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# Adrenal gland disease in ferrets

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**ABSTRACT:** Adrenal gland disease (AGD) is a common problem in ferrets. This paper will discuss the proposed aetiology and prevention of this disease. As well as briefly discussing AGD diagnosis and therapy, it will focus on the role of the veterinary nurse in these cases.

Adrenal gland disease (AGD) is now commonly seen in UK ferrets, especially in middle-to older-age animals, though some may be as young as two years old.

Research has shown that reproductive management and husbandry may be the principle causes of this problem. Therefore, client education will play a major part in the prevention of this disease.

The veterinary nurse plays an integral part in any preventive health scheme in clinical practice. In addition, the veterinary nurse will play a major role in the surgical nursing and postoperative care of ferret adrenal cases

## Clinical signs

The clinical signs are almost pathognomonic, consisting of a progressive alopecia (typically tail to abdomen to torso to head) in a neutered ferret (Figure 1).

Initially this may be seasonal or cyclical with most cases presenting in autumn and a smaller peak in spring. Pruritus is seen in approximately a quarter of all cases

Signs related to high sex hormone levels are also likely and relate to the hormone that is being produced in excess (Figure 2). High levels of oestrogens in jills cause them to return to season (with swollen vulva and increased scent), while high levels of testosterone in males cause dysuria, owing to prostatomegaly (Figure 3).

In the later stages of disease, the ferret may lose weight, develop ascites and become weak. Persistent high oestrogen levels cause bone marrow suppression, leading to anaemia and immunosuppression, similar to that seen in intact jills in prolonged oestrus (hyperoestrogenism).

## Diagnosis

The signs and signalment are often enough to make a positive diagnosis. However, other potential causes of pruritic skin disease, or the possibility of ovarian remnant syndrome/retained testes, may require investigation (Table 1).

## Aetiology

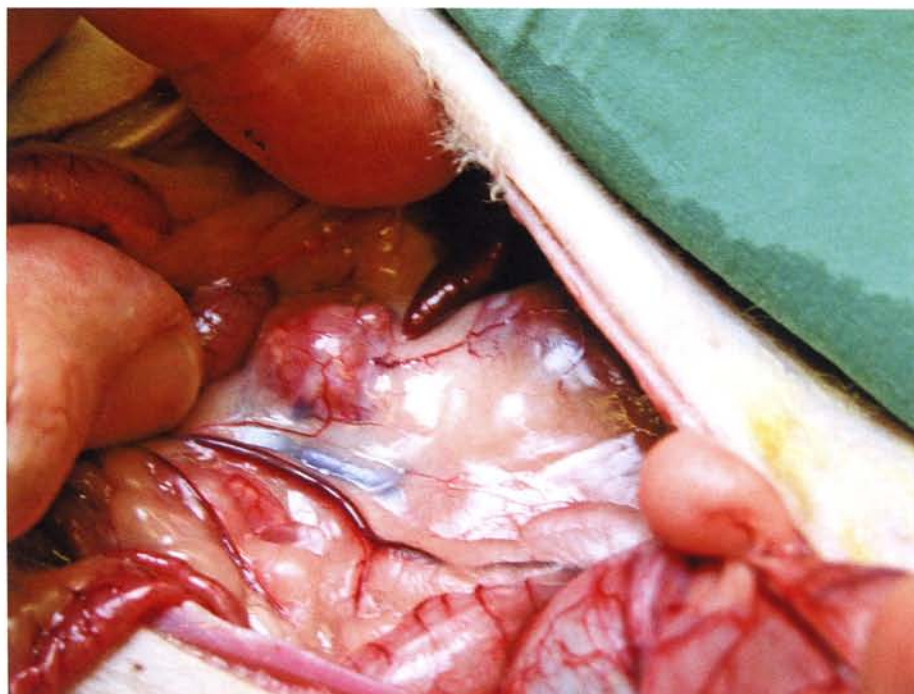
Increased longevity may, ironically, mean that better diet and less exposure to predators when hunting may actually increase incidence of diseases of later years, simply because more animals live longer. Twenty years ago a two-year-old ferret was considered to be relatively old.

However, to understand the aetiology it is essential to realise that this disease involves the over-production of sex hormones from the adrenal glands

**Figure 1:** Typical hair loss pattern in advanced AGD



Figure 2: Markedly enlarged left adrenal gland



– this may be from hyperplastic or neoplastic tissue. Cortisol is not over-produced and so it is inappropriate to refer to this condition as ‘Cushing’s disease/syndrome’.

The major cause of this stems from surgical neutering.

The female ferret is seasonally monoestrous and an induced ovulator. This is an adaptation to a solitary lifestyle and means that chance encounters are more likely to result in fertile mating. Males are also seasonal – the testes enlarge and descend in the spring and are retracted over the winter period.

‘Season’ is induced by increasing day length causing:

- reduction in melatonin levels
- stimulation of GnRH production
- stimulation of FSH/LH production
- stimulation of gonadal hormones.

The result should be a sharp rise in gonadal hormone levels with the process regulated by a negative feedback of gonadal hormone on the pituitary and hypothalamus – a sequence of short sharp peaks of LH (luteinising hormone) followed by short sharp peaks of gonadal hormone.

But when the gonads have been removed, this feedback is altered. The initial hormone changes induced by altered day length still occur, but the stimulatory hormones (principally LH) can no longer

act on the gonad. Instead, undifferentiated adrenal gland cells are stimulated and are enabled to produce sex hormones.

The resulting rise in sex hormone is not as rapid as from the gonad, so negative feedback on LH production is not so fast. In other words, LH production tends not to achieve such high levels, but they last longer. As a result, there is a chronic stimulatory effect on adrenal cells leading to hyperplasia and, eventually, neoplasia.

One other aspect of management that is also believed to have an influence is that of indoor ferret keeping, owing to its

effect on annual light cycles. This does have a certain logic as most cases do appear to be in indoor pet ferrets. However, AGD does occur in outdoor ferrets and there may be a sampling bias in that outdoor ferrets may be less likely to be taken for diagnostic investigation. As a result there is little direct evidence that any factor other than surgical neutering is responsible for the rise in AGD.

The age of neutering has also been shown to have an effect with a linear relationship between age of neutering and age of onset of AGD. Prevention, therefore, depends on avoiding surgical neutering.

## Prevention

There are several options for prevention.

### Jills

- allow them to breed each year
- use of a ‘teaser’ or vasectomised hob. This is very useful for large groups of working animals; but not so good for show or pet animals as, by the end of the season, the jill has a chewed neck from the repeated rough (to induce ovulation) matings. It is also sensible that each owner has their own teaser – because sharing males is a good (undesirable!) means of transmitting disease.
- stimulation – some owners will stimulate the jill’s vagina/cervix using a blunt probe to mimic mating. Obviously, this should only be done by a very experienced owner. □

Figure 3: Prostatomegaly in an AGD ferret. The ferret presented with dysuria



**TABLE 1** Overview of diagnostic tests for adrenal disease in ferrets

Test	Pros	Cons	Rule out ovarian remnant/ retained testis?	Comments
General haematology/ biochemistry	Enables evaluation of underlying disease	Will not give specific diagnosis	No	Only provides background information
Radiography	Non-invasive	Unlikely to detect adrenals unless markedly enlarged	No	Of little value
Ultrasonography	Non-invasive Easier to detect adrenals and measure May be possible to detect ovarian remnant Allows prostatic assessment	Needs skill – can be difficult to find adrenals and negative findings do not rule out AGD	Possibly	Useful, but can only be used to confirm suspicions and assist in planning surgery
Hormone panels	Non-invasive	False negatives common False positives possible Expensive and only a few labs offer correct panel	No	Must use Tennessee panel – androstenedione, oestradiol and 17-hydroxy- progesterone Cortisol measurements NOT appropriate A rise in any of the hormones indicative of hormone production
Exploratory surgery	Visualisation of adrenals only reliable means to compare sides and detect and detect enlargement Allows possible curative surgery at time of diagnosis Enables submission of adrenal tissue for histopathology Enables searching for ovarian remnants, etc, as well as other tumours (insulinoma and lymphoma frequently found alongside AGD) Ferrets very robust under anaesthesia Allows prostatic assessment	Invasive Expensive May bruise badly postoperatively if high oestrogen levels	Yes	Ideal method if confident, but requires careful explanation to client

- proligestone injections – 0.5ml proligestone (Delvosteron, MSD) can be given subcutaneously after onset of the season. This may last all season or need repeating at intervals depending on that year's light levels.
- GnRH injections – both buserelin (Receptal, MSD) and leuprolide acetate may be used.

**Hobs**

- vasectomise (see above) – but this will not alter smell or behaviour.

The other option for both sexes is the deslorelin implant (Suprelorin, Virbac). Currently the 9.4mg implant is

licensed for chemical neutering of male ferrets. However, the 4.7mg implants have been used successfully for several years in both sexes. The 9.4mg implant is licensed for 16 months onwards. However, this author's experiences show that the 4.7mg implant will reliably suppress season in either sex for 18 to 24 months

**Summary of options**

Deslorelin implants are, overall, the method of choice for reproductive and AGD control in ferrets. Proligestone may be used for large groups of jills, where cost may be an issue and is also effective in controlling AGD.

Surgery may still be indicated in rescue shelters where permanent reproductive prevention is essential prior to rehoming. It is still possible to implant with deslorelin after neutering and evidence points to the implants being effective for AGD control in neutered animals too.

There will also be pet ferret owners who do not want the worry of watching for their pets coming back into season without their noticing. In these cases too, surgical neutering may be indicated though simultaneous implantation should also be recommended.

Above all, the issues should be discussed

with the ferret owner; so whichever option they choose, they have made an informed consent.

## Placing implants

The implants are quite large and require a large-gauge implantation device. These enable the implant to be placed subcutaneously between the shoulder blades. Correct placement can be checked by palpating the implant and gentle manipulation can orientate the implant away from the skin wound (to reduce the chances of the animal grooming it out). The skin wound may be sutured or glued.

The manufacturer's advice is to implant the 9.4mg implants under anaesthesia or sedation.

In the author's experience, the 4.7mg implants (same diameter but shorter) may be placed in the conscious ferret causing minimal distress. However, those with limited experience of handling ferrets may be advised to use a light isoflurane anaesthetic for these as well.

Naturally, the use of anaesthesia – and its implication for patient safety and cost – must be fully discussed with the owner before undertaking the procedure.

## Surgical management of adrenal disease

Surgery is still the 'gold standard' procedure, especially as approximately 70 per cent are 'left-side-only' at time of diagnosis – and the left gland is relatively easily removed. However, medical management (deslorelin) may be undertaken if the right gland is affected or if there are other underlying issues that may preclude surgery.

Adrenal gland removal constitutes major abdominal surgery, so careful patient management is required. The following advice is written with respect to surgery for diagnosis and left adrenal removal.

Right adrenal removal normally requires excision of a portion of vena cava; so peri- and post-surgical management is, accordingly, much more intense and this type of surgery should normally be undertaken at referral level.

### Pre-operative

Most ferrets presented for adrenal surgery appear 'well'. In these cases, it is advisable

to start antibiotics 6-24 hours prior to surgery, but little other preparation is required. If a jill has a swollen vulva, then a PCV should be assessed in case of aplastic anaemia, secondary to hyperoestrogenism.

Animals should be starved for six hours prior to surgery, with water withdrawn three to four hours before anaesthesia. If the animal appears unwell, or is excessively thin, then full health assessment is required to determine whether or not the animal is fit for surgery.

### Peri-operative

Ferrets should be intubated in the same manner as cats – a 2-3mm uncuffed tube is normally adequate, and a T-piece circuit used.

Heat loss can be a problem especially with abdominal surgery; heat mats or warm air blankets are ideal. If possible a rectal temperature probe should be placed. Monitoring devices, such as pulse oximetry or capnography, can be used alongside conventional auscultation.

Analgesia should be used in all cases. Non-steroidal anti-inflammatory drugs (NSAIDs) are usually adequate and may be started at the end of surgery. Opiates may be used alongside NSAIDs and may be started either pre- or peri-operatively, depending on preference and patient need.

Fluid needs should be evaluated on a patient-to-patient basis. Typically, 30ml/kg saline, given either intra-peritoneally or subcutaneously at the end of surgery, is adequate for most patients, unless there has been excessive blood loss.

The excised adrenal tissue should always be retained and submitted for histopathology to ensure full excision and to determine tumour regrowth potential.

### postoperative

Ferrets should be hospitalised for 24 hours postoperatively to monitor recovery and ensure adequate haemostasis. Analgesia should be maintained for 24-48 hours, depending on patient need, and antibiotics for 48 hours post-surgery.

postoperative nutrition is important. The ferret's normal preferred food should be provided as soon as the animal has recovered adequately from anaesthesia. Assist feeding using carnivore diets, for

example, Carnivore Care (Oxbow), and vitamin supplements, (for example, NutriPlus, Virbac) are very useful.

Ferrets are easily hospitalised and quiet areas and kennels suitable for cats will suit ferrets. They do like to curl up in blankets or hammocks – either the owner should bring the ferret's normal bedding, or this can be provided by the clinic. Cleanable Feline Forts (Cats Protection League), that are used to provide privacy for hospitalised cats, are suitable for ferrets (Figure 4).

Wound care is also important, because a long mid-line incision is usually needed. There will often be considerable bruising – this appears to cause little discomfort to the patient and is a consequence of raised oestrogen levels. However, owners may find this concerning so they should be warned prior to surgery.

This author tends to use subcuticular sutures and to place a layer of tissue glue over the skin wound. Wound management generally involves daily wound cleaning until healed (typically 7-10 days).

## Conclusion

Good nursing is essential for a successful outcome in AGD. Veterinary nurses may also play a significant role in reducing AGD incidence by providing relevant advice on reproductive control and husbandry. [\[1\]](#)

**Figure 4:** Hospitalised ferret. Note the blankets and Feline Fort in the background to provide comfort and hiding places. The bars of the cage are narrow enough to prevent the ferret from pushing its head through them and becoming trapped

