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Bilateral symmetrical alopecia is sporadically observed in male and female rabbits

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Any disease that affects the hair follicle or disrupts its growth can lead to hypotrichosis or alopecia. Both are abnormal hair patterns that lead to, respectively, a partial or complete loss of hair in areas of the body that are normally covered with hair. Alopecia is fairly common in rabbits and is one of the 4 main reasons for a veterinary consult, the other 4 being pruritus, the presence of cutaneous nodules and skin scaling/dandruff.

Susceptibility to alopecia is independent from the breed, age or gender of the rabbit.

There are many causes for alopecia. They have been classified into:

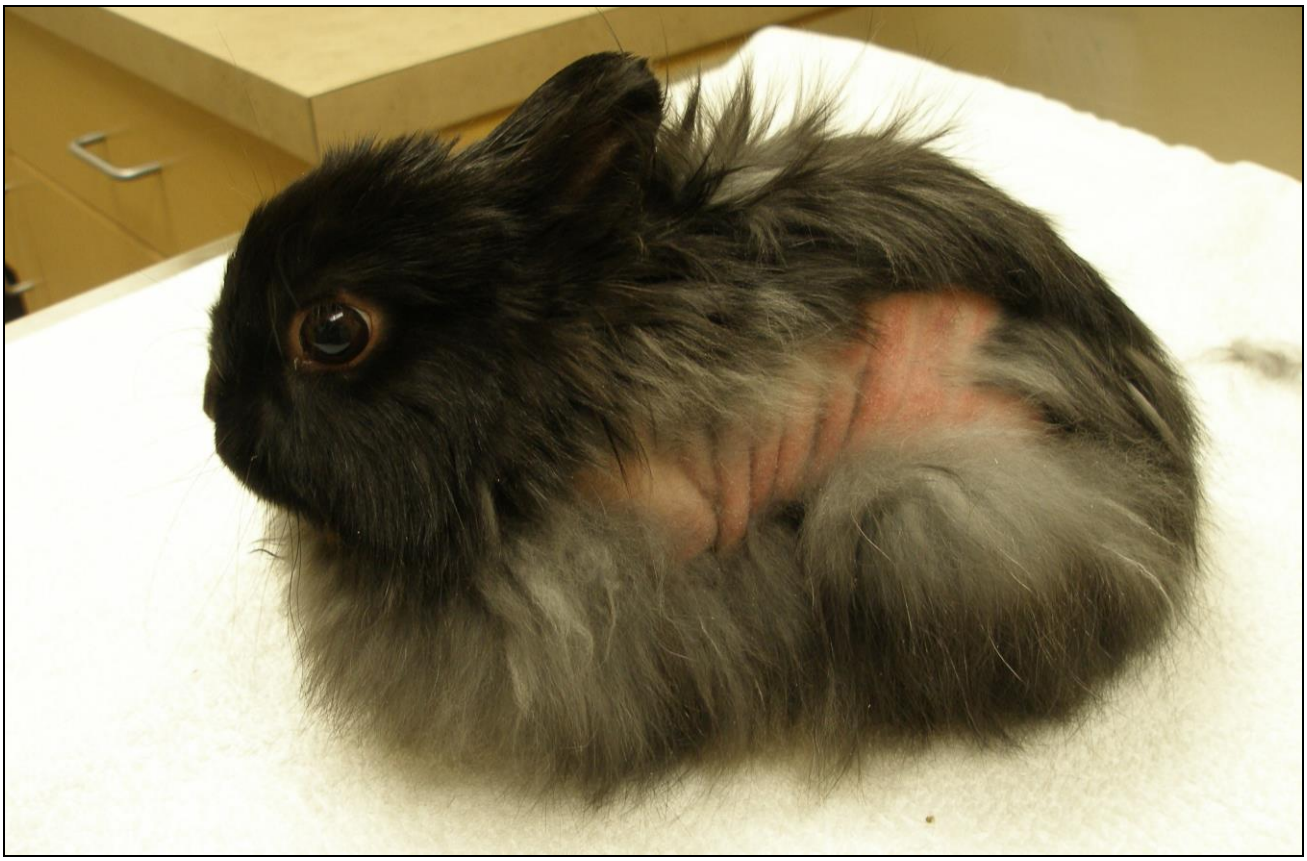


Figure 1: Vince, a young unaltered male dwarf rabbit developed a symmetrical bilateral alopecia on the flanks.

- Congenital/hereditary alopecia;
- Acquired alopecia, e.g. bacterial or fungal cutaneous infection, skin parasites, diet-related nutrient or vitamin deficiencies, hormonal diseases, trauma, immune disorder or hair plucking in pseudopregnant females (the latter is usually limited to the shoulders, dewlap and ventral abdomen), or hygiene in the living environment of the rabbit. Acquired alopecia is, furthermore, divided into inflammatory alopecia and non-inflammatory alopecia.

Alopecia should not be confused with molting-related naked patches of skin or it may be the result of "barbering" by a companion rabbit.

Figure 2: Three of 4 young rabbits (3 months old here) that were born hairless. They belong to a litter of 10 newborn; the other 6 are normally haired. Picture courtesy Hoegie from the Netherlands.

Finally, alopecia and natural molting must be differentiated from hair loss related to anagen or telogen defluxion, observed 10 days or 3 months after a physiological stress such as disease, infection-induced metabolic stress, post-parturition hormonal disturbances, hypo- or hyperthyroidism, or reaction to medication. Sudden synchronous cessation of hair growth in the follicles results in massive loss of hair some time later, with localized or diffuse alopecia affecting a single region or the entire body.

Congenital alopecia in rabbits

Congenital alopecia has been described in numerous animal species (Figure 2). It may be hereditary, but this is not always the case. In some cases, the hereditary hairlessness has been perpetuated by breeding to create special breeds for pets or research. Furless rabbits were first reported in Russia and Britain in the first part of the 20th century, and later in France too. Different mutations have been reported since in rabbits:

- Naked or furless (f), with individuals almost completely devoid of fur. The condition is hereditary. The pattern of inheritance is a single recessive gene, making it very rare. Hair is scarce and limited to guard hair. The skin shows excessive keratinization.
- Wirehair (Wh), with individuals growing only

guard hairs, without undercoat hair. It is due to a partially recessive mutation that is a less severe form of the naked/furless mutation. The amount of grown hair varies from one individual to another; the density of the fur is, however, lower than that of a normal rabbit (hypotrichosis). A similar condition has been observed in rabbits in Japan.

- Pelt-loss (pl), with individuals that possess hair follicles in the skin, but premature, excessive keratinization hinders the emergence of the hair. The recessive mutation leads to thick skin.
- Juvenile hairlessness, rabbits a few weeks old present a generalized or focal loss of their juvenile hair with exception of the tail, the extremities of the limbs, the ears, and the nasal region. Most affected rabbits will start to grow new fur within a few weeks, with no further health problems (information gathered via personal conversations). The cause of this condition is unknown.

The excessive keratinization of the skin hinders the emergence of new growing hair and leads to hyperplasia of the sebaceous glands and dysplasia of the epithelial sheath. It obstructs, furthermore, proper oxygenation and nutritional supply to the skin cells, impeding hair growth.

Rabbits afflicted with congenital alopecia seem to have a weaker immune response and are prone to develop skin disorders or lung infection caused by *Pneumocystis jiroveci* (*Pneumocystis carinii*). Damage to internal organs was observed in some cases, including ulceration of the stomach wall, pyloric stricture, cecal paralysis, infertility, and low reproduction rates. The life expectancy of some affected rabbits was as short as 1 month; others lived several years or a normal life span.

Congenital alopecia appears to be independent of rabbit breeds. It has been observed in Vienna Whites, rabbits of the Hyplus strain, Japanese White (JWNIBS strain), spotted and Rex/Mini-Rex rabbits.

Hairless rabbits must be kept indoors in a shielded, clean environment, in comfortable temperatures; without the protective fur they are sensitive to cold. These rabbits appear to tolerate heat better than normally furred rabbits. Hairless rabbits should also be protected from excessive ultraviolet radiation from sunlight and sunburn due to increased risk of developing skin tumors such as melanoma.

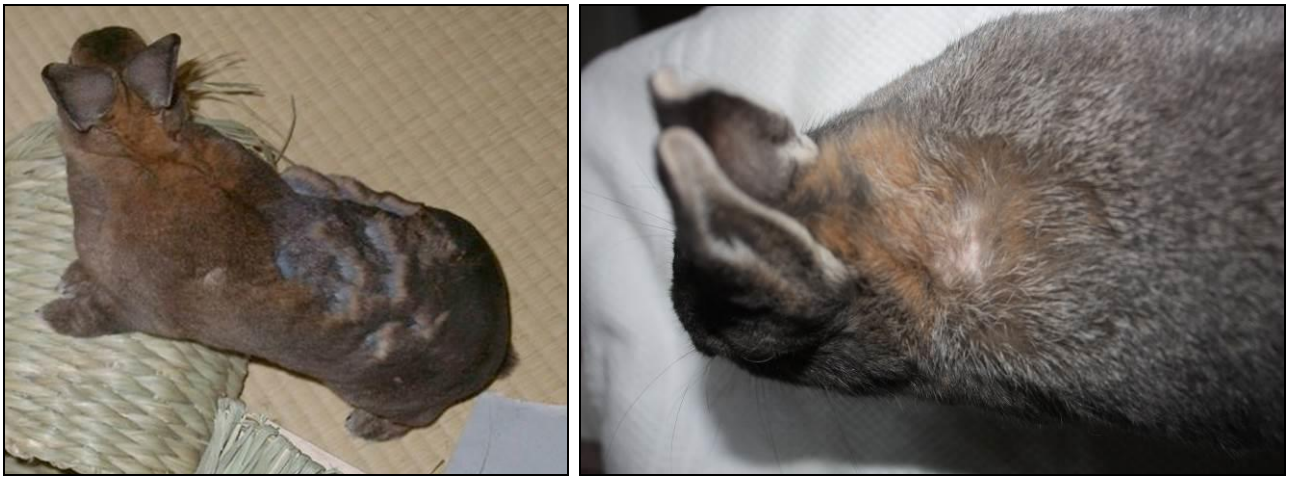
Acquired alopecia in rabbits

When acquired alopecia is noted, it is important to inspect the hair shaft. A clean break is indicative of scratching – self-mutilation caused by pruritus due to e.g. the presence of skin parasites – while damaged or broken hair shafts hint to an inflammatory origin such as infectious dermatitis.

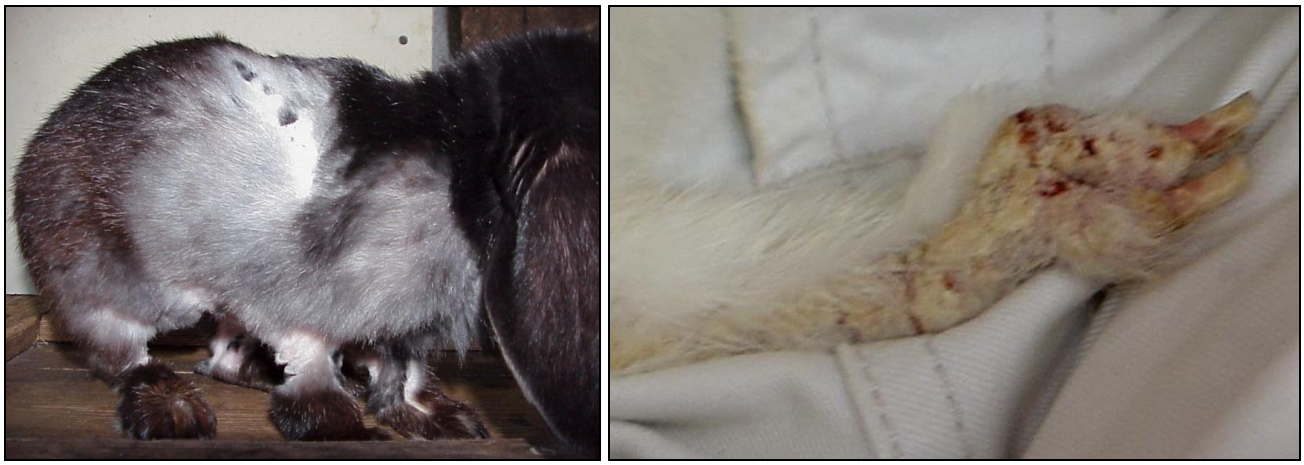
The degree of hair loss, the location and pattern of lesions and their distribution on the body will provide useful information will help determine if the condition is primary or secondary to an underlying disease (Figure 3).

A full examination of the rabbit should be performed, noting the following aspects:

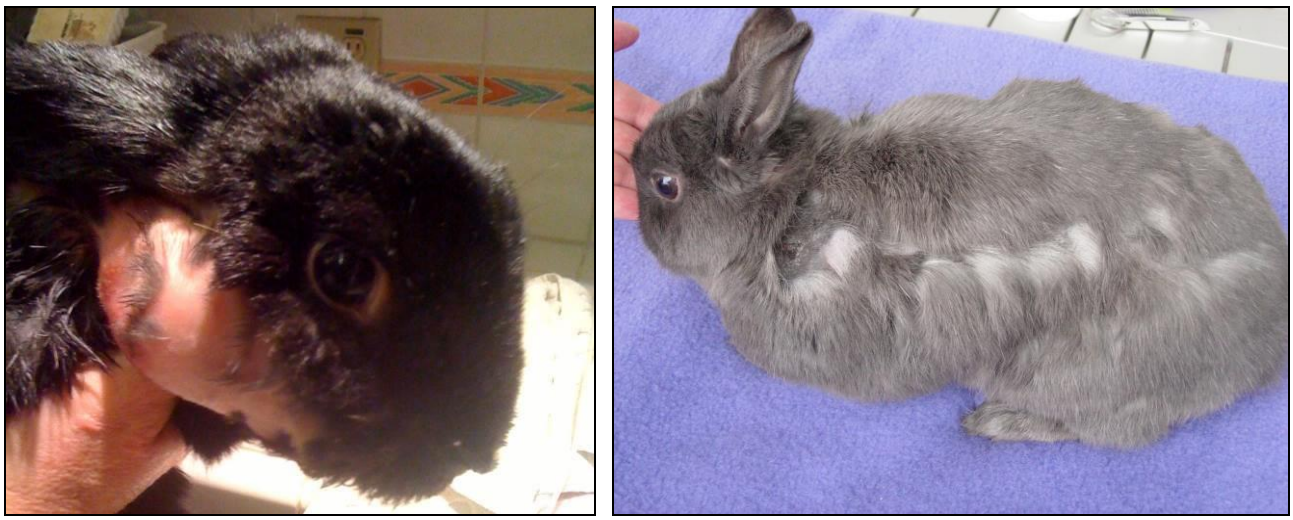
- Appearance of the skin. If focal or generalized alopecia is noted, it is important to inspect the hair shaft. A clean break is indicative of scratching – pruritus by, e.g., skin parasites – while damaged or broken hair shafts point to inflammatory origins such as bacterial or fungal dermatitis. Alopecia caused by diet deficiencies, e.g., lack of vitamin A, pyridoxine (vitamin B_6), biotine (B_8), or nutrients (magnesium, iodine, sulfur,



Hair loss and alopecia caused by excessive molting (left) and barbering (right) in the neck by a dominant rabbit companion. Picture courtesy Tal Saarony (left)



Excessive hair loss and alopecia caused by skin parasites: typical V over the shoulder in a case of severe cheyletielosis and Sarcoptes scabiei on the limb and digits of a rabbit. Pictures courtesy Ils Vanderstaey (left) and Berend Bakker (right)



Alopecia caused by a facial abscess and excessive hair loss, skin scaling, and alopecia caused by sebaceous adenitis. Pictures courtesy Linda Baley (left) and Lyne Lavigueur (right)

Figure 3: Some more frequent causes for alopecia in rabbits

zinc) should also be taken into account. A trichogram test with microscopic examination of the fur will quantify the amount of hair in the telogen, anagen, and catagen growing;

- Presence or absence of pruritus. This can help indicate or exclude skin parasites (e.g., *Demodex* sp., lice) and skin dermatophytes. Primary testing methods are non-invasive, e.g., visual check, magnifying glass, skin scraping, and/or adhesive tape. If results are inconclusive, comparative skin biopsies should be performed on skin samples taken from healthy and affected regions;
- Symmetrical lesions on the body are indicative of atrophic hair follicle diseases associated with hormonal or autoimmune disorders. Endocrinologic disturbances (e.g., thyroid) must be ruled out through blood and serum analyses, including the level of thyroxin (T4);
- Presence of polyuria and/or polydipsia may be associated with alopecia related to increased secretion of cortisol due to tumors in the pituitary or adrenal glands (hyperadrenocorticism) in some animals, but not with congenital hairlessness.

Acquired alopecia should not be confused with non-inflammatory and non-pruritic hairlessness of genetic origin.

Symmetrical bilateral alopecia

Rarely, symmetrical bilateral thinning and balding of the fur along both sides of the spine is observed in a rabbit. There is no itching or inflammation of the skin and the rabbit does not scratch excessively the affected regions or presents behavioral changes.

Due to the scarcity of the cases, and few veterinary publications on this topic in rabbits, the problem is often misdiagnosed. As a result, diagnosis is often made as a last resort, when all attempts to heal the problem have failed. Formerly believed to related to an imbalance of sexual hormones, it is now believed that others causes may also cause this pattern of alopecia, e.g. a tumoral development of the thymus or the adrenal gland (Cushing syndrome).

Clinical signs that may be indicative of endocrine, neoplasia or auto-immune disorders include:

- Bilateral alopecia;
- Generalized thinning of the fur density;
- Changes in the aspect, thickness, or color of the skin;
- Chronic presence of a non-healing skin disorder;
- Skin abnormalities with absence of pruritus.

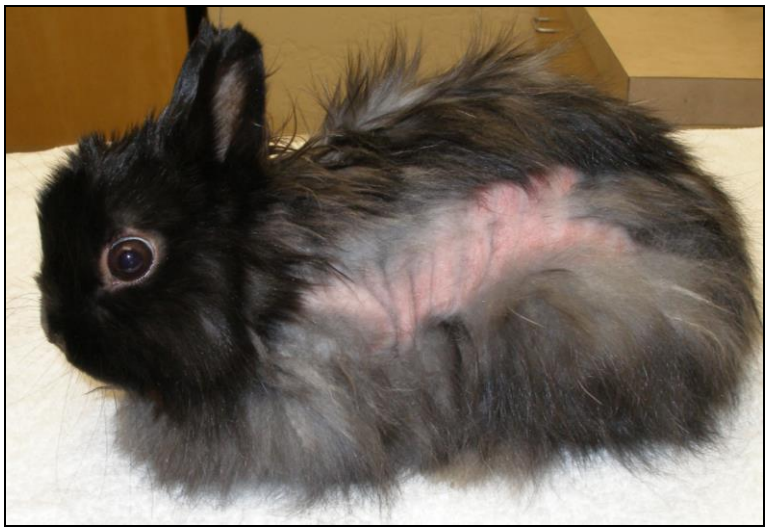
Different tests are used to confirm the diagnosis of symmetrical bilateral alopecia. An examination of the fur, an adhesive tape impression and/or a skin scraping will help rule out the presence of skin parasites. Hairs are examined under the microscope to rule out breaks or chewing. If no cause is found, a skin biopsy and a complete blood test can be performed.

To confirm endocrine disorders, the levels of particular hormones in the blood, urine, or saliva are measured.

Imaging can help rule out or confirm the presence of a tumor.

Testosterone-responsive dermatoses in unaltered male rabbits

Scleroderma is characterized by the activation of dermal fibroblasts and the dysregulation of the connective tissue metabolism. It is followed by fibrosis of the dermal layer, excessive deposits of collagen in the dermis and subcutaneous tissues, and thinning of the epidermis. Skin edema plaques; alterations in blood vessels and the immune system; dysfunction of major organs such as the digestive tract, kidneys,



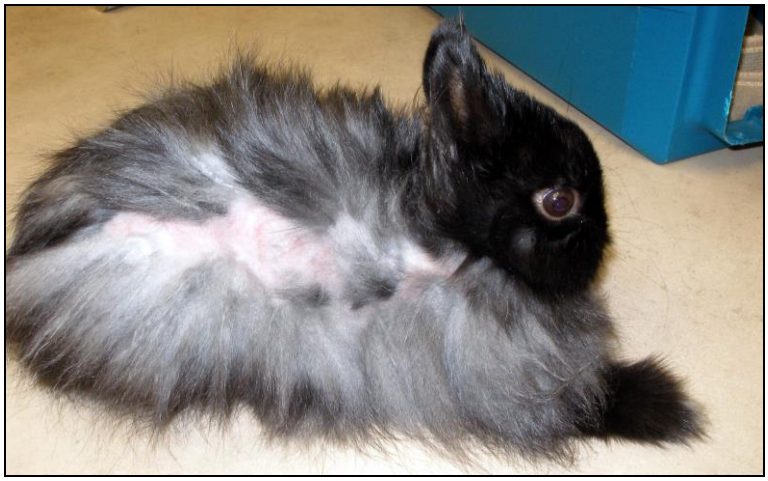


Figure 4: Vince, an unaltered male rabbit, suffering from non-pruritic skin thickening accompanied by bilateral alopecia on the flanks. After castration, the skin condition improved and fur started to grow back.

lungs, and the urogenital system are, furthermore, associated with scleroderma.

Scleroderma-like lesions have been described in an unaltered 6-year-old male rabbit that suffered from Leydig cell tumors in both testes, accompanied by an elevated level of androgen hormones in the blood serum. The latter was suspected to have caused the cutaneous lesions. Skin thickening and induration was accompanied by bilateral alopecia. Since castration brought improvement of the observed clinical signs, it is speculated that the skin condition was linked to the elevated level of circulating androgen hormones.

A similar condition was observed in an unaltered and sexually mature dwarf rabbit (Figure 4).

Elevated levels of estrogen and testosterone were suspected to be the causative agents of the thickened skin and the alopecia on the abdominal sides of these rabbits, as these cleared up completely within weeks of the castration surgery. There is no known cure for scleroderma. Castration led to the return to normal levels of testosterone.

Female pattern hair loss

Androgenetic alopecia after a spay surgery in a rabbit

Rarely, a rapid symmetrical bilateral loss of hair may develop several days or weeks after a castration surgery in male or female rabbit (Figure 5). The condition is poorly understood. It

is believed to be triggered by an imbalance of androgen hormones, even though their role is poorly understood in female individuals. Indeed, while important for the sexual development of the animal, these hormones also contribute to the regulation of hair growth. An imbalance will affect the growth pattern of the hair and modify the structure of the hair follicle. The growing phase of the hair (anagen or telogen phases) is shorter or stopped, while the period before the hair is shed is longer. If the structure of the hair follicle is changed, the new hair will be thinner, shorter, and may lack pigments.

Causes for such an imbalance include an overproduction of androgen hormones due to an androgen producing neoplasia in the ovary, in the pituitary gland or adrenal cortical adenoma.

Cystic endometrial hyperplasia in an unaltered female rabbit

In one non-spayed female rabbit, symmetrical bilateral alopecia has been associated to a hormonal disorder caused by an ovarian imbalance. In various animal species, hyperestrogenism is accompanied by fur thinning in the urogenital region. The mammary glands and vulva may appear swollen. If x-ray images do confirm the absence of tumors in other organs or lungs, an emergency ovariohysterectomy may help the rabbit regain health.

During the spay surgery of one female, cystic hyperplasia of the endometrium was observed (information gathered via personal conversations).

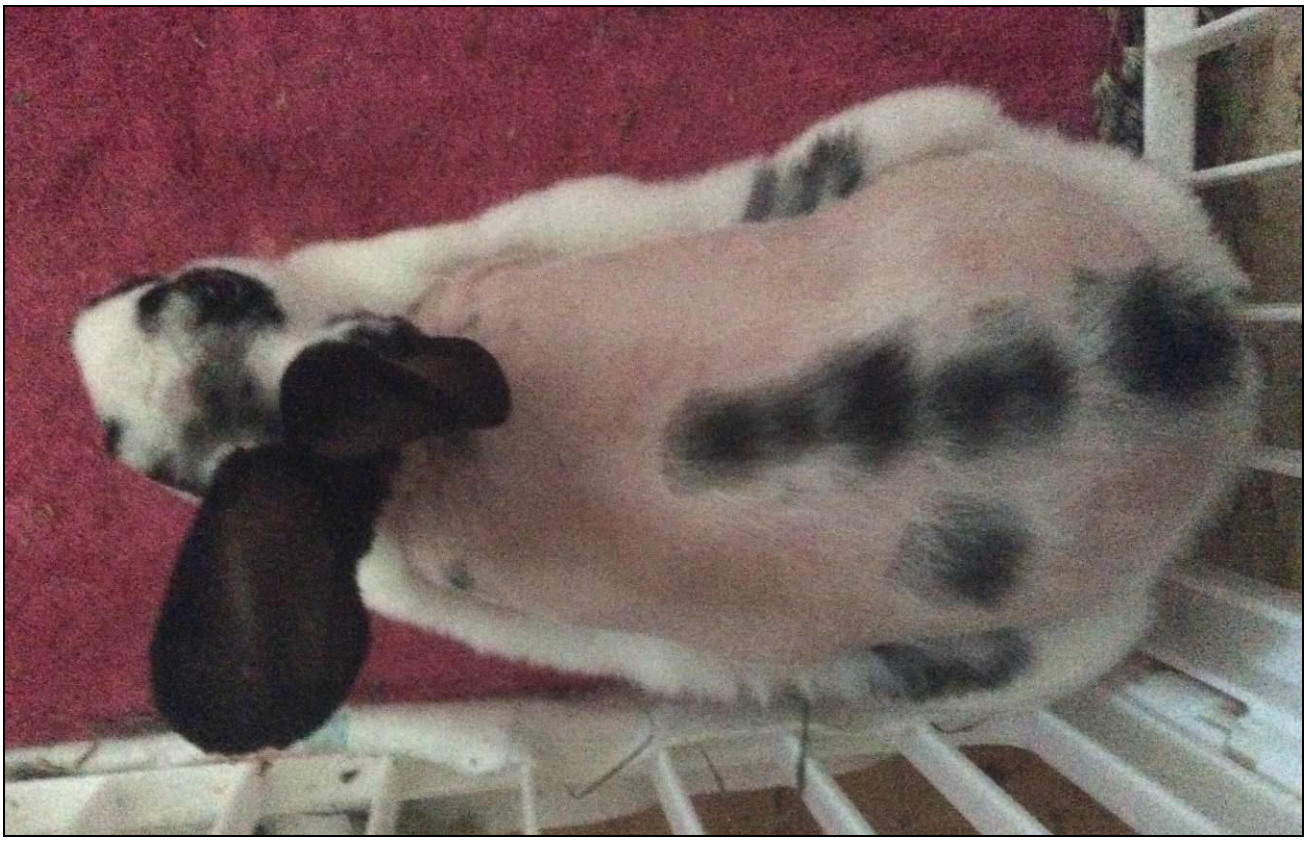


Figure 5: Dakota, a young spayed female rabbit that developed a symmetrical bilateral alopecia roughly 3 weeks after the surgery.

Symmetrical bilateral alopecia associated to autoimmune hepatitis

One 5 year old rabbit presented symmetrical bilateral alopecia on the flanks. The rabbit suffered also from a decreased appetite and labored breathing.

The skin showed features typical of exfoliative dermatitis and sebaceous adenitis. A skin biopsy confirmed the keratinization of the skin accompanied by the destruction of sebaceous glands and lymphocytic mural folliculitis. Infiltration of lymphocytes and apoptosis of cells in the basal layer of the epidermis was also noticed. During necropsy, inflammation and erosion of the hepatic parenchyma was observed in the liver (interface hepatitis), which presented much similarities with the human form of autoimmune hepatitis.

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References

Baine K, Newkirk K, Fecteau KA, Souza MJ. Elevated testosterone and progestin concentrations in a spayed female rabbit with an adrenal cortical adenoma. Case Reports in Veterinary Medicine. 2014 (2014), Article ID 239410.

Beyer C, Cruz ML, Rivaud N. Persistence of sexual behavior in ovariectomized-adrenalectomized rabbits treated with cortisol. Endocrinology. 1969 Oct;85(4):790-3.

Boucher S, Thebault G, Plassiat G, Vrillon JL, Rochambeau H. Phenotypical description of hairless rabbits appeared in three different herds. Congrès mondial de cuniculture, Toulouse, 1996.

Boucher S, Nouaille L. Maladies des lapins. Paris, F: Edition France Agricole; 2002.

Castle WE. The furless rabbit. J Heredity 1933;24:81-86.

East Drapeau E. An anatomical study of the furless condition in rabbits. J. Morphology 2005;54:365-388.

Florizoone K. Thymoma-associated exfoliative dermatitis in a rabbit. Vet Dermatol 2005;16:281-284.

Florizoone K, van der Luer R, van den Ingh T. Symmetrical alopecia, scaling and hepatitis in a rabbit. Vet Dermatol. 2007 Jun;18(3):161-4.

Jackson R, Rogers AD, Lukefahr SD. Inheritance of the naked gene and associations with postweaning performance and thermotolerance characters in fryer rabbits from an F2 generation. World Rabbit Sci 2006;14:147-155.

Kanai K, Nunoya T, Yasawa H, Shibuya K, Ihara M, Mizutani M, Yui F, Hoshi S, Tajima M. Congenital hypotrichosis in Japanese White Strain (JW-NIBS) Rabbits. J Toxicol Path 2000;13:21-27.

Kislovsky DA. Naked - a recessive mutation in the rabbit. J of Heredity 1928;19:438-439.

Kojimoto A, Naitoh H, Ozaki S, Suzuki S, Murakoshi N, Yokota K, Uchida K. A scleroderma-like lesion in a rabbit with Leydig cell tumors. Jap J Vet Anesthesia

& Surgery 2006;37:39-42. Lebas F. Besoins nutritionnels des lapins. Revue bibliographique et perspectives. Cuni-Sciences 1989;2:1-28.

Sandford JC. Handling and Management. In Sandford JC: The Domestic Rabbit, Oxford, UK: Blackwell Science; 1996.

Sawin PB, Denenberg VH, Ross S, Hafterer E, Zarrow MX. Maternal behavior in the rabbit: hair loosening during gestation. Am J Physiol 1960;198:1099-1102.

Van Praag E., Maurer A., Saarony T. "Skin Diseases of Rabbits". Geneva, CH: MediRabbit.com; 2010.

Varga M. "Hypersexuality in a castrated rabbit (*Oryctolagus cuniculus*)," Companion Animal, vol. 16, no. 1, pp. 48–51, 2011.