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Madonna is a past Chair of Scottish BSAVA and an affiliate of Glasgow Vet school where she also teaches exotics clinical skills and lectures on exotic animal medicine and surgery on her day off from private practice. The Ark Veterinary Clinics Ltd now hosts the exotics selective rotation for Glasgow Vet School with Madonna as clinical lead. She also does consultancy work for Nation Wide Laboratories and is the ethical chair for a small zoo collection.



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# Reproductive Medicine in Ferrets

Ferrets have become increasingly popular as pets over the last ten years. Many more are being presented to the general practitioner which can be intimidating for those not familiar with these gregarious and generally friendly patients. This article aims to provide the reader with an easy to read, up-to-date guide on reproductive medicine in the pet ferret.

**Key words:** ferret, reproduction, anaemia, gestation, adrenal gland disease, vasectomy

## Introduction

Ferrets have been domesticated for over 3,000 years, yet many vets still feel unequipped to deal with these charming animals. Over the last ten years, there has been a dramatic increase in ferrets being kept purely as pets and now there are more pet ferrets than working ferrets in the UK.

With an undeserved reputation as being aggressive, smelly animals, most ferrets are actually delightful, curious and playful.

The vast majority of pet owners identify their pet as being a member of their family and, as such, they expect the same high level of care for their pet ferret as their pet dog or cat.

Reproductive control of ferrets is very different compared to more familiar species. This article aims to equip the general practitioner with an easy to read, up-to-date guide to reproductive medicine in this species. It should be noted that many of the drugs mentioned are unlicensed in ferrets, and an off-license consent form should be signed by the client prior to use in the UK. Readers outwith the UK are advised to check the regulations where they are based.

## Terminology

An entire male ferret is referred to as a hob or a dog. A vasectomised ferret is known as a hoblet whilst a castrated ferret is known as a hobble. An entire female ferret is referred to as a jill or a bitch whereas a spayed ferret is known as a sprite. Ferrets under a year old are referred to as kits.

## Effect of anaesthesia on blood counts

Venipuncture can easily be performed in the conscious ferret using the cephalic, jugular or lateral saphenous veins. The jugular can be used for large samples



**Figure 1:** Conscious blood sample being taken from the cephalic vein. Allowing the blood to drip from the needle prevents venous collapse from excessive negative pressure which may occur if a syringe is used.

but the author regularly obtains 2ml from the cephalic vein (Figure 1). If you are presented with a fractious ferret or are unused to sampling ferrets then mask induction with isoflurane could be considered. This will decrease blood parameters such as packed cell volume, haemoglobin, white blood cell counts and plasma protein levels. Due to these factors, a conscious blood sample should be attempted. Full biochemistry and haematology can be run on in-house analysers or can be sent to an external laboratory.

## Dimorphism

Hobs and jills are sexually dimorphic. The hobs are usually twice the size of the jill, and the testes are situated just distal to the anus (much like a tom cat) (Figure 2) whereas the prepuce is on the ventral abdomen much like a dog. The vulva in the jill is situated just distal to the anus much like in the queen. Outwith the season, the vulva is very small and slit like. During her season, the vulva will swell to up to fifty times its usual size and resembles a pink doughnut in shape (Figure 3).



**Figure 2:** In a hob, the testicles are situated ventral to the anus.



**Figure 3:** In oestrus, the vulva swells up dramatically. The flash has made the vulva appear paler than it was. The vulva will usually be bright pink.



**Figure 4:** A neck bite is required during mating, as well as intromission, to facilitate ovulation.



**Figure 5:** The penis is shaped like this due to a 'J' shaped os penis.



**Figure 6:** Smearing a treat (in this case, it was unsweetened peanut butter) on the jills thorax kept her busy during her ultrasound.



**Figure 7:** Mucous plug coming away from the vulva 48 hours prior to kitting.

## Reproduction

Ferrets are seasonal breeders with increasing photoperiod being the stimulus. They become sexually mature at the spring following their birth. The hobs' breeding season starts earlier than the jills', and in the Northern Hemisphere their testosterone levels start to rise in January. There is a nice correlation between testicle size and testosterone levels, the peak of both occurring in February. Jills typically come into season at the beginning of March although there is some individual variation, and this year the author was presented with a jill in season on the 15th of January.

## Mating

Mating in ferrets is aggressive and lengthy. The hob will grab the neck of the jill and will drag her around the enclosure (Figure 4). The mating is often vocal with the jill making a screaming noise. Once the jill accepts the mating, she will become limp and the hob will mount her. Mating can last up to three hours and some owners will find this distressing. The jill can experience damage to the skin at her scruff, and during particularly

aggressive matings there can be excoriation of the vulva. Jills are induced ovulators and require both the neck bite and the stimulation of the cervix by the hob's j-shaped os penis to ovulate (Figure 5). The vulva will start to decrease in size 3-4 days post mating if ovulation has occurred; failure to do so indicates ovulation has not occurred, and the jill should be mated again (Lagerqvist 1992).

## Gestation

Pregnancy can be diagnosed via ultrasound at twelve days after fertilisation and will appear as 3-5mm anechoic structures in the uterus (Peter *et al.* 1990), or by palpation fourteen days after fertilisation where the foetus can be palpated as walnut sized structures (Conalty 1967). Rubbing some food or salmon oil on the abdomen distracts the jill (Figure 6) during ultrasound.

Diet is vitally important to support pregnancy and prevent conditions such as eclampsia, pregnancy toxemia, agalactia, low litter size, for example. Ensuring a high quality, meat-source protein diet with protein 35% and at least 20% fat being readily available for the jill and

placed in close proximity to the nest will prevent any issues due to diet. Fresh water should be provided daily.

Gestation in jills is 41-43 days. 41 days is most common in primiparous jills whereas the average gestation is 42 days.

## Parturition

Ferrets do not show overt signs of impending birth the way bitches do. This year, the author's own jills passed a mucous plug forty-eight hours prior to kitting but showed no other signs (Figure 7). The actual birthing process is normally rapid. On average it will take 2-3 hours in total. In pet ferrets, handling of the kits does not appear to cause rejection of the litter provided the jill is comfortable with it. The author's jills actively pull her hand into the nest from day one of birth.

Dystocia is rare in ferrets. In colonies of ferrets, it is said to affect 1% of ferrets and to be even rarer in pet ferrets. Causes of dystocia are similar to those seen in more familiar species: too few kits (single kit syndrome), very large litters resulting in uterine inertia, over-large kits due to over-long gestation (over 43 days) or



abnormal kit presentation. Environmental temperatures exceeding 21°C can also result in dystocia.

### Kits

Kits weigh approximately 6-10g at birth and grow rapidly on their mothers' rich milk, gaining at least 4g a day during week one. They are altricial and rely on the jill for all of their care during the first three weeks. Hand rearing of kits before ten days of age is extremely difficult as they are nutritionally fastidious and require ferret milk only up to this age (Manning and Bell 1990).

Kits start to sample mushed up wet food at three weeks of age whilst their eyes are still shut (Figure 8). Their eyes do not open until approximately four and a half to five weeks of age. In the author's opinion, this makes sense if you have evolved to be born underground in a tunnel, therefore you do not need to open your eyes until you are mature enough to leave the tunnels. By fourteen days, their deciduous teeth have erupted and are fully through by eighteen days of age. Their adult canines start to erupt between forty-two and fifty-two days whilst they retain their deciduous canines until fifty-six days of age (Berkovitz 1969). Their full adult dentition is through by ten weeks old age. Kits can hear sounds by thirty-two days of age; for comparison cats gain ability to hear sounds by six days of age (Moore 1982).

Ferrets imprint on food at a young age by smell, so kits should be offered several brands and also dry versus wet. This is to ensure that they will continue to eat well with their new owners and also if there is ever a disruption in the supply of the usual brand. Some ferrets will point blank refuse to eat an unfamiliar food and will starve themselves.

The kits are ready to be independent and re-homed at eight weeks of age.

### Hyperestrogenism

Similar to rabbits and cats, jills are induced ovulators. Unlike rabbits and cats, jills will continue to stay in oestrus until they either ovulate, the day length shortens, or they die. Ferrets appear to be particularly sensitive to the toxic effects of oestrogen (Sherrill and Gorham 1985). The risk of hyperestrogenism is high especially if the jill has been in season for four weeks or longer. Sherrill and Gorham (1985) demonstrated an incidence of 50% of unmated jills developing hyperestrogenism with a mortality rate of 40%. The high, persistent oestrogen

levels cause bone marrow suppression resulting in hypoplasia of all the cell lines and decreases splenic extramedullary haematopoiesis. The most common cause of mortality is haemorrhagic anaemia due to thrombocytopenia. The neutropenia increases the risk of bronchopneumonia and pyometra.

### Clinical signs

- Enlarged vulva
- Weakness
- Anorexia and progressive weight loss
- Dehydration
- Pale mucous membranes (Figure 9)
- Symmetrical flank alopecia
- Petechiae or ecchymosis

Diagnosis is based on signalment and haematology showing a non-regenerative anaemia, thrombocytopenia and leukopenia. The normal haematocrit in ferrets ranges between 46% to 61% which is much higher compared to dogs and cats. Haematocrit can be used as a prognostic indicator (see Table 1).

### Treatment

With a packed cell volume (PCV) of at least 25% then administration of Proligestone (Delvosteron, MSD) 50mg by subcutaneous injection will bring the jill out of season within a week. No further treatment will be required but the use of a deslorelin (Suprelorin, Virbac) implant in the autumn should be recommended to prevent further seasons. Deslorelin should not be administered to bring the jill out of season if she is already showing clinical signs of hyperestrogenism due to the initial hormonal surge resulting in another two weeks of oestrus.

For lower PCV between 15% and 25% more intensive treatment will be required. Proligestone (Delvosteron, MSD) should be administered but it is highly likely with any PCV <20% a blood transfusion will be required.

Conveniently, ferrets do not have blood groups. A large male makes a good blood donor and severely affected jills may require multiple transfusions. Jekl and Hauptman 2017 recommend that in a healthy ferret 0.8% of the body weight is the volume of blood that can be taken, obtaining blood from the cranial vena cava (under anaesthesia) and immediately mixing the blood with sodium citrate (ratio 6:1) then slowly administering to the recipient. Where severe neutropenia is present, prophylactic antibiotics, for example clavulanated amoxicillin 12.5-25mg/kg q8-12hours (Quesenberry and

Carpenter 2012), should be considered. For jills with PCV less than 15 % the prognosis is grave despite intensive care.

**Table 1: Haematocrit prognostic indicator**

PACKED CELL VOLUME	PROGNOSIS
>25%	Good
15%-25%	Fair
<15%	Grave
<10%	Fatal



**Figure 8:** Kits start to wean at three weeks old before their eyes have opened.



**Figure 9:** Note the very pale vulva and fur loss in this jill which had hyperoestrogenism.