

## THE SOLID FOODS REQUIRED BY MACROPODS FOR OPTIMAL HEALTH

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### WHY DIETARY ASPECTS ARE SO IMPORTANT TO GUT FLORA IN MACROPOD NUTRITION.

The most important aspect to macropod digestion is the symbiotic relationship between the animal and the microorganisms that inhabit its digestive tract.

Greater gut capacities and lower mass-specific energy requirements allow larger herbivores to adapt to less digestible diets, by increasing digesta retention and fermentation time in a fore-stomach. Prolonged retention of plant particles in the fore-stomach increases the extent of fibre fermentation, and favours the destruction of some plant toxins. Foregut-fermenting herbivores (such as macropods), also have the advantage of utilizing both their midgut and hindgut for recovery of the large secretions of fluid and electrolytes required for microbial fermentation.

Although there are anatomical differences between the macropod digestive system and that of ruminants, they are similar in respect to their ability to adapt to conditions where forage, water, or both are sparse. Many of the gastrointestinal diseases of herbivores can be attributed to inappropriate diets and/or feeding schedules. The digestive tract of most herbivores is constructed for almost continuous feeding on a diet **high in plant fibre and relatively low in protein, starches, and sugars.**

Therefore, major problems can arise from intermittent feeding or diets that contain low levels of fibre and high levels of rapidly fermentable starch or sugar.

*Ref: Contributions of Microbes in Vertebrate Gastrointestinal Tract to Production and Conservation of Nutrients C. EDWARD STEVENS and IAN D. HUME*

Carers need to attain as close a diet as possible to the natural diet of macropods in the wild. Specific foods are instrumental in the correct function of all animals' digestive tracts, as a means of avoiding nutritional problems, disease, and in readiness for their eventual release.

The most important factor when feeding rehabilitating macropods, is to provide the natural foods that the animals will come across when released into a particular environment. 'Junk foods' or foods containing sucrose or over processed carbohydrates such as bread, grains or pellets are not only totally foreign to the digestive system of macropods, but are foods which macropods are intolerant to.

All animals (wild or domestic) will eat whatever they are offered, so it is up to us to ensure they do not get these foods.

There are two major conditions that can be caused by the inappropriate feeding of carbohydrates and starches;

1. **Lumpy jaw** of the upper or lower mandible; and
2. an overburden of **clostridia *difficile*.**

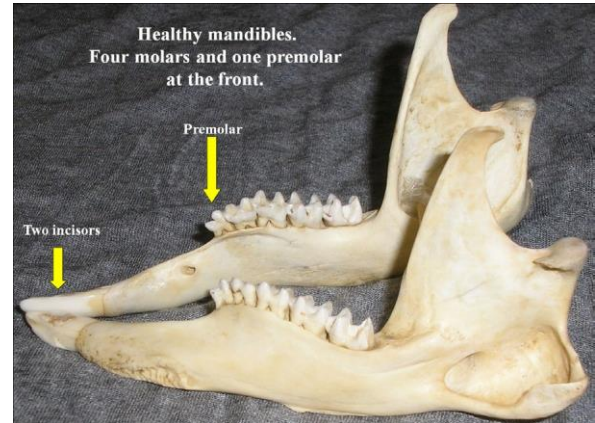
These are the two conditions I will be discussing today.

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### MACROPOD MASTICATION (chewing)

The interesting aspect to macropod mastication (chewing) is that like many herbivores, they chew *across* the molars when eating fibrous plant material, whereas when they eat high processed carbohydrates or starches, such as pelleted foods, the mastication process changes to a *vertical* action. (Lynda Staker 2008). If macropods are only being fed this type of diet, the eventual outcome is the ceasing of molar progression, which is what keeps jaw bones healthy. (Dr. Meytal Bakal-Weiss-et al -Gan-Garoo Australian Park-Israel 2010).



Once molar progression ceases, the receded gums provide the perfect environment for Necrobacillosis (lumpy jaw) to occur, where anaerobic bacteria enters into the bone. Even commonly isolated organisms that live normally in the mouths of macropods, may enter into the receding gums, causing infection. Once infection sets up in the receded gums and spreads into the jaw bone, the result is inflammation, and usually a hard swelling of the infected area. This can occur in either the upper or lower mandible and when the upper mandible is affected, the eye socket and sinus region is also implicated.

### CAUSES OF LUMPY JAW:

1. A tooth abscess can be the cause of eventual lumpy jaw, if tooth extraction and surgical debridement is not undertaken.
2. When molar progression ceases, the teeth become loose, providing a route for the bacteria to enter  
Dr. Meytal Bakel-Weiss-et al 2009-Israel.



Left: Lumpy jaw in a Red kangaroo's lower mandible.

Below left: The x-ray of the Red kangaroo's mandibles left. Notice the inflammation of the lower mandible.

Below right: An x-ray of the healthy mandibles of a Red kangaroo.



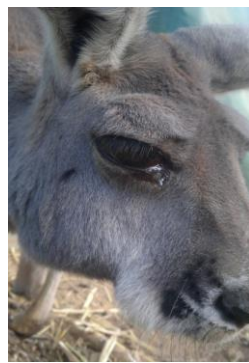


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### CLINICAL SIGNS:

- the animal will have facial swelling, which may be situated along the top or bottom mandible (jaw bone) or the cheek or eye area. Where a lump is evident, it will be hard to the touch, whereas abscesses are usually soft and spongy,
- the eye (usually the eye on the same side as the affected jaw) may have a discharge. Watery eyes is quite often the first sign. Lumpy jaw often causes ocular (eye) pressure which leads to tearing.
- excessive salivation once the condition becomes severe,
- pus may be discharged anywhere in the cheek area,
- loss of weight,
- lethargy,
- reluctance to eat solid foods,
- and eventually become anorexic due to not being able to eat.
- necrotic tissue and/or organic matter that is stuck and rotting in the abscess will emit an offensive odour.



### OVERBURDEN OF CLOSTRIDIA difficile (Sloshy gut syndrome)

Engorgement of grain, fruit, or other foods containing high levels of rapidly fermentable carbohydrate or rapid conversion to a high-grain diet can result in a fulminating production of short-chain fatty acids (SCFA) and depression of the pH in the rumen, with an increase in lactobacilli and production of lactic acid. High levels of SCFA and lactic acid result in hypertonic rumen digesta and systemic dehydration, and rapid absorption of these organic acids can produce rumen atony, ulceration of the fore-stomach epithelium, and systemic acidosis. High-concentrate diets also produce bloat, because of the rapid production and entrapment of fermentative gasses, with intraruminal pressures that can result in cardiovascular collapse and death. *Contributions of Microbes in Vertebrate Gastrointestinal Tract to Production and Conservation of Nutrients* C. EDWARD STEVENS and IAN D. HUME

### OF THE MACROPOD GUT:

When the bacteria in the gut changes from gram negative to gram positive, and lactic acid is produced, the natural pH balance is lowered, hence when it reaches below 5.5, protozoa and bacteria begin to die, resulting in the gut going into a static situation. The resulting acid is absorbed into the body creating acidosis, ultimately causing infections in the gut and liver. Once this imbalance occurs, the usual anaerobic bacteria that takes over is *Clostridia difficile* which causes the *sloshy gut* syndrome. Sloshy gut is the description of fluid sloshing around in the stomach when an affected macropod hops.

Fibre, which constitutes fresh or dried grasses, hay, barks, leaves, branches etc., is vital in the macropod's diet as it stimulates macropods to chew, thus producing alkaline saliva which serves to buffer (protect) the digestive system. Macropods with diets containing little fibre are at more risk of suffering lactic acidosis or an imbalance of gut microflora, resulting in the sloshy gut syndrome.

Even when macropods are offered plenty of forage, if pellets are also available, the odd individual, or even quite a few of the animals may 'choose' to gorge themselves on the pellets. Just like some children or adults preferring 'junk foods' instead of a healthy diet, leaving the choice up to the animals has also proven to be a bad idea.

### CLINICAL SIGNS: in order of detection.

- sporadic, bloated gut,
- lethargy,
- runny, foul smelling, green/brown (light) diarrhoea, right.
- inappetence (*but macropods may continue to eat pellets rather than grasses and fibrous foods*)
- weight loss,
- sloshy gut sounds when the animal hops,
- eventual death.



Right: A Bennett's wallaby with Sloshy Gut Syndrome, who eventually died. Up until a few days before his death, he would only eat pellets.





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## NATURAL FOODS & SUPPLEMENTATION

### MACROPODS REQUIRE FIBRE AND MINERALS FOR OPTIMAL HEALTH

Macropods are basically browsers *and* grazers, and as joeys are most often raised in the suburban backyard, this presents the problem of availability to the natural herbs and grasses they would be eating in the wild. It is therefore commendable when a carer takes the time to plant the types of grasses which the animals would most likely encounter in their natural habitat. When this is not a possibility, grasses and branches can be collected in areas away from main thoroughfares, or a good supplementation provided.

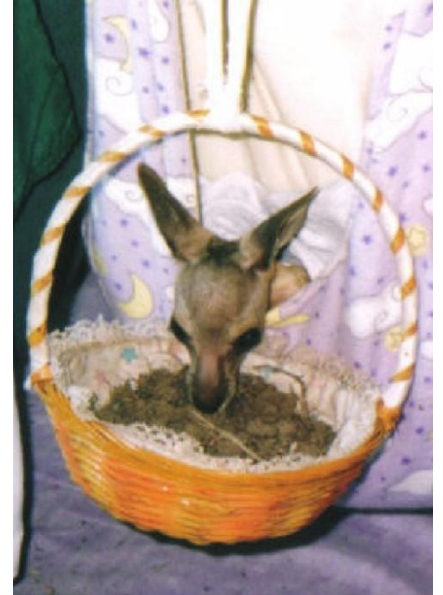
From the time a joey is at the stage of development to be able to eat solid foods (the just furring stage) it is up to us to assist their digestive system, in preparation to digest the increasing ratio of fats in the formula, and the cellulose in grasses and forage. To do this, we need to offer dirt and roots initially right, to enhance the production of micro flora

in the gut, and once they have attained sufficient gut flora, (once they are passing black, firm faecal pellets) a variety of fibrous grasses, leaves and barks is all that should be offered, so that their digestive system, teeth and gums are kept in good order.

A variety of grasses (dead and live), barks, leaves, (dead and fresh), roots and dirt, should always be provided. Apple leaves, bamboo, Eucalypt branches and willow branches are also favoured.

\* Lucerne is often fed, but not advised, since it is very high in protein.

Only once macropods are eating their natural solid foods, should they be given some little luxuries, which should not cause digestive problems when given *small* amounts, now and then. Foods such as red apple, sweet potato, carrot, cashew nuts or rolled oats are acceptable, provided that this is not all that is available to them and does consist of the bulk of their daily intake. (once or twice per day).





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### IT IS CHEAPER TO BUY CHAFF, AND BETTER FOR MACROPODS!

When grasses aren't available, wheaten chaff, orchard grass hay, pasture or timothy hay are the preferred supplementation. If macropods don't like the particular wheaten chaff purchased, try offering the Oaten chaff instead.



Above left: Macropods held in captivity for 20 years and fed only wheaten chaff, eventually died of old age. No cases of lumpy jaw were ever experienced.



Left and above: Dedicated carers go to great lengths to discover the different types of herbage that is favoured by the species of macropods in their care, and ensure there is always a large variety of forage available. Quite often this means collecting sufficient herbage to last up to three days.



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## MINERAL REQUIREMENT

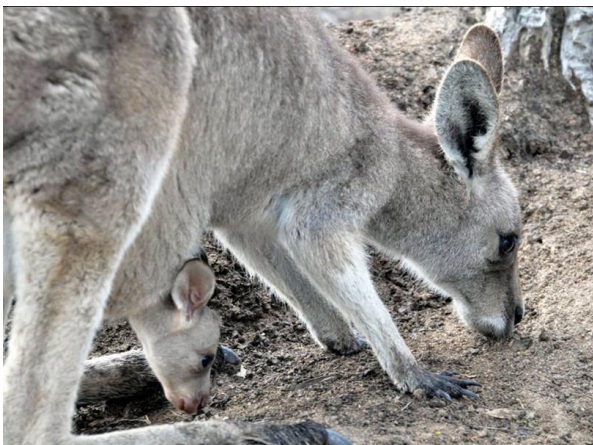
All animals require minerals, and native animals know where these minerals can be accessed. Most often they find natural courses of clay and minerals in rocky ravines such as the one photographed right.



Left: These are the teeth and lick marks where macropods, wombats and other animals have been accessing the minerals over centuries.



Below Left: A mother Eastern grey teaching her joey where to find a good source of minerals.



Below: Minerals are also sourced in the soil from termite mounds.



## MINERAL BLOCKS:

Mineral blocks provide minerals that may not be available in the immediate environment of macropods in our care. One vital mineral required by macropods is magnesium. When Magnesium is deficient in soils, macropods will ringbark trees to glean this mineral from the bark. This is just one example why mineral licks are a vital component to have available at all times. Individuals animals can decide for themselves whether they require the mineral/salt lick.



Left and right: These are 2 blocks that have been used successfully, they differ greatly in their analysis, so it depends upon what the specific region is deficient in.

It may be a good idea to have the soil tested in the macropod enclosure to ascertain which mineral block is required, since each region is deficient in particular minerals.



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