Sheets 2nd Edn. [NOHSC:2011(2003)]

Australian Dangerous Goods Code 6th Edn. (1998)

Reigart, R. and Roberts, J. editors (1999) Recognition and Management of Pesticide Poisoning 5th Edition, EPS Office of Pesticides Programs, Washington D.C.

The physical values and properties described in this MSDS are typical values based on scientific literature and material produced to date, and are believed to be reliable. Animal Control Technologies provides no warranties, either expressed or implied and assumes no responsibility for the accuracy or completeness of the data contained herein. The information is supplied upon the condition that the persons receiving information will make their own determination as to the suitability for their purposes prior to use of this product. Due care should be taken to ensure that the use of this product and its disposal is in compliance with all relevant Federal, State and Local Government regulations.

<http://www.animalcontrol.com.au/pdf/RABBAIT%20Pindone%20at%202008.pdf>

Appendix C:

Contrac Rodent Bait *Material Safety Data Sheet*

Trade Name: Contrac Rodenticide Date Created: 07 May 2004

Supplier: Bell Laboratories, Inc. Page 1 of 2

CONTRAC RODENTICIDE

SAFETY DATA SHEET ACCORDING TO EEC DIRECTIVE:

93/112/EEC

DATE OF ISSUE:

07 May 2004

PREPARED BY:

CAR

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY

PRODUCT NAME:

CONTRAC RODENTICIDE

AUSTRALIAN REGISTRATION NUMBER:

48374

USE:

Anticoagulant Rodenticide

FORM:

Formulated Dry Bait

MANUFACTURER/IMPORTER:

Bell Laboratories, Inc.

3699 Kinsman Blvd.

Madison, WI 53704

USA

EMERGENCY PHONE NUMBERS:

Poisonings: 131 126 POISON INFORMATION

CENTRE

Others: (02) 9682-5155

2. COMPOSITION/INFORMATION ON INGREDIENTS

COMPOSITION: Bromadiolone [3-[3-(4'-Bromo-[1,1'-biphenyl]-4-yl)-3-hydroxy-1-phenylpropyl]-4-hydroxy-2H-1-benzopyran-2-one]

% BY WEIGHT:

0.005 %

CAS NO.:

28772-56-7

EEC NO.:

Not Established

3. HAZARD IDENTIFICATION

PRIMARY ROUTES OF ENTRY: Ingestion.

4. FIRST AID MEASURES

EYE CONTACT: Flush with cool water for at least 15 minutes. If irritation develops, obtain medical assistance.

SKIN CONTACT: Wash with soap and water. If irritation develops, obtain medical assistance.

INHALATION: None

INGESTION: Call physician or emergency number immediately. Do not give anything by mouth or induce vomiting unless instructed

by physician.

SYMPTOMS: Ingestion of excessive quantities may cause nausea, vomiting, loss of appetite, extreme thirst, lethargy, diarrhea, bleeding.

ADVICE TO PHYSICIAN: If ingested, administer Vitamin K1 intramuscularly or orally as indicated by bishydroxycoumarin overdoses. Repeat as necessary as based upon monitoring of prothrombin times.

5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA: Extinguish with water, foam or inert gas.

MEASURES UNSUITABLE FOR SAFETY REASONS: None

PROTECTIVE EQUIPMENT: Firefighters should be equipped with protective clothing and self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTION: Gloves should be worn during clean up.

ENVIRONMENTAL PROTECTION: Avoid entry to watercourses.

CLEAN UP AND DISPOSAL: Sweep up spilled material, place in properly labeled container for disposal or re-use. Dispose of all wastes in accordance with all local, regional and national regulations.

7. HANDLING AND STORAGE

HANDLING: Keep product in the original container. Do not handle the product near food, animal foodstuffs or drinking water. Keep out of reach of children. Do not use near heat sources, open flame, or hot surfaces. Wash thoroughly with soap and water after handling.

STORAGE: Store in a cool, dry place inaccessible to children, pets and wildlife. Keep container tightly closed when not in use. Avoid contamination of lakes, streams and ponds by use, storage and disposal.

Trade Name: Contrac Rodenticide Date Created: 07 May 2004

Supplier: Bell Laboratories, Inc. Page 2 of 2

8. EXPOSURE CONTROL/PERSONAL PROTECTION

SPECIAL PROTECTIVE EQUIPMENT:

Not Required

VENTILATION:

Not required

RESPIRATOR TYPE:

Not required

SKIN PROTECTION:

Rubber gloves (recommended)

EYE PROTECTION:

Not required

HYGIENE RECOMMENDATIONS:

Wash thoroughly with soap and water after handling.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:

Blue pellets with sweet grain-like odor.

BOILING POINT:

N/A

MELTING POINT:

N/A

FREEZING POINT:

N/A

FLASH POINT:

N/A

DENSITY:

N/A

VAPOR PRESSURE:

N/A

SOLUBILITY:

N/A

10. STABILITY AND REACTIVITY

STABILITY: Stable if stored in original container in a cool, dry location

INCOMPATIBILITY/CONDITIONS TO AVOID: Strongly alkaline materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of carbon.

11. TOXICOLOGICAL INFORMATION

LD50, ORAL (INGESTION):

>5000 mg/kg (rats)

LD50, DERMAL (SKIN CONTACT):

> 5001 mg/kg (rats)

LC50, INHALATION:

N/A

EYE IRRITATION:

None (rabbits)

SKIN IRRITATION:

None (rabbits)

DERMAL SENSITIZATION:

Not Considered a Sensitizer

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL BEHAVIOR: Solid, non-volatile. Material is essentially insoluble in water.

ENVIRONMENTAL TOXICOLOGY: Prevent access to non-target mammals and birds.

EFFECTS ON WASTEWATER TREATMENT: Unlikely to have any effect on wastewater treatment.

13. DISPOSAL

WASTE DISPOSAL METHOD: Wastes resulting from use may be disposed of on-site or at an approved waste disposal facility. Dispose of all wastes in accordance with all local, state and national regulations.

14. TRANSPORT INFORMATION

CLASSIFICATION: Not regulated or not classified as dangerous by DOT (USA), IATA (Air), or IMDG (Vessel).

SHIPPING NAME: Rodenticide containing Bromadiolone.

15. REGULATORY INFORMATION

CLASSIFICATION: Not classified as Dangerous for supply/use.

16. OTHER INFORMATIONS

The information provided in this Safety Data Sheet has been obtained from sources believed to be reliable. Bell Laboratories, Inc. provides no warranties, either expressed or implied, and assumes no responsibility for the accuracy or completeness of the data contained

herein. This information is offered for your consideration and investigation. The user is responsible to ensure that they have all current

data relevant to their particular use

http://www.allstatepest.com.au/pdf/Msds/contrac_rodenticide.pdf

Appendix D:

Salt Lick Manufacturers

Salt Lick Manufacturer

Himalayan Natural Rock Salt Lick on a rope

Sizes available:

2-3 kgs & 3-4 kgs

Manufacturer: Rock Salts

Distributor: Animal Health Store

Website: www.animalhealthstore.com.au/products/

Categories: Livestock

http://animalhealthstore.com.au/products/Himalayan_Natural_Rock_Salt_Lick_on_a_Rope-295-0.html

Appendix E:

Vitamin E & Selenium Supplement

RANVET E 1000

Pack: 1 kg fine powder

Distributors:

Provet NSW Pty Ltd

Castle Hill

(02) 9899 5022

Dr Neils Pet & Equine Supplies

1800 032 139

Email: sales@drneils.com.au

Animal Supplies (Wholesale) Pty Ltd
124 Toongabbie Road
Girraween, 2145
(02) 9688 2949

For more information on available distributors see website:

http://www.ranvet.com.au/new_south_wales.htm

Appendix F:
Symbio Preventative Medicine Program

Symbio - Preventative Medicine Program
Created by MJC on 21/8/2001
Located in Symbio Food Prep Room

SYMBIO

Preventative Medicine Program

MJC 21/8/2001

MEDICATION	BIRDS	REPTILES	MAMMALS	SPECIAL
Ivomec (Sheep formulation 0.8 g/L)	0.1ml per 100g body weight via crop needle	0.5ml per kg body weight via crop needle or in food	0.25-0.5ml per kg body weight in food	Dog & Dingo Heartworm: 0.1ml per kg body weight once monthly
Nilverm LV	Use 9 ml per litre drinking water or nectar. Use Glucodin powder as flavouring, add until it tastes OK to you.			
Benzelmin Concentrate (Horse Strength)			1ml per 10kg mixed in food	
Panacur 25 or Synanthic	8ml + 12 ml Cooking oil per 1kg of seed. Mix Panacur and oil first, then mix this into seed. Allow to stand for 12 hours. Use this seed as only seed for 5-6 days	2ml per Kg orally	1ml per 5kg in food or into mouth	
Droncit	Tapeworm: Use 1 tablet per kg of birds in food			
Popantel			Carnivores: 1 tablet per 10kg body wt	

Appendix G: Camel Weight estimation formula

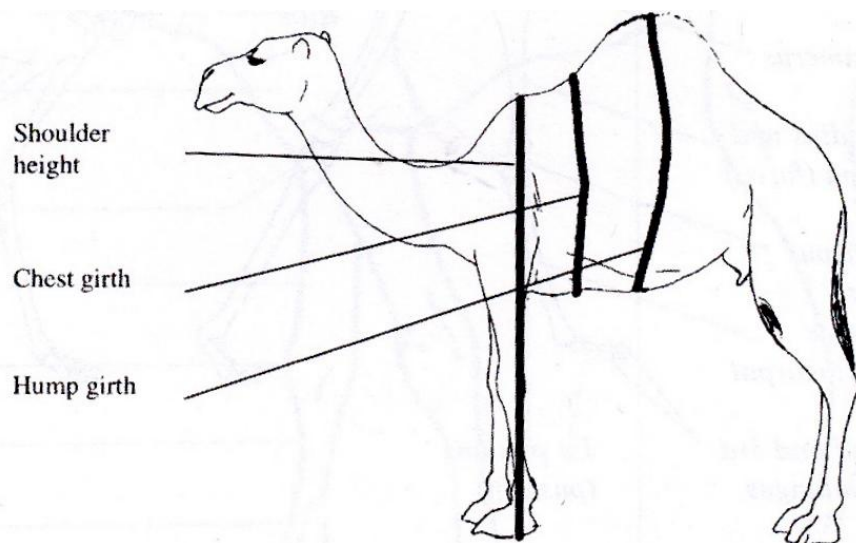
Estimating a Camels Weight

A Field Manual of Camel Diseases → *Managing and Treating Camels* Section, Page 22
2001

Estimating a Camels Weight

FORMULA:

$$\text{Weight in Kg} = \text{Shoulder Height} \times \text{Chest girth} \times \text{Hump Girth} \times 50^{112}$$



Shoulder Height: Height of Shoulder in Metres

Chest Girth: Distance in metres around the Camels chest, measured in front of the hump and behind the front legs and chest pad

Hump Girth: Distance in metres around the Camels body, measured at its widest point, from the top of the hump and around the belly

Example:

Shoulder Height: 1.95 m

Chest Girth: 2.00 m

Hump Girth: 2.20 m

Weight in Kgs: $1.95 \times 2.00 \times 2.20 \times 50 = 429$ Kgs

¹¹² Formula and diagram taken from 'A Field Manual of Camel Diseases, on Page 22.

Appendix H:¹¹³

Feeding Guide for Divetelact:

Use of Divetelact as a milk replacer for orphaned or early weaned Camels.

DiVetelact is a low lactose milk supplement for orphan and early weaned animals.

For older animals, Divetelact can be used in powder or liquid form as a general supplement and offers excellent extra nutrition during pregnancy and lactation.

Ingredients: Lactose hydrolysed skim and whole milk solids, dried vegetable oils, dextrose, dried glucose solids, casinates, lecithin, minerals, taurine, vitamins, mixed tocopherols and emulsifiers. DiVetelact has its lactose enzymically converted to easily digested glucose and galactose. It is 95% lactose free.

Feeding Guide:

Dilution A: 1 scoop DiVetelact to 60mL warm water. For 1 litre, 135g (15 scoops) DiVetelact to 900mL warm water gives 2800kJ.

Dilution B: 1 scoop DiVetelact to 40mL warm water. For 1 litre, 200g (22 scoops) DiVetelact to 850mL warm water gives 4200kJ.

Foals, calves, kids & fawns - feed Dilution A and do not increase concentration.

Lambs, native animals, rabbits, kittens, piglets & pups - start on Dilution A and gradually increase to Dilution B over 1 week as the animal tolerates DiVetelact.

Orphan or Early Weaned Animals:

Start volume at Dilution A. The table below should be used as a guide. Usually the animal will take as much as it needs.

Animal Weight	100g	200g	500g	1kg	5kg	10kg	20kg	50kg	100kg
Total Daily Feed Volume	30mL	60mL	150mL	300mL	1L	1.6L	2.8L	5.4L	9L

Equipment: All utensils should be clean before use. Animals should be fed colostrum for the first few days if possible.

Divide the calculated feed volume into the number of feeds per day shown below:

Feeds per day for the first week of life	
Foals	Feed at 2-3 hourly intervals
Lambs, Calves, Kids	2-3 feeds per day
Pups, Kittens, Fawns	4 feeds per day
Piglets	4 feeds per day of 100mL each
Furred Native Animals	4 feeds per day
Furless Native Animals	6 feeds per day

Storage:

¹¹³ <http://www.horsesuppliesdirect.com.au/prod1730.htm>

Sealed container should be stored in a cool, dry place. Once opened, keep sealed when not in use. For best results, use within 1 month of opening.

Appendix I:

Hand Raising Exotic Animals

Hand Raising Exotic Animals
Western Plains Zoo
Janet Gamble
1997

http://www.australasianzookeeping.org/Husbandry%20Manuals%20-%20Rearing,%20Training%20&%20Enrichment.htm#Rearing_

CAMELIDAE

DROMEDARY CAMEL, GUANACO & ALPACA

MILK FORMULA

200 gms Full Cream Milk Powder made up to 1 Lt.
ADD 2 Egg yolks,
200 mls Thickened Cream,
1 tbsp Natural yoghurt,
20 mls Enervol.

BIRTH WEIGHT AVERAGE

Camel 35 - 40 kgs, Guanaco 9 - 10kgs, Alpaca 6 - 16 kgs.

TEAT

Beige Calf teat initially, may be put on a Black Calf teat on a bucket.

TIMES FED

X 4 first 10 - 14 days then to X 3.

WEAN

Camel and Guanaco X 2 @ 5 - 6 weeks, X 1 @ 16 weeks, Wean @ 28 weeks.

PROBLEMS ENCOUNTERED

Scouring due to a tendency to eat anything and everything offered by the public.

REFERENCES

'Tenaj' 1988, 'Sahara 1990 & 'Chad' 1990 VQC Camel Departure file.
VQC Handraising Camels file.

Appendix J:

Bleach – *Material Safety Data Sheet*

MSDS:	Rev 2 Date: 06 August 2003
Domestic Trade Name:	Bleach
Other Names:	Hypochlorite Solution, Bleach Solution, Hypo.
Manufacturers Product Code:	None Allocated
UN Number:	1791
Dangerous Goods Class:	8
HAZCHEM Code:	2X
Poison Schedule Number:	None Allocated
Use:	Bleaching Agent, Disinfectant

Section 2 Physical Description / Properties

Appearance:	Clear, green-yellow liquid having a chlorine odour. Bleach is strongly corrosive and a moderate oxidising agent.
Boiling Point or Melting Point:	110°C (15% available Chlorine)
Vapour Pressure:	Not Available
Specific Gravity:	1.1
Flash Point:	Not Available
Flammability Limits:	Not Available
Solubility in Water:	Aqueous Solution

Section 3 Other Properties

pH of Concentrate:	12 (approximately)
---------------------------	--------------------

Section 4 Ingredients

Chemical Name:	CAS Number:	Proportion:
Sodium Hypochlorite [NaOCl]	7681-52-9	10% weight / volume
Sodium Hydroxide [NaOH]	1310-73-2	0.8%
Water	-	Remainder

Section 5 Health Effects

Acute:	Corrosive and irritating if swallowed or ingested. Dangerous when in contact with the eyes.
Swallowed:	Severe internal irritation due to corrosive effect.
Eye:	Severe irritation and burns.
Skin:	Irritation and burns.
Inhaled:	Irritation of respiratory tract, resulting in coughing and breathing difficulty caused by chlorine fumes.
Chronic:	If condition persists, seek further attention.

Section 6 First Aid

Swallowed:	Wash out mouth with water and give water to drink. Do not induce vomiting.
Eye:	Irrigate immediately with water for 15 minutes and seek medical attention.
Skin:	Wash with large amounts of water. Remove affected clothing and wash underlying skin.

Inhaled: Remove from exposure. Keep warm and at rest.

Section 6B First Aid Facilities:

Advice to Doctor: Treat symptomatically.

Section 7 Precautions for Use

Exposure Standard: There are no exposure limits available.

Engineering Controls: Use in open or well ventilated areas.

Personal Protection: Wear PVC gloves and chemical goggles. An acid resistant respirator to AS 1716 is recommended if spray mists are produced during use. It is recommended that a shirt with long sleeves and long trousers be worn. Always wash skin and clothing after using this product.

Flammability: Non-flamable.

Section 8 Safe Handling Information

Storage and Transport: This product is classified as non dangerous according to the ACTDG. Store in plastic containers in a clean, dry, cool, well ventilated place away from foodstuffs, other oxidising agents and acids. Store and transport in an upright container. Containers must be carefully vented to release any pressure build-up.

Spills and Disposal: Minimise leak and or contain spills. Collect as much of the spillage as possible. Keep pH of the remaining spilled solution above 7.0 and dilute it with large amounts of water. Avoid contact with acids. Add soda ash to the cleanup liquid to minimise release of chlorine gas during cleanup.

Fire / Explosion Hazard This product is not flammable under the conditions of use and does not support combustion.
The product is stable and will not polymerise. It is incompatible with strong acids, metals, metal salts, peroxides and other oxidising agents and with reducing agents. It decomposes on exposure to heat or light. Upon heating or upon contact with acids, this product may emit toxic fumes, including chlorine gas which has a TLV of 1 ppm; 3 mg/m³ – peak exposure. Source: NOHSC (under review). If the product is involved in a fire, fire fighters should wear self-contained breathing apparatus as well as PVC gloves and chemical goggles. Fire fighters should fight any fires with dry chemical, carbon dioxide, vaporising liquid or foam extinguishers or water delivered in a fine spray or fog if available.

Section 9 Other Information

Sodium hydroxide solution is chemically sensitive to: Acids, Temperature, Metals and Aging

Section 10 Contact Point

Customer Service: 1300 307 755

Emergency Advice: 1300 307 755

Important Notes

This MSDS summarises our best knowledge of the health and safety hazard information of the product and how to safely handle and use the product in the workplace. Each user should read this MSDS and consider the information in the context of how the product will be handled and used in the workplace including in conjunction with other products.

The user should contact the Solo Pak Customer Service Department if clarification or further information is needed to make an appropriate risk assessment of the use of this material

Appendix K: Viraclean – Material Safety Data Sheet

Issue No. 9 Page 1 of 4

MATERIAL SAFETY DATA SHEET

Section 1: IDENTIFICATION

VIRACLEAN

Recommended Use: Disinfectant Cleaner.

Product Code: 210556 (2x5L), 210555 (15L), 210564 (12X500mL Pump), 210574 (12X500mL Squeeze).

Whiteley Medical

A division of Whiteley Corporation Pty Ltd (A.C.N. 000 906 678)

Postal Address: P. O. Box 1076 North Sydney NSW 2059

Telephone Number: (02) 9929 9155 Facsimile: (02) 9929 9077

Emergency Telephone Number: Poisons Information Centre (National) 131126

Section 2: HAZARDS

Not classified as hazardous by the criteria of NOHSC.

Section 3: COMPOSITION INFORMATION

Ingredient

CAS No

Proportion

Proprietary Blend Not applicable 10-30%

Ingredients deemed not to be hazardous Not applicable To 100%

Section 4: FIRST AID

Eye (Contact)

Hold eyelids apart and flush the eye continuously with running water.

Skin (Contact) Remove contaminated clothing and flush skin and hair with running water.

Inhalation(Breathing) Remove to fresh air. The product is non volatile at room temperatures.

Ingestion (Swallowing) DO NOT induce vomiting. For advice, contact a Poisons Information Centre (Phone 131126) or a doctor.

Advice to Doctor Treat symptomatically for neutral detergent.

First Aid Facilities Ensure an eye wash is available and ready for use.

Additional Information No aggravated medical conditions are known to be caused by exposure to this product.

Section 5: FIREFIGHTING MEASURE

Suitable Extinguishing Media

Solution does not burn. Use extinguishing media suited to the materials that are burning. eg. Dry chemical, CO2 or water spray

Hazards From Combustion

Products

Carbon dioxide and carbon monoxide may be produced in the case of fire or during thermal decomposition.

MATERIAL SAFETY DATA SHEET VIRACLEAN

Issue No. 9 Page 2 of 4

Precautions For Fire Fighters

and Special Protective

Equipment

Keep containers cool by spraying with water.

Additional Information

Hazchem Code – Not applicable.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedure

SAA/SNZ HB76: Dangerous Goods – Initial Emergency Response Guide – Not applicable.

Spills / Clean up

Clean up personnel should wear full protective clothing. Restrict access until completion of clean up. Then ensure adequate ventilation. Stop leak if safe to do so. Contain spill with absorbent material, such as towelling, sand, vermiculite or other inert material. Prevent spill entering stormwater drains or waterways. Collect and dispose of clean up material according to local regulations. Wash away remnants with copious amounts of cold water to sewer. Clean area by working from the periphery to the centre of

spill or from the edge of the room to the centre.

Section 7: HANDLING AND STORAGE

Precautions for Safe Handling

Contact Whiteley Corporation sales representative for advice when using this product for any application other than that outlined on the label or technical bulletin.

Any non-intended or non-authorised use of this product may result in personal injury or damage to equipment.

Store product in original container.

Wash thoroughly after handling product.

Conditions for Safe Storage

Store in a cool, dry, well ventilated area. Keep container tightly sealed. Store below 25oC.

Section 8: EXPOSURE CONTROL/PERSONAL PROTECTION

National Exposure Standards – Source: National Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:1003].

Ingredient CAS No ES-TWA ES-STEL

None available

Biological Limit Values

Not available.

Engineering Controls

Use only in a well ventilated area.

Personal Protective Equipment

Eye/face protection – Safety glasses / face shield / chemical resistant goggles should be worn to prevent eye contact.

Skin protection – Use Nitrile gloves or similar to prevent skin contact.

Respiratory protection – Respirator is not usually necessary but if required use a respirator suitable for organic vapours.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance Clear pink liquid

Boiling Point approximately 100oC

Odour Slight Lemon odour

Freezing Point approximately 0oC

pH 7.00-7.40

Solubility Soluble in water.

MATERIAL SAFETY DATA SHEET VIRACLEAN

Issue No. 9 Page 3 of 4

Specific Gravity 0.985-0.995

Flash Point Not Applicable.

Vapour Pressure Not Available.

Upper and Lower Flammability limits (in air) Not Applicable.

Vapour Density Not Available.

Ignition Temperature Not Applicable.

Section 10: STABILITY AND REACTIVITY

Chemical Stability

Stable for period of shelf-life when stored as directed.

Conditions to avoid

Avoid high temperatures (store below 25oC). Do NOT store in direct sunlight. Protect against physical damage.

Incompatible materials

None known. Do not mix with other chemicals.

Hazardous decomposition products

None known.

Hazardous reactions

None known.

Section 11: TOXICOLOGICAL INFORMATION

HEALTH EFFECTS

Acute

Swallowed Considered an unlikely route of entry in commercial / industrial environments. May be irritating to gastro-intestinal tract.

Eye May cause irritation and reddening.

Skin May cause irritation.

Inhaled May cause irritation if aerosol inhaled.

Chronic

Swallowed No effects known.

Eye No effects known.

Skin No effects known

Inhalation No effects known.

TOXICITY DATA

Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity

Not available.

Persistence and degradability

Not available.

Mobility

Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal method

Disposal to sewer is normally recommended with copious amounts of water.

Refer to State/Territory Land Waste Management Authorities if applicable.

Containers are recyclable and can be disposed of by a licensed waste contractor. Containers can be disposed of to general waste or rinsed thoroughly and recycled.

MATERIAL SAFETY DATA SHEET VIRACLEAN

Issue No. 9 Page 4 of 4

Special precautions

Suitable for incineration by approved agent.

Section 14: TRANSPORT INFORMATION

Not classified as Dangerous Goods by the criteria of the Australian Dangerous Goods Code (ADG Code).

UN Number Not applicable.

UN Proper Shipping Name Not applicable.

Class and subsidiary risk Not applicable.

Packing Group Not applicable.

Special precautions for user Not applicable.

Hazchem Code

Not applicable.

Section 15: REGULATORY INFORMATION

Poisons Schedule (SUSDP): Not applicable.

All ingredients are listed in the Australia Inventory of Chemical Substances (AICS).

Section 16: OTHER INFORMATION

Prepared by:

Position:

G. Probert

National Operations Manager

Date of preparation:

22 February 2006

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<http://www.davanna.com.au/msds/whiteleys/viraclean-9.pdf>

Appendix L:

Milton – Material Safety Data Sheet

MILTON ANTIBACTERIAL SOLUTION

Chemwatch Material Safety Data Sheet

Issue Date: 25-Jan-2006 CHEMWATCH 4654-57

CD 2005/4 Page 1 of 9

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

MILTON ANTIBACTERIAL SOLUTION

SYNONYMS

PRODUCT USE

Disinfection of infant feeding and other utensils, when diluted with water.

SUPPLIER

Company: Milton Australia Pty Ltd

Address:

100 Antimony Street

Carole Park

QLD, 4300

AUS

Telephone: +61 7 3271 9600

Fax: +61 7 3271 1315

HAZARD RATINGS

Flammability

Toxicity

Body Contact

Reactivity

Chronic

SCALE: Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4

Section 2 - HAZARDS IDENTIFICATION**STATEMENT OF HAZARDOUS NATURE**

NON-HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS. According to the Criteria of NOHSC, and the ADG Code.

POISONS SCHEDULE

None

RISK

Toxic to aquatic organisms.

Limited evidence of a carcinogenic effect*.

* (limited evidence).

SAFETY

Do not breathe gas/fumes/vapour/spray.

Avoid contact with skin.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME CAS RN %

sodium hypochlorite 7681-52-9 1

metal salts unregulated 10-30

water 7732-18-5 >60

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS**Section 4 - FIRST AID MEASURES****SWALLOWED**

- Immediately give a glass of water.

- First aid is not generally required. If in doubt, contact a Poisons Information Centre or a doctor.

EYE

If this product comes in contact with eyes:

- Wash out immediately with water.

- If irritation continues, seek medical attention.

- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

If skin or hair contact occurs:

- Flush skin and hair with running water (and soap if available).

- Seek medical attention in event of irritation.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.

- Other measures are usually unnecessary.

NOTES TO PHYSICIAN

Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES**EXTINGUISHING MEDIA**

- There is no restriction on the type of extinguisher which may be used.

Use extinguishing media suitable for surrounding area.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.

- Wear breathing apparatus plus protective gloves for fire only.

- Prevent, by any means available, spillage from entering drains or water courses.

- Use fire fighting procedures suitable for surrounding area.

- DO NOT approach containers suspected to be hot.

- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

- Non combustible.
- Not considered to be a significant fire risk.
- Expansion or decomposition on heating may lead to violent rupture of containers.
- Decomposes on heating and may produce toxic/ irritating fumes.
- May emit acrid smoke.

May emit poisonous fumes.

FIRE INCOMPATIBILITY

None known.

Section 5 - FIRE FIGHTING MEASURES

HAZCHEM

None

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable labelled container for waste disposal.

MAJOR SPILLS

Moderate hazard.

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing life-threatening health effects is:

water 500 mg/m³

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:

water 500 mg/m³

other than mild, transient adverse effects

without perceiving a clearly defined odour is:

water 500 mg/m³

The threshold concentration below which most people.

will experience no appreciable risk of health effects:

water 500 mg/m³

American Industrial Hygiene Association (AIHA)

Ingredients considered according exceed the following cutoffs

Very Toxic (T+) >= 0.1% Toxic (T) >= 3.0%

R50 >= 0.25% Corrosive (C) >= 5.0%

R51 >= 2.5%

Section 6 - ACCIDENTAL RELEASE MEASURES

else >= 10%

where percentage is percentage of ingredient found in the mixture

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

SUITABLE CONTAINER

- Polyethylene or polypropylene container.
- Packing as recommended by manufacturer
- Check all containers are clearly labelled and free from leaks.

STORAGE INCOMPATIBILITY

None known.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

No data available: sodium hypochlorite as (CAS: 7681-52-9) / (CAS: 10022-70-5)

No data available: water as (CAS: 7732-18-5)

No data for Milton Antibacterial Solution.

EXPOSURE STANDARDS FOR MIXTURE

"Worst Case" computer-aided prediction of vapour components/concentrations:

"Worst Case" computer-aided prediction of vapour components/concentrations:

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

Composite Exposure Standard for Mixture (TWA) (mg/m³): 1.5 mg/m³

"Worst Case" computer-aided prediction of vapour components/concentrations:

Composite Exposure Standard for Mixture (TWA) (mg/m³):

If the breathing zone concentration of ANY of the components listed below is exceeded, "Worst Case" considerations deem the individual to be overexposed.

Component Breathing Zone ppm Breathing Zone mg/m³ Mixture Conc: (%).

Component Breathing zone Breathing Zone Mixture Conc

(ppm) (mg/m³) (%)

sodium hypochlorite 0.50 1.5000 1.0

"Worst Case" computer-aided prediction of vapour components/concentrations:

Composite Exposure Standard for Mixture (TWA) (mg/m³):

If the breathing zone concentration of ANY of the components listed below is exceeded, "Worst Case" considerations deem the individual to be overexposed.

Component Breathing Zone ppm Breathing Zone mg/m³ Mixture Conc: (%).

Operations which produce a spray/mist or fume/dust, introduce particulates to the breathing zone.

If the breathing zone concentration of ANY of the components listed below is exceeded, "Worst Case" considerations deem the individual to be overexposed.

"Worst Case" computer-aided prediction of vapour components/concentrations:

Composite Exposure Standard for Mixture (TWA) (mg/m³):

If the breathing zone concentration of ANY of the components listed below is exceeded, "Worst Case" considerations deem the individual to be overexposed.

Component Breathing Zone ppm Breathing Zone mg/m³ Mixture Conc: (%).

Operations which produce a spray/mist or fume/dust, introduce particulates to the breathing zone.

If the breathing zone concentration of ANY of the components listed below is exceeded, "Worst Case" considerations deem the individual to be overexposed.

At the "Composite Exposure Standard for Mixture" (TWA) (mg/m³): 1 mg/m³

INGREDIENT DATA

SODIUM HYPOCHLORITE:

available chlorine, as chlorine

TLV TWA: 0.5 ppm, 1.5 mg/m³; STEL: 1 ppm, 2.9 mg/m³

ES Peak: 1 ppm, 3 mg/m³

CEL TWA: 2 mg/m³ (compare WEEL TWA)

The odour threshold is likely to be similar to that of chlorine, 0.3 ppm.

Acute, subchronic, and chronic toxicity studies have shown no significant treatment related effects. High concentrations may produce moderate to severe eye irritation, but not permanent injury. High doses also appear to be embryotoxic. Since nearly all sodium hypochlorite is handled as aqueous solution, airborne exposure is likely to be as an aerosol, or mist. Sodium hypochlorite dissociates in water to form free hypochlorous acid in equilibrium. The toxic effects are likely to be similar to those of chlorine or sodium hydroxide.

WATER:

No exposure limits set by NOHSC or ACGIH.

PERSONAL PROTECTION

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE

- Safety glasses with side shields
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59].

HANDS/FEET

Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

RESPIRATOR

Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Maximum Half-face Full-Face

Zone Level Protection Respirator Respirator

ppm (volume) Factor

1000 10 B-AUS P- -

1000 50 - B-AUS P-

5000 50 Airline * -

5000 100 - B-2 P-

10000 100 - B-3 P-

100+ Airline**

* - Continuous Flow ** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

For further information consult site specific

CHEMWATCH data (if available), or your

Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

General exhaust is adequate under normal operating conditions. If risk of

overexposure exists, wear SAA approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Clear, colourless liquid with a chlorine odour; mixes with water.

PHYSICAL PROPERTIES

Liquid.

Mixes with water.

Molecular Weight: Not Applicable Boiling Range (C): Not Available

Melting Range (C): Not Available Specific Gravity (water=1): 1.13

Solubility in water (g/L): Miscible pH (as supplied): 10.8

pH (1% solution): Not Available Vapour Pressure (kPa): Not Available

Volatile Component (%vol): Not Available Evaporation Rate: Not Available

Relative Vapour Density (air=1): Not Available Flash Point (C): Not Applicable

Lower Explosive Limit (%): Not Applicable Upper Explosive Limit (%): Not Applicable

Autoignition Temp (C): Not Available Decomposition Temp (°C): Not Available

State: Liquid

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.

- Product is considered stable.

- Hazardous polymerisation will not occur.

Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

The material has NOT been classified by EC Directives or other classification systems as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.

EYE

Although the liquid is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may produce transient discomfort characterised by tearing or conjunctival redness (as with windburn).

SKIN

The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

Entry into the blood-stream, through, for example, cuts, abrasions or lesions,

Section 11 - TOXICOLOGICAL INFORMATION

may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

Not normally a hazard due to non-volatile nature of product.

The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models).

Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

CHRONIC HEALTH EFFECTS

On the basis, primarily, of animal experiments, concern has been expressed by at least one classification body that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.

TOXICITY AND IRRITATION

Not available. Refer to individual constituents.

unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

SODIUM HYPOCHLORITE:

TOXICITY IRRITATION

Oral (mouse) LD50: 5800 mg/kg Eye (rabbit): 10 mg - Moderate
Oral (woman) TDLo: 1000 mg/kg Skin (rabbit): 500 mg/24h-Moderate
Oral (rat) LD50: 8910 mg/kg Eye (rabbit): 100 mg - Moderate
as sodium hypochlorite pentahydrate

The substance is classified by IARC as Group 3:

NOT classifiable as to its carcinogenicity to humans.

Evidence of carcinogenicity may be inadequate or limited in animal testing.

WATER:

No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

DO NOT discharge into sewer or waterways.

Refer to data for ingredients, which follows:

SODIUM HYPOCHLORITE:

The material is classified as an ecotoxin* because the Fish LC50 (96 hours) is less than or equal to 0.1 mg/l

* Classification of Substances as Ecotoxic (Dangerous to the Environment)

Appendix 8, Table 1

Compiler's Guide for the Preparation of International Chemical Safety Cards:
1993 Commission of the European Communities.

continued...

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licenced land-fill or Incineration in a licenced apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM

None

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS:UN,IATA,IMDG

Section 15 - REGULATORY INFORMATION

POISONS SCHEDULE

None

REGULATIONS

sodium hypochlorite (CAS: 7681-52-9) is found on the following regulatory lists;

Australia High Volume Industrial Chemical List (HVICL)

Australia Inventory of Chemical Substances (AICS)

sodium hypochlorite (CAS: 10022-70-5) is found on the following regulatory lists;

Australia High Volume Industrial Chemical List (HVICL)

Australia Inventory of Chemical Substances (AICS)

water (CAS: 7732-18-5) is found on the following regulatory lists;

Australia Inventory of Chemical Substances (AICS)

Section 16 - OTHER INFORMATION

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Issue Date: 25-Jan-2006

Print Date: 27-Jan-2006

<http://www.probiotecpharma.com.au/milton/images/Downloads/msds-miltonantibacterial.pdf>

Appendix M:

Ivermectin

Material Safety Data Sheet

Material Safety Data Sheet

Ivermectin MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ivermectin

Catalog Codes: SLI1771

CAS#: 70288-86-7

RTECS: IH7891500

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not available.

Synonym: 22,23-Dihydroavermectin B1

Chemical Name: Ivermectin

Chemical Formula: Not available.

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS # % by Weight

Ivermectin 70288-86-7 100

Toxicological Data on Ingredients: Ivermectin: ORAL (LD50): Acute: 29.5 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Slightly hazardous in case of skin contact (irritant), of eye contact (irritant). Severe over-exposure can result in death.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Classified None. for human. Non-mutagenic for mammals.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/male [POSSIBLE]. Classified

Reproductive system/toxin/female [None.].

Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

p. 1

Eye Contact: No known effect on eye contact, rinse with water for a few minutes.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin.

Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact: Not available.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill: Use a shovel to put the material into a convenient waste disposal container.

Section 7: Handling and Storage

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Precautions:

Keep locked up. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label.

Storage:

Keep container dry. Keep in a cool place. Ground all equipment containing material. Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Not available.

Taste: Not available.

Molecular Weight: Not available.

Color: Off-white.

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

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Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, acetone.

Solubility:

Soluble in acetone.

Very slightly soluble in hot water, n-octanol.

Insoluble in cold water, methanol.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Not available.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): 29.5 mg/kg [Mouse].

Chronic Effects on Humans:

MUTAGENIC EFFECTS: Classified None. for human. Non-mutagenic for mammals.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/male [POSSIBLE]. Classified Reproductive system/toxin/female [None.].

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

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Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Toxic solids n.o.s. (Ivermectin) : UN2811 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: TSCA 8(b) inventory: No products were found.

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada): CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).

DSCL (EEC):

R40- Possible risks of irreversible effects.

R62- Possible risk of impaired fertility.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Safety glasses.

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Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:54 PM

Last Updated: 11/06/2008 12:00 PM

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<http://www.sciencelab.com/xMSDS-Ivermectin-9924423>

Appendix N:

Benzelmin Concentrate

Material Safety Data Sheet

Material Safety Data Sheet SYNTAX

Date: May 15, 1992

SECTION 1. COMPANY AND MATERIAL IDENTIFICATION

Supplier of Data:

In Case of Emergency, Call:

Product Name:

Syntax (U.S.A.) Inc.

3401 Hillview Avenue

Palo Alto, CA 94304

Environmental Health & Safety, (415) 855-5050

Benzelmin Paste

SECTION 2. PRODUCT COMPOSITION

Component 1

CAS #

Formula

Percent

Oxfendazole

53716-50-0

37.5%

Propylene glycol

57-55-6

15%

Colloidal silicon dioxide

7631-86-9

3%

(amorphous silica)

Polyoxyl 40 stearate

NA3

NA

2%

Polyethylene glycol 8000

2532-26-83

NA

3%

Water

7732-18-5

H₂O

>35%

1 Components less than 1% not listed unless pharmacologically active or carcinogenic

2 Pharmacologically active,

Not Available.

page 1 of 7

SECTION 3. HEALTH HAZARDS

WARNING STATEMENT

CAUTION: Contains deworming agent. Excessive exposure may affect the liver and if severe, affect the gastrointestinal tract, testes, and blood. Oral doses exceeding those that caused liver toxicity in laboratory animals have caused embryolethality (death to developing embryo). Avoid skin contact, eye contact, ingestion, and inhalation. Material intended for animal use only.

Potential Routes of Exposure

Skin and eye contact, accidental ingestion, inhalation.

Eye

Direct contact is not expected to cause eye irritation.

Skin

Direct contact is not expected to cause skin irritation or sensitization.

Systemic

Acute: Acute exposure is considered to be relatively nontoxic. The acute lethal dose of oxfendazole in test animals exceeded 1 g/kg body weight, corresponding to >65 g/150 lb person, assuming equal sensitivity; 68 g of oxfendazole is contained in approximately 180 g of **Benzelmin** Paste. The oral LD50 (dose that kills 50% of the test animals) of propylene glycol in rats is 20 g/kg body weight, corresponding approximately to 1400 g/150 lb person; 1400 g of propylene glycol is contained in approximately 9000 g of **Benzelmin** Paste.

Chronic: Based on studies in test animals, excessive chronic exposure may affect the liver and if severe, may affect the gastrointestinal tract, testes, and blood.

Reproductive and Developmental Toxicity

Administration of oxfendazole to male and female rats for two generations of reproduction had no significant adverse effect on fertility or on any aspect of reproductive performance. (These studies were conducted at doses similar to those that caused liver toxicity in repeated exposure studies.) As with repeated administration studies, some liver effects were observed in treated animals.

Teratology (birth defect) studies in mice, rabbits, swine, horses, and cattle have produced no evidence of teratogenic activity. Studies in rats and sheep show equivocal evidence of birth defects from oxfendazole administration. The data show that, at doses exceeding those that cause liver toxicity, oxfendazole may cause embryoletality (death to the embryo).

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SECTION 3. HEALTH HAZARDS (CONT'D)

Carcinogenicity

None of the components in **Benzelmin** Paste are listed by NTP, IARC, or OSHA as carcinogenic.

Medical Conditions Aggravated by Exposure

None known or reported.

Occupational Exposure Limit

Syntex has not established an Occupational Exposure Limit (OEL) for **Benzelmin** Paste. Syntex has established an OEL for oxfendazole of 0.35 mg/m³ of air based on the toxicity profile of oxfendazole and appropriate safety factors. OSHA's Permissible Exposure Limit (PEL) for amorphous silica is 6 mg/m³ ACGIH's Threshold Limit Value (TLV) for amorphous silica is 10 mg/m³. The OEL, PEL, and TLV are 8-hour time-weighted average airborne concentrations

SECTION 4. FIRST AID MEASURES

Eye Contact

Immediately flush eyes thoroughly with water for at least 15 minutes. If redness or irritation develops, notify medical personnel and supervisor.

Skin Contact

Immediately wash thoroughly with soap and water for 15 minutes. If a rash or irritation develops, contact medical personnel and supervisor.

Inhalation

Immediately move to fresh air and notify medical personnel and supervisor.

Ingestion

Drink a moderate amount (8-12 oz.) of water and immediately notify medical personnel and supervisor.

SECTION 5. FIRE PROTECTION

Flash Point

Not applicable.

Explosivity

Not applicable.

page 3 of 7

SECTION 5. FIRE PROTECTION (CONT'D)

Extinguishing Media

Water, multipurpose dry chemical or halon-fire extinguisher.

Special Fire Fighting Procedures

Wear full protective clothing and NIOSH/MSHA-approved, positive pressure, self-contained breathing apparatus. Wash all equipment thoroughly after use.

SECTION 6. SPILL AND RELEASE MEASURES

If material is released or spilled, take proper precautions to minimize exposure by using appropriate personal protective equipment Cordon off spill area and

minimize the spreading of spilled material. Soak up spilled material with absorbent, e.g., paper towels. Wash spill area thoroughly with soap and water. Collect spilled material, absorbent, and rinsewater into suitable containers for disposal in accordance with applicable waste disposal regulations.

SECTION 7. HANDLING AND STORAGE

Avoid contact with skin, eyes, or clothing. Use adequate ventilation to minimize exposure. Wash thoroughly after handling. Store in a cool, well-ventilated area.

SECTION 8. EXPOSURE CONTROUPERSONAL

PROTECTION

Eye Protection

Wear safety glasses with side shields or full face shield if eye contact is likely. The choice of protection is based on the job activity and potential for contact with eyes and face.

Respiratory Protection

When handling bulk quantities or for long durations where aerosolization of material is likely, wear a NIOSH/MSHA-approved half-face air purifying respirator.

Skin Protection

Wear gloves if skin contact is likely. Wear coveralls or other protective overgarment if necessary. The choice of skin protection is based on the job activity and potential for skin contact

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SECTION 8. EXPOSURE CONTROL/PERSONAL

PROTECTION (CONT'D)

Engineering Controls

When handling bulk quantities or for long durations where aerosolization of material is likely, local exhaust ventilation may be necessary. Proper equipment design may be necessary to reduce the opportunity for skin and eye contact

Other

Wash hands immediately after handling material (especially before eating, drinking, or smoking). Wash protective equipment thoroughly after each use.

SECTION 9. PHYSICAL/CHEMICAL PROPERTIES

Boiling Point:

Melting Point:

Solubility in Water:

Vapor Pressure:

Specific Gravity:

pH:

Percent Volatile:

Vapor Density:

Evaporation:

Appearance, Color, Odor:

Not applicable.

Not available.

Soluble at low and high pH.

Nil.

1.15 to 1.20 g/cm³.

4.4 to 5.0.

Nil.

Nil.

Nil.

White to off-white smooth paste.

page 5 of 7

SECTION 10. STABILITY AND REACTIVITY

Stability

Stable.

Incompatibility

May react violently in the presence of strong oxidizing agents (e.g., peroxides, permanganates, nitric acid), chlorine trifluoride, manganese trifluoride, and oxygen difluoride.

Hazardous Decomposition Products

Emits carbon dioxide, carbon monoxide, nitrogen oxides and sulfur oxides when heated to decomposition.

Hazardous Polymerization

Will not occur.

SECTION 11. TOXICOLOGICAL INFORMATION

See Section 3. Health Hazards.

SECTION 12. ENVIRONMENTAL INFORMATION

Persistence and Degradability:

Oxfendazole is not expected to bioconcentrate in the aquatic environment or to partition significantly into soils, based on its octanol/water partition coefficient (log Kow = 1.95). Oxfendazole rapidly photodegrades in aqueous solutions. Propylene glycol is degraded by a variety of acclimated and unacclimated soil, water, and sewage microorganisms. Under different conditions, complete degradation usually occurs within 3-20 days.

Aquatic Toxicity:

The 96 hour LC₅₀ for oxfendazole in bluegill sunfish and rainbow trout were >2.7 and >2.5 mg/L, respectively. The 48 hour EC₅₀ for oxfendazole in *Daphnia magna* was 0.52 mg/L (The LC₅₀ is the chemical concentration in water that kills 50% of the test subjects over a specified exposure duration; the EC₅₀ is the chemical concentration that produces a specified adverse effect in 50% of the test subjects over a specified exposure duration.) Propylene glycol is relatively nontoxic to aquatic organisms based on studies using rainbow trout and brine shrimp.

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SECTION 13. WASTE DISPOSAL METHODS

All wastes containing the material should be properly labeled and stored separately from other facility wastes. Dispose of waste materials according to prescribed Federal, state, and local regulations, e.g., appropriately permitted chemical waste incinerator. Rinsewaters resulting from spill cleanups should be discharged in an environmentally safe manner, e.g., to an appropriately permitted wastewater treatment facility.

SECTION 14. TRANSPORTATION INFORMATION

DOT Hazard Class

Not regulated.

UN Number

Not assigned.

SECTION 15. LABELING/REGULATORY INFORMATION

In addition to the identity label, containers of **Benzelmin** Paste should be labeled according to FDA requirements.

The above information is based on data available to us and is believed to be correct. Since the information may be applied under conditions beyond our control and with which we may be unfamiliar, we do not assume any responsibility for the results of its use and all persons receiving it shall make their own determination of the effects, properties, and protections which pertain to their particular conditions.

No representation, warranty, or guarantee, express or implied (including a warranty of fitness or merchantability for a particular purpose), is made with respect to the material, the accuracy of this information, the results to be obtained from the use thereof, or the hazards connected with the use of the material. Caution should be used in the handling and use of the material

<http://74.125.153.132/search?q=cache:KKiZ50q3ySoJ:www.henryschein.com/MSDS/1050546.pdf+Benzelmin+Concentrate+msds&cd=1&hl=en&ct=clnk&gl=au>

Appendix O:

Panacur

Material Safety Data Sheet

Material Safety Data Sheet

Fenbendazole MSDS

Section 1: Chemical Product and Company Identification

Product Name: Fenbendazole

Catalog Codes: SLF1243

CAS#: 43210-67-9

RTECS: DD6520500

TSCA: TSCA 8(b) inventory: No products were found.

CI#: Not available.

Synonym: Panacur, Fenbendazol; Methyl

5-[phenylthio]-2-benzimidazolecarbamate

Chemical Name: 2-Benzimidazolecarbamate

acid,5-(phenylthio)-, methyl ester

Chemical Formula: C15-H13-N3-O2-S

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS # % by Weight

Fenbendazole 43210-67-9 100

Toxicological Data on Ingredients: Fenbendazole: ORAL (LD50): Acute: >10000 mg/kg [Rat]. >10000 mg/kg [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

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Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Not available.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: These products are carbon oxides (CO, CO₂), nitrogen oxides (NO, NO₂...).

Fire Hazards in Presence of Various Substances:

Slightly flammable to flammable in presence of open flames and sparks, of heat.

Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Slightly explosive in presence of heat.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill:

Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill:

Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water

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on the contaminated surface and allow to evacuate through the sanitary system.

Section 7: Handling and Storage**Precautions:**

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. Wear suitable protective clothing. If ingested, seek medical advice immediately and show the container or the label.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection**Engineering Controls:**

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (crystalline powder.)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 29.3 g/mole

Color: Brownish-Grey. (Light.)

pH (1% soln/water): Not applicable.

Boiling Point: Not available.

Melting Point: Not available.

Critical Temperature: Not available.

Specific Gravity: Not available.

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

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Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Insoluble in cold water, hot water.

Freely Soluble in Dimethyl Sulfoxide (DMSO).

Very slightly soluble in usual solvents.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Excess heat

Incompatibility with various substances: Not available.

Corrosivity: Not available.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals: Acute oral toxicity (LD50): >10000 mg/kg [Mouse].

Chronic Effects on Humans: MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: May cause skin irritation.

Eyes: May cause eye irritation.

Inhalation: May cause respiratory tract irritation.

Ingestion: May cause gastrointestinal tract irritation with vomiting.

Chronic Potential Health Effects:

Ingestion: Prolonged or repeated ingestion may affect the blood (changes in serum composition), liver, metabolism (weight loss), and respiration (pneumoconiosis).

The toxicological properties of this substance have not been fully investigated.

Section 12: Ecological Information

Ecotoxicity: Not available.

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BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Not a DOT controlled material (United States).

Identification: Not applicable.

Special Provisions for Transport: Not applicable.

Section 15: Other Regulatory Information

Federal and State Regulations: No products were found.

Other Regulations: EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): Not controlled under WHMIS (Canada).

DSCL (EEC):

R40- Possible risks of irreversible effects.

S2- Keep out of the reach of children.

S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 1

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 1

Flammability: 1

Reactivity: 0

p. 5

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent.

Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:31 PM

Last Updated: 11/06/2008 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

<http://www.sciencelab.com/xMSDS-Fenbendazole-9924023>

Appendix P:

Amitraz

Material Safety Data Sheet

MATERIAL SAFETY DATA SHEET A18146/07/AUS

AMITRAZ EC CATTLE AND PIG SPRAY

SECTION 1 – IDENTIFICATION, CONTACTS, HAZARDOUS NATURE

Bayer Australia Ltd
875 Pacific Highway
Pymble NSW 2073

Emergency Telephone Number

1800 033 111

24 hour Emergency Service Australia Wide, Toll Free

Contact Point (for non-emergency calls)

Animal Health Division

Telephone Number: (02) 9391-6000

Product Name **Amitraz EC Cattle and Pig Spray**

Product Use Dip concentrate for control of ticks on cattle and mange on pigs.

Other Names Amitraz, aromatic hydrocarbons

Creation Date 25th June 2003

Revision Date 11th March 2009

SECTION 2 – HAZARDS IDENTIFICATION

Hazard Classification HAZARDOUS SUBSTANCE

NON-DANGEROUS GOODS

Risk Phrases Harmful if swallowed. May cause lung damage if swallowed.

Safety Phrases Do not breathe vapour. Avoid contact with skin. If swallowed do not induce vomiting; seek medical advice immediately and show this container or label.

RISK & SAFETY PHRASES ARE NOT REQUIRED ON PACKAGES

INTENDED FOR END USERS. APPROPRIATE SAFETY DIRECTIONS AND

FIRST AID STATEMENTS ARE SHOWN ON THE PRODUCT LABEL.

SECTION 3 – COMPOSITION

Ingredients CAS No Proportion

Amitraz* 33089-61-1 12.5%

Solvent naphtha (petroleum), heavy aromatic 64742-94-5 >60%

Other ingredients determined not to be hazardous - 10 - <30%

*Amitraz is an amidine; N,N-bis(2,4-dimethylphenyliminomethyl)methylamine

A18146/07/AUS Amitraz EC Cattle and Pig Spray Page 2 of 7

SECTION 4 – FIRST AID MEASURES

Label Regulated First

Aid Statement

If poisoning occurs, contact a doctor or Poisons Information Centre.

Phone Australia 131126. If swallowed, do NOT induce vomiting.

Give a glass of water.

General Remove victim from contaminated area. If there is a risk of unconsciousness, position and transport in a stable lateral position.

Remove soiled or soaked clothing immediately.

Scheduled Poisons Poisons Information Centres in each State capital city can provide additional assistance for scheduled poisons. Phone 131126.

Inhalation Inhalation of this product is a risk. In this event remove from exposure and perform artificial respiration if necessary.

Skin contact Remove contaminated clothing. Wash affected area immediately with soap and water. Seek medical attention if required.

Eye contact Flush eye immediately with large amounts of water or normal saline, occasionally lifting eyelids, until no evidence of chemical remains. Seek medical attention if eye irritation persists.

Ingestion If vomiting occurs keep head lower than hips to help prevent aspiration. Seek medical attention if required.

Advice to doctor See also Chapter 11. Onset of clinical signs is within 4-6 hours.

There is no specific antidote for amitraz. Apply standard decontamination procedures and symptomatic treatment considering possible solvent effects as described below.

SECTION 5 – FIRE FIGHTING MEASURES

Extinguishing Media Sprayed water jet, foam, dry powder, CO2, sand

Fire and Explosion

Hazards

Combustible product. Product has a flash point of >95°C.

Hazardous Combustion

Products

Thermal decomposition products include hydrogen cyanide, carbon monoxide, and nitrogen oxides.

Fire Fighting Fight fire in the early stages if safe to do so. Wear respiratory protection.

In well ventilated areas wear full face mask with a combination filter. (Offers no protection from carbon monoxide)

In enclosed premises: respirator with independent air supply.

Contain firefighting water.

A18146/07/AUS Amitraz EC Cattle and Pig Spray Page 3 of 7

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Accidental Release Use any personal protective equipment listed in Chapter 8.

Prevent spillage from spreading or entering soil, waterways and drains.

Take up with absorbent material such as sawdust, peat or chemical binder. Fill material along with any contaminated soil etc., into sealable containers. Clean affected area with an aqueous detergent and a small amount of water. Absorb this with hydrated lime and place in a sealable container. Spread hydrated lime over the affected area. On completion of clean-up remove and wash all protective clothing and equipment with detergent and water. Place cleaning materials into the same container.

Do not eat, drink or smoke during clean-up operation.

SECTION 7 – HANDLING AND STORAGE

Safe Handling Pour the product using a funnel or other equipment to avoid splashing and glugging. Suitable container materials: HDPE, LDPE.

Storage Keep out of reach of children.

Store away from food, drink or animal feeding stuffs.

To maintain product quality, store below 30°C.

Keep away from heat or moisture.

This material is a Schedule 6 poison and must be stored, handled and used in accordance with the relevant regulations.

SECTION 8 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits No exposure standards allocated for amitraz or other ingredients of this product.

Ventilation Ensure adequate ventilation during use to prevent build-up of fumes. Do not inhale spray mist.

Eye Protection May irritate the eyes. Avoid contact with eyes and skin. Do NOT inhale spray mist. If product in eyes, wash out immediately with water. Wear a face shield while handling the concentrate..

Skin Protection May irritate the skin. When preparing dip or spray, using prepared dip or spray, wear cotton overalls buttoned to the neck and wrist, washable hat, elbow-length PVC gloves, and face shield. If product on skin, immediately wash area with soap and water.

Wash hands before breaks and at end of work.

Respirator No respirator is required under normal conditions of use.

Protective Material

Types

PVC, rubber

General Advice After use and before eating, drinking or smoking, wash hands, arms and face thoroughly with soap and water. After each day's use, wash gloves, face shield and contaminated clothing. Product is poisonous if swallowed.

A18146/07/AUS Amitraz EC Cattle and Pig Spray Page 4 of 7

SECTION 9 – PHYSICAL & CHEMICAL PROPERTIES

Physical State Clear liquid

Colour Yellow to yellow-brown

Odour Slight characteristic smell

Boiling Point Boiling range 215-300°C

Solidifying point Not available

Density approx 1.00-1.02 kg/L at 20°C

Vapour Pressure 0.005 hPa at 20°C (amitraz)

Viscosity Not available

Solubility in Water Emulsifiable

pH Not available

Flash Point >95°C

Ignition Temperature Not available

Explosive Limits Not available

Other Information Product is packed in 1 and 10 litre containers

SECTION 10 – STABILITY & REACTIVITY

Chemical Stability Product is chemically stable.

Conditions to Avoid Avoid oxidising agents.

Incompatible Materials None

Hazardous

Decomposition

Thermal decomposition products include hydrogen cyanide, carbon monoxide, and nitrogen oxides.

Hazardous Reactions None

SECTION 11 – TOXICOLOGICAL INFORMATION

Acute Toxicity Oral LD50 (rat) 1000-2000 mg/kg (of amitraz)

Dermal LD50 (rat) >2000 mg/kg (of amitraz)

Inhalation LC50 (rat) 65 mg/L (6h)(dust)(amitraz)

Local Effects Eye: may irritate the eye

Skin: may irritate the skin

Reproductive Effects None of the ingredients of the formulation have been shown to produce reproductive or teratogenic effects.

Mutagenicity None of the ingredients of the formulation have been shown to produce mutagenic effects.

Carcinogenic Effects Amitraz has been shown in animal tests to have no carcinogenic potential. Other ingredients are not classified as carcinogens

A18146/07/AUS Amitraz EC Cattle and Pig Spray Page 5 of 7

Health Hazard

Information

Amitraz: The ingestion of large quantities may cause hypotension, sedation, slowing of the heart beat and hypothermia. Effects are transient and reversible within 24-48 hours. Absorbed by skin.

May cause irritation to skin or transient skin flushing. Amitraz has a skin sensitizing potential.

May cause irritation by eye contact.

Inhalation of large amounts of spray mist may produce lethargy.

Solvent naphtha, heavy aromatic: Inhalation of high concentrations leads to mucous membrane irritation and anaesthesia. Frequent or persistent skin contact can lead to irritation and contact dermatitis. Aspiration of even small amounts is associated with the danger of severe lung damage with a possibly fatal outcome (chemical pneumonia).

SECTION 12 – ECOLOGICAL INFORMATION

Octanol/Water Partition

Co-efficient

log P = 5.5 at pH 5.8 and 25°C

Ecotoxicity **Fish toxicity**

amitraz

LC50 0.74 mg/L (96h) Rainbow trout (*Salmo gairdneri*)

LC50 0.45 mg/L (96h) Bluegill (*Lepomis macrochirus*).

Daphnia toxicity

amitraz

LC50 0.035 mg/L (48h) Water flea (*Daphnia magna*)

Toxic to fish and horses. Do not contaminate ponds, waterways or drains with product or used containers.

SECTION 13 – DISPOSAL INFORMATION

After Intended Use Disposal of unwanted spraywash should be into a pit of adequate size on level ground and away from watercourses, drains, dams, and tree roots.

Triple or (preferably) pressure rinse empty containers, adding rinsate to spray wash. Do not dispose of undiluted chemicals on site. If not available bury containers below 500mm in a disposal pit specifically marked and set up for this purpose clear of waterways, vegetation and roots. Empty containers and product should not be burnt.

After spill or accident Dispose of sealed containers at an approved local waste disposal site.

A18146/07/AUS Amitraz EC Cattle and Pig Spray Page 6 of 7

SECTION 14 – TRANSPORT INFORMATION

UN No Not classified

UN Proper Shipping

Name

Not classified

Class & Subsidiary

Risk

Not classified

Packaging Group Not classified

Hazchem Code Not classified

SECTION 15 – REGULATORY INFORMATION

Poisons Schedule Schedule 6

APVMA Registration The product is registered by the APVMA.

Registration Number 48200

Labelling All necessary directions, precautions and warnings for normal use of the product are included on the product label.

SECTION 16 – OTHER INFORMATION

Summary of Changes

from Last Edition

Routine Review and Update

Acronyms **ADG** Code Australian Code for the Transport of Dangerous

Goods by Road and Rail

APVMA Australian Pesticides and Veterinary Medicines

Authority

CAS Chemical Abstracts Service Registry Number

HDPE High density polyethylene

LDPE Low density polyethylene

NOHSC National Occupational Health & Safety Commission

SUSDP Standard for the Uniform Scheduling of Drugs and Poisons

UN Number United Nations number

A18146/07/AUS Amitraz EC Cattle and Pig Spray Page 7 of 7

Disclaimer This Material Safety Data Sheet has been developed according to the NOHSC National Code of Practice for the Preparation of MSDS [NOHSC:2011(2003)].

The data, information and recommendations herein ("information") are represented in good faith and believed to be correct as of the date hereof.

The purpose of this Material Safety Data Sheet is to describe product in terms of their safety requirements.

Bayer Australia Limited make no representation of merchantability, fitness for a particular purpose or application, or of any other nature with respect to the information or the product to which the information refers ("the product").

The information is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use of the product.

The physical data shown herein are typical values based on material tested. These values should not be construed as a guaranteed analysis of any specific lot or as guaranteed specification for the product or specific lots thereof.

Due care should be taken to make sure that the use or disposal of this product and / or its packaging is in compliance with relevant Federal, State and Local Government regulations.

<http://www.bayeranimal.com.au/PDFViewer/DocumentDisplayPage.aspx?CurrentDocumentID=qunm0PYKXUfkNSp0Q6mwgg%3d%3d#>

Appendix Q:

Quintiphos

Material Safety Data Sheet

1. Chemical product and company identification

1.1 Product name QUANTOPHOS H

1.2 Manufacturer/supplier identification BWT - AG

Walter Simmer Str. 4

A-5310 Mondsee/Austria

Telefon: +43-6232-5011-0

Telefax: +43-6232-5011-1229

1.2.1 Contact for information Dipl. Ing. L. Nagl - _ +43-6232-5011-1505

1.2.2 Emergency telephone No.: Poison information center _ +43-1-406 43 43

1.3 Date of issue/revision 12.12.2002

2. Composition/Information on ingredients

2.1 Chemical characterisation (substance)

2.2 Chemical characterisation (preparation)

2.2.1 Description Preparation of foodgrade phosphates for drinking water treatment

2.2.2 Hazardous ingredients CAS-No.: % mass R-phrases Symbol

None - - - -

2.2.3 Identification numbers EINECS No.: EEC number:

3. Possible Hazards

3.1 Hazards identification No hazardous product as specified in

Directive 67/548/EEC

3.2 Special hazards information for man and environment -

4. First aid measures

4.1 General recommendations -

4.2 After inhalation Fresh air. Consult doctor if feeling unwell

4.3 After skin contact Wash off with plenty of water

Remove contaminated clothing

4.4 After eye contact Wash off with plenty of water

4.5 After ingestion Make victim drinking plenty of water

Induce vomiting

Summon doctor if feeling unwell

4.6 Advice to doctor

4.6.1 Effects

5. Fire fighting measures

5.1 Suitable extinguishing media To suit environment

5.2 Improper extinguishing media No restriction

5.3 Specific hazards None

Non-combustible

5.4 Special protective equipment -

6. Accidental release measures

6.1 Person-related precautionary measures -

6.2 Environmental precautions Do not discharge into the environment (sewers, rivers, soils ...)

6.3 Methods for cleaning up/taking up Take up dry

Forward for disposal

Clean up affected area

QUANTOPHOS H - page 1/4 – printed: 14.04.04/revised: 12.12.02 - LN

http://www.bwt.de/NR/rdonlyres/A6A845A2-E9FA-4E55-865D-859B65AD8C9D/0/QuantophosH_english_080811.pdf

Appendix R:

Deltamethrin

Material Safety Data Sheet

Material Safety Data Sheet - LC Laboratories Cat. No. D-6153 - page 1

Revision Date: June 6, 2008

1. IDENTIFICATION OF SUBSTANCE:

Trade name: Deltamethrin

Product Number: D-6153

Manufacturer/Supplier:

LC Laboratories

165 New Boston Street

Woburn, MA 01801 USA

+1-781-937-0777 Fax: +1-781-938-5420

2. COMPOSITION/DATA ON COMPONENTS:

Chemical Name: (S)- α -Cyano-3-phenoxybenzyl (1*R*)-cis-3-(2,2-dibromo-vinyl)-2,2-dimethylcyclopropanecarboxylate
Synonyms:
Hazardous Ingredient: Deltamethrin
CAS Registry Number: 52918-63-5
Molecular Weight: 505.20
Molecular Formula: C₂₂H₁₉Br₂NO₃

3. HAZARDS IDENTIFICATION:

Hazard Description: Highly Toxic (USA) Toxic (EU)
Dangerous for the environment
Harmful in contact with skin; readily absorbed through skin system
Toxic by inhalation
Very toxic if swallowed
May cause sensitization by inhalation and skin contact
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
Target organ(s): central nervous system, cardiovascular system
Information pertaining to particular dangers for man and environment:
HMIS Ratings: Health =1 Flammability =0 Reactivity =0

4. FIRST AID MEASURES:

After Inhalation: If inhaled, remove to fresh air; if breathing is difficult, give oxygen; if breathing stops, give artificial respiration
After skin contact: flush with copious amounts of water; remove contaminated clothing and shoes; call a physician
After eye contact: flush with copious amounts of water; assure adequate flushing by separating the eyelids with fingers; call a physician
After swallowing: if swallowed, wash out mouth with copious amounts of water; call a physician

5. FIRE FIGHTING MEASURES:

Suitable extinguishing agents: water spray, carbon dioxide, dry chemical powder or foam
Protective equipment: wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Unusual fire hazard: may emit toxic fumes under fire conditions

6. ACCIDENTAL RELEASE MEASURES:

Person-related safety precautions: cordon off area of spill; wear self-contained breathing apparatus, protective clothing and heavy rubber gloves
Measures for cleaning/collecting: absorb solutions with finely-powdered liquid-binding material (diatomite, universal binders); decontaminate surfaces and equipment by scrubbing with alcohol; dispose of contaminated material according to Section 13

7. HANDLING AND STORAGE:

Information for safe handling: avoid contact with skin, eyes and clothing; material may be an irritant
Storage: store solid and solutions at -20 °C

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION:

Personal protective equipment as follows:
Breathing equipment: NIOSH/MSHA-approved respirator
Protection of hands: chemical-resistant rubber gloves
Eye protection: chemical safety goggles

9. PHYSICAL AND CHEMICAL PROPERTIES:

Form:
Color:
Odor: none
Melting point/Melting range:
Danger of explosion: none
Solubility in / Miscibility with water: not soluble
Solvent content: none
Organic solvents: soluble in DMSO, ethanol, or acetone

10. STABILITY AND REACTIVITY:

Stability: avoid acids and bases
Thermal decomposition / conditions to be avoided: protect from light and heat
Dangerous products of decomposition: thermal decomposition may produce toxic gases such as carbon monoxide and carbon dioxide

11. TOXICOLOGICAL INFORMATION:

RTECS #: GZ1233000
Acute toxicity: none known
Primary irritant effect:
On the skin: none known
On the eye: not known; may be an irritant

12. ECOLOGICAL INFORMATION:

General notes: no data available

13. DISPOSAL CONSIDERATION:

Dispose of in accordance with prevailing country, federal, state and local regulations

14. TRANSPORT INFORMATION:

DOT:
Proper shipping name: none
Non-Hazardous for transport: this substance is considered to be non-hazardous for transport
IATA class:
Proper shipping name: none
Non-Hazardous for transport: this substance is considered to be non-hazardous for transport

15. REGULATIONS:

Code letter and hazard designation of product:
Hazard-determining components of labeling:
EU Risk And Safety phrases:
S26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S28: After contact with skin, wash immediately with plenty of water
S29: Do not empty into drains
S36/37/39: Wear suitable protective clothing, gloves, and eye/face protection
S45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
S53: Avoid exposure - obtain special instructions before use
R21: Harmful in contact with skin
R23: Toxic by inhalation
R27/28: Very toxic in contact with skin and if swallowed

16. OTHER INFORMATION:

The above information is believed to be correct based on our present knowledge but does not purport to be complete. For research use only by trained personnel. The burden of safe use of this material rests entirely with the user. LC Laboratories disclaims all liability for any damage resulting from use of this material.

<http://www.lclabs.com/printableMSDS/D-6153MSDSSprintable.html>

Appendix S:**Diazinon*****Material Safety Data Sheet*****MATERIAL SAFETY DATA SHEET**

Accensi Pty Ltd Date Issued: 06/01/98
Narangba Qld, 4504 Date Reviewed: 09/99, 08/01, 02/03,
05/06
Ph: (07) 3897 2000 Fax: (07) 3897 2022
www.accensi.com.au Product Code: Diaru8020

1. PRODUCT AND COMPANY IDENTIFICATION:

PRODUCT: DIAZINON 800

USE: Insecticide for the control of various insect pests in agriculture.

COMPANY IDENTIFICATION:

Accensi Pty Ltd

Lot 96 Potassium Street

Narangba, Queensland 4504

2. COMPOSITION / INFORMATION ON

INGREDIENTS:

Ingredients CAS Reg. No. Conc.

Diazinon Tech 333-41-5 800g/L

Surfactants - Low

Aromatic Hydrocarbons 64742-95-5 Low

Proportion (% weight per weight): VHIGH >60, HIGH 30-60, MED 10-29, LOW 1-9, VLOW <1

3. HAZARDOUS IDENTIFICATIONS:

• **Hazardous according to criteria of Worksafe**

Australia

POTENTIAL HEALTH EFFECTS: This section includes possible adverse effects, which could occur if this material is not handled in the recommended manner.

These are typical **POISONING SYMPTOMS** organophosphate pesticides – nausea, diarrhoea, dripping nose and mouth, excessive salivation, stomach cramps, excessive sweating, trembling, loss of muscle coordination, muscle twitches, weakness, mental confusion, blurred vision, breathing difficulties, rapid pulse pin-point pupils.

(Cholinesterase inhibition)

EYE: Mild irritant

SKIN: The active ingredient, diazinon, can be rapidly absorbed through the skin thus causing cholinesterase inhibition. Mild irritant.

INGESTION: Moderate Toxicity

INHALATION: Slight Toxicity

SYSTEMIC (other target organ): Repeated minor exposure of diazinon tech may cause a cumulative poisoning effect due to cholinesterase inhibition. Cholinesterase levels will return to normal a few weeks after exposure is stopped.

The hydrocarbon liquid may cause narcosis and central nervous system depression following prolonged over-exposure.

CANCER INFORMATION: Diazinon is not considered carcinogenic

TERATOLOGY (Birth defects): No evidence of in laboratory mammals.

REPRODUCTIVE EFFECTS: No evidence of in laboratory mammals.

MUTAGENICITY: The mutagenicity in humans remains unevaluated.

4. FIRST AID:

If poisoning occurs, immediately contact a doctor or Poisons Information Centre (telephone 13 11 26), and follow the advice given. Show this Material Safety Data Sheet to a doctor.

EYE: Rinse immediately with plenty of water for at least 15 minutes, holding eye open and taking care to rinse under eyelids as well. If irritation persist seek medical attention.

SKIN: Wash off skin immediately with soap and plenty of water. Remove all contaminated clothing and shoes. If poisoning occurs seek immediate medical

attention and if more than 15 minutes from medical attention, give one Atropine tablet (0.5mg) every 5 minutes until dryness of mouth occurs.

INGESTION: Wash out mouth with water. Do not induce vomiting. Keep patient at rest and seek medical advice.

INHALATION: Move affected person to fresh air and keep until recovered. If poisoning occurs seek immediate medical attention and if more than 15 minutes from emergency medical attention, give one Atropine tablet (0.5mg) every 5 minutes until dryness of mouth occurs.

NOTE TO PHYSICIAN: Treat as cholinesterase inhibitors. Atropine sulphate is antidote.

Always seek medical attention when atropine has been given. (Even if symptoms have subsided)

MATERIAL SAFETY DATA SHEET

Accensi Pty Ltd Date Issued: 06/01/98

Narangba Qld, 4504 Date Reviewed: 09/99, 08/01, 02/03, 05/06

Ph: (07) 3897 2000 Fax: (07) 3897 2022

www.accensi.com.au Product Code: Diaru8020

Page 2 of 4

5. FIRE FIGHTING MEASURES:

FLASHPOINT: > 620C (solvent)

FLAMMABLE LIMITS: Not Applicable

EXTINGUISHING MEDIA: Use fine water spray or foam.

FIRE AND EXPLOSION HAZARDS: This product is non-flammable and non-explosive.

FIRE-FIGHTING EQUIPMENT: Wear suitable breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES:

ACTION TO TAKE FOR SPILLS:

In case of spills it is important to take all steps necessary to:

- Avoid eye and skin contact.
- Avoid contamination of waterways.
- 1. Keep all bystanders away.
- 2. Wear full-length clothing and PVC gloves.
- 3. Reposition any leaking containers so as to minimise further leakage.
- 4. Dam and absorb spill with an absorbent material (e.g. sand or soil).
- 5. Shovel the absorbed spill into drums and top with hydrated lime.
- 6. Disposal of the absorbent material will depend on the extent of the spill.
 - For quantities up to 50L of product bury in a secure land fill site.
 - For quantities greater than 50L seek advice from the manufacturer before attempting disposal. Contain in a secure location until disposal method is established.
- 7. Decontaminate spill area with hydrate lime scattered over the spill prior to rinsing off with water.

7. HANDLING AND STORAGE:

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Store in a cool dry place away from direct sunlight. Store away from food and food stuffs for animal or human consumption. Store in its original container well sealed. Store as combustible C1

8. EXPOSURE CONTROL / PERSONAL PROTECTION:

EXPOSURE GUIDELINES:

Exposure values at the TWA (Time Weighted Average) means the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. There is a blanket recommendation of 10mg/m³ for inspirable dusts or mists when limits have not otherwise been established.

ACGIH TLV: 0.1mg/Cu metre

STEL 0.3mg/Cu metre

ENGINEERING CONTROLS:

In industrial situations, concentration values below the TWA value should be maintained. Values may be reduced by process modification, use of local exhaust ventilation, capturing substances at the source, or other methods. If you believe air borne concentrations of mists, dusts or vapours are high, you are advised to modify the process or environment to reduce the problem.

RECOMMENDATIONS FOR MANUFACTURING, COMMERCIAL BLENDING, AND PACKAGING

WORKERS: Avoid skin and eye contact and inhalation of vapour. Wear overalls, chemical goggles and impervious gloves. Use adequate ventilation. Eye washing and shower facilities available.

EYE / FACE PROTECTION: Eye protection should be worn when splashing is possible. Wear splash proof goggles or a full-face shield. Consult AS 1336 and 1337.

SKIN PROTECTION: Wear chemical resistant PVC or nitrile gloves. For help in selecting suitable gloves consult AS 2161. Wear cotton overalls buttoned to the neck and wrist. Wear a washable hat. For help in selecting suitable clothing consult AS 2919. For help in selecting boots consult AS/NZS 2210.

RESPIRATORY PROTECTION: Do not breathe vapour/spray/fumes. Use an organic-chemical cartridge respirator when working in poorly ventilated areas or where there is potential for spray mist, splashing or vapours. Consult AS 1715

APPLICATIONS AND ALL OTHER HANDLERS:

After handling this product always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storing or re-using.

MATERIAL SAFETY DATA SHEET

Accensi Pty Ltd Date Issued: 06/01/98

Narangba Qld, 4504 Date Reviewed: 09/99, 08/01, 02/03, 05/06

Ph: (07) 3897 2000 Fax: (07) 3897 2022

www.accensi.com.au Product Code: Diaru8020

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9. PHYSICAL AND CHEMICAL PROPERTIES:

APPEARANCE: Clear light amber coloured liquid.

ODOUR: Strong to objectionable

SOLUBILITY IN WATER: Emulsifies with water

SPECIFIC GRAVITY: 1.12

BOILING POINT: >1120C

CORROSIVENESS: Non-Corrosive

10. STABILITY AND REACTIVITY

STABILITY: This product is unlikely to spontaneously decompose

INCOMPATIBILITY: Avoid oxidising agents, strong acids and alkalis.

HAZARDOUS DECOMPOSITION PRODUCTS:

Diazinon decomposes above 1200C. During a fire this

product may release smoke and hazardous decomposition products.

HAZARDOUS POLYMERIZATION: This product is unlikely to spontaneously polymerise.

11. TOXICOLOGICAL INFORMATION:

Diazinon is classified as slightly toxic to moderately toxic.

12. ECOLOGICAL INFORMATION:

ENVIRONMENTAL DATA: Do not allow any part of this product to enter waterways.

ECOTOXICOLOGY: Diazinon technical is moderately toxic to fish LC50 (96h) Rainbow Trout = 2.6 – 3.2 mg/L and highly toxic to birds and bees.

13. DISPOSAL CONSIDERATIONS:

DISPOSAL METHOD: Dispose of empty, used containers by;

- (a) Triple rinsing with water. Add the rinsings to the tank mix or dispose of rinsate in a disposal pit away from desirable plants and roots, and watercourses. On-site disposal of undiluted product is unacceptable.
- (b) Breaking, crushing or puncturing the containers to prevent reuse.
- (c) Disposing of in a local authority, bury landfill site that does not burn its refuse. If there is no local authority landfill readily available in your area, bury the containers under at least 50cm of soil at a licensed/approved disposal site. DO NOT burn empty containers or product.

14. TRANSPORT INFORMATION:

ROAD AND RAIL TRANSPORT:

SHIPPING NAME: Pesticide organophosphorus, liquid, flammable, toxic.

DANGEROUS GOODS: 6.1

Sub-risk: Not Applicable

P.G: III

HAZCHEM: 2WE

UN No: 3018

MARINE TRANSPORT:

SHIPPING NAME: Pesticide organophosphorus, liquid, flammable, toxic.

DANGEROUS GOODS: 6.1

Sub-risk: Not Applicable

P.G: III

HAZCHEM: 2WE

UN No: 3018

AIR TRANSPORT:

SHIPPING NAME: Pesticide organophosphorus, liquid, flammable, toxic.

DANGEROUS GOODS: 6.1

Sub-risk: Not Applicable

P.G: III

HAZCHEM: 2WE

UN No: 3018

15. REGULATORY INFORMATION:

WHO HAZARD CLASS: II

POISON SCHEDULE: 6

FLAMMABILITY: Non-flammable.

Is a Combustible C1

RISK PHRASES:

- Toxic in contact with skin.
- Toxic if swallowed

SAFETY PHRASES:

- After contact with skin wash immediately with soap and water.
- Wear suitable protective clothing and gloves.

- If you feel unwell, contact doctor or Poisons Information immediately (show label if possible)

MATERIAL SAFETY DATA SHEET

Accensi Pty Ltd Date Issued: 06/01/98

Narangba Qld, 4504 Date Reviewed: 09/99, 08/01, 02/03, 05/06

Ph: (07) 3897 2000 Fax: (07) 3897 2022

www.accensi.com.au Product Code: Diaru8020

Page 4 of 4

16. OTHER INFORMATION:

All information in this data sheet is provided in good faith and is believed to be correct. Each user should consider the information in this safety data sheet within the context of their particular application as Accensi Pty Ltd cannot anticipate or control conditions under which this product may be used. Accensi Pty Ltd will not be responsible for any damages arising out of the use or reliance upon the information in this safety data sheet. No expressed or implied warranties are given other than those implied mandatory by Commonwealth, State or Territory legislation. Please read all labels carefully before use.

Contact: Emergency Services

Ph: 000

Accensi Pty

Ltd

Ph: (07)3897 2000

Fax: (07) 3897 2022

Issued: 06-01-98

Reviewed: 02-09-99

02-08-01

28-05-02

11-02-03

12-05-06

http://www.garrards.com.au/zone_files/msds/country_diazinon_800.pdf

Appendix T:

Gamma BHC

Material Safety Data Sheet

Material Safety Data Sheet

1,2,3,4,5,6-Hexachlorocyclohexane,gamma- Isomer MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,2,3,4,5,6-Hexachlorocyclohexane,gamma-Isomer

Catalog Codes: SLH1075

CAS#: 58-89-9

RTECS: GV4900000

TSCA: TSCA 8(b) inventory:

1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer

CI#: Not available.

Synonym: gamma-Benzene Hexachloride; Aalindan;

Hexicide; Viton; Lindane; gamma-BHC

Chemical Name: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma-Isomer

Chemical Formula: Not available.

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: Sciencelab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name CAS # % by

Weight

{1,2,3,4,5,6}-Hexachlorocyclohexane, gamma- 58-89-9 100

Toxicological Data on Ingredients: Isomer 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer: ORAL (LD50): Acute: 76 mg/kg [Rat]. 44 mg/kg [Mouse]. DERMAL (LD50): Acute: 50 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation (lung irritant).

Hazardous in case of skin contact (permeator). Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified + (Proven.) by OSHA. Classified A3 (Proven for animal.) by ACGIH.

Classified SUSPECTED by NTP.

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MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Classified Development toxin [SUSPECTED].

The substance may be toxic to blood, kidneys, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: Not available.

Flash Points: CLOSED CUP: Higher than 93.3°C (200°F).

Flammable Limits: Not available.

Products of Combustion: Corrosive and toxic fumes (toxic fumes of halides, hydrogen chloride, and phosgene)

Fire Hazards in Presence of Various Substances: Slightly flammable to flammable in presence of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Slightly explosive in presence of heat.

Fire Fighting Media and Instructions:

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SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards:

May decompose on heating to produce corrosive and/or toxic fumes.

Very toxic fumes of chlorides, hydrogen chloride, and phosgene are released when lindane is heated to

decomposition.

Special Remarks on Explosion Hazards: Containers may explode when heated.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Poisonous solid.

Stop leak if without risk. Do not get water inside container. Do not touch spilled material. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe dust. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:

Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent.

Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.5 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation

TWA: 0.5 STEL: 1.5 (mg/m3) [Canada] Inhalation

TWA: 0.5 (mg/m3) from NIOSH SKIN

TWA: 0.5 (mg/m3) from NIOSH Inhalation

TWA: 0.1 (mg/m3) [United Kingdom (UK)] Inhalation3

Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

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Physical state and appearance: Solid. (Powdered solid.)

Odor:

Odorless to slight musty odor. Pure Lindane is odorless

Taste: Not available.

Molecular Weight: 290.83 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: 323.4°C (614.1°F)

Melting Point: 113°C (235.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.85 (Water = 1)

Vapor Pressure: 0.0000094 mm Hg @ 20 C.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: 1 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.6

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, acetone.

Solubility:

Soluble in acetone.

Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, excess heat.

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Corrosive in presence of aluminum.

Special Remarks on Reactivity:

It decomposes in the presence of alkalis at ambient temperature, forming trichlorobenzenes.

It is decomposed by powdered iron, aluminum, and zinc

Lidane is incompatible with lime, sulfur, calcium arsenate, and other strong alkaline materials.

Special Remarks on Corrosivity: Lindane is corrosive to aluminum and other metals.

Polymerization: Will not occur.

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Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

Acute oral toxicity (LD50): 44 mg/kg [Mouse].

Acute dermal toxicity (LD50): 50 mg/kg [Rabbit].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified + (Proven.) by OSHA. Classified A3 (Proven for animal.) by ACGIH.

Classified SUSPECTED by NTP.

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells.

DEVELOPMENTAL TOXICITY: Classified Development toxin [SUSPECTED].

May cause damage to the following organs: blood, kidneys, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (irritant), of ingestion, of inhalation (lung irritant).

Hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

Can cause adverse reproductive effects and birth defects.

May cause cancer based on animal data.

May affect genetic material based on animal data.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: May cause skin irritation; can be absorbed through skin. May be fatal if absorb pure product through skin.

May affect behavior and cardiovascular system

Inhalation: May cause respiratory tract irritation, cyanosis, and breathing difficulty.

Eyes: Can cause eye irritation. It may be absorbed through the eyes.

Ingestion: Harmful (toxic) if swallowed. Can affect the gastrointestinal system (nausea, vomiting, malaise), behavior (headaches, excitability, unconsciousness, tremor, dizziness, loss of coordination, clonic/tonic seizures, muscle spasm, sleeplessness, CNS depression), and the respiratory system (cyanosis breathing difficulty). May affect metabolism.

Chronic Potential Health Effects:

May affect blood, liver, kidneys, metabolism

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 0.1 ppm 96 hours [Fathead minnow]. 0.1 ppm 96 hours [Bluegill]. 0.1 ppm 96 hours [rainbow trout]. 0.1 ppm any hours [lake trout]. 0.1 ppm any hours [goldfish].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: Not available.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

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Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Toxic Solid, Organic, n.o.s. (Lindane) UNNA: 2810 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute:

1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer

California prop. 65 (no significant risk level): 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer: 6 mg/day (value)

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer

New York release reporting list: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
Rhode Island RTK hazardous substances: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
Pennsylvania RTK: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
Florida: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
Minnesota: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
Massachusetts RTK: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
New Jersey: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
Tennessee: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
California Director's List of Hazardous Substances (8 CCR 339): 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
TSCA 8(b) inventory: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
SARA 302/304/311/312 extremely hazardous substances: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
SARA 313 toxic chemical notification and release reporting: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer
CERCLA: Hazardous substances.: 1,2,3,4,5,6-Hexachlorocyclohexane, gamma- Isomer: 1 lbs. (0.4536 kg)
Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.
Other Classifications:
WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
DSCL (EEC):
R25- Toxic if swallowed.
R27- Very toxic in contact with skin.
R37/38- Irritating to respiratory system and skin.
R41- Risk of serious damage to eyes.
R45- May cause cancer.
R61- May cause harm to the unborn child.
S1/2- Keep locked up and out of the reach of children.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S28- After contact with skin, wash immediately with plenty of [***]
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S36/37- Wear suitable protective clothing and gloves.
S39- Wear eye/face protection.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S46- If swallowed, seek medical advice immediately and show this container or label.
S53- Avoid exposure - obtain special instructions before use.
HMIS (U.S.A.):
Health Hazard: 3
Fire Hazard: 1
Reactivity: 0
Personal Protection: E
National Fire Protection Association (U.S.A.):
Health: 3
Flammability: 1
Reactivity: 0
Specific hazard:
Protective Equipment:
Gloves.
Lab coat.
Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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Last Updated: 11/06/2008 12:00 PM

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http://www.sciencelab.com/xMSDS-1_2_3_4_5_6_Hexachlorocyclohexane_gamma_Isomer-9924243