

# Mini mammal matters: reproduction and common reproductive issues in small mammals



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## Abstract

Exotic small mammals (or zoological companion animals) have become common pets. Having a basic understanding of their reproduction and reproductive anatomy is helpful. Common conditions that they develop should be understood. Prevalence of conditions and most common conditions vary by species. Awareness of these common conditions enables the veterinary practitioner to provide adequate medical therapy and treatments to these animals and to continue to improve their quality of life.

**Keywords:** Guinea pig, rabbit, hedgehog, reproduction, neoplasia

## Introduction

Small mammals are increasingly becoming common pets and are presented in veterinary practice. Common animals kept as pets include rabbits, guinea pigs, chinchillas, ferrets, mice, rats, and sugar gliders. There are other species (e.g., groundhogs, prairie dogs, and degus) that also have reproductive issues; however, these species are not as common. It is not unusual for an owner to have reproductive questions regarding their animal or for the animal to experience abnormalities throughout the course of their lives. Among small mammal pets, only rabbits and ferrets are commonly ovariectomized or castrated, consequently, other species have more reproductive issues. A brief overview of reproductive anatomy and common reproductive concerns of a few pet species is provided.

## Rabbits

Female rabbit anatomy is unique in that rabbit does not have a uterine body, instead rabbits have 2 separate uterine horns that open into vagina. Rabbits are induced ovulators and do not have a reproductive cycle; however, they appear to have receptiveness every 4 - 6 days. Rabbits ovulate ~ 10 hours after receptivity. Duration of pregnancy in rabbits is 30 - 32 days. Litter sizes can vary from 4 - 12 depending on the parity and size of the rabbit with larger and multiparous rabbits producing larger litters.

It is recommended to perform ovariectomy or castration on rabbits prior to 6 months of age. Surgery for females is similar to other animals; however, tissues are more friable hence typically a spay hook is not used. Other difference is excess fat-tissue in the female that poses a challenge to iden-

tify vessels and ovaries.<sup>1</sup> Castration in males is commonly via the scrotal approach and should be performed as closed or 'open to closed castration' to prevent herniation through the inguinal canal.<sup>1</sup>

Rabbits develop numerous lesions of their reproductive tract. Most common neoplasia is uterine adenocarcinoma, known to metastasize to lungs, liver, brain, or bone marrow. In rabbits presented with vaginal discharge, common uterine lesions were endometrial hyperplasia (44% [24/54]) and uterine adenocarcinoma (33% [18/54]);<sup>2</sup> 4 of these rabbits that presented with mammary adenocarcinoma had concurrent uterine disorders. Rabbits with endometrial hyperplasia had a mean age of 4.5 years whereas rabbits with adenocarcinoma had a mean age of 6.1 years. Upon presentation with adenocarcinoma, 8 rabbits were euthanized due to declined health or metastases. Rabbits that underwent ovariectomy as treatment for adenocarcinoma, 8/29 (28%) survived for 22 months or longer after surgery. Rabbits (5 - 6 years) had 79.1% prevalence of adenocarcinoma.<sup>2</sup> Mammary gland abnormalities in rabbits were associated with endometrial hyperplasia or adenocarcinoma in rabbits.<sup>3,4</sup> Ovarian neoplasia has been reported; however, the prevalence is low.<sup>4</sup> Other lesions of rabbit ovaries reported were follicular cysts, cystic rete ovarii, widespread ovarian necrosis with dystrophic calcification, and ovarian adenoma.<sup>5</sup>

## Guinea pigs

Females have bicornuate uterus with short uterine body and paired uterine horns. There is 1 cervix that opens into vagina. Guinea pigs have a vaginal closure membrane that opens at estrus and at parturition ~ day 26 of pregnancy.<sup>6</sup> Sexual maturity is ~ 2 months in females and 3 months in males. Females

can breed year-round; however, their peak reproductive age is 3 - 20 months, nevertheless, they reproduce until 5 years.<sup>6</sup> Guinea pigs have spontaneous ovulation. Duration of pregnancy is typically 65 - 71 days. Impending parturition can be determined by a gap of 15 mm in pubic symphysis, ~ 2 days prior to parturition.<sup>6</sup> This width can expand to 25 mm or more at parturition. Pubic separation may not occur adequately in guinea pigs that are bred after 7 - 8 months of age that can result in dystocia.<sup>6</sup>

It is not uncommon for guinea pigs to develop cystic ovaries. Additional presenting clinical signs include bilateral nonpruritic alopecia of the flanks in female guinea pigs. Cysts originating from rete ovarii are common in guinea pigs, with 58% prevalence.<sup>7</sup> Ovarian cysts were observed in 94% of guinea pigs 18 months old.<sup>8</sup> Clinical signs include abdominal distention, clitoral hypertrophy, depression, hyperkeratosis and/or hyperpigmentation of the nipples, pain, rounded, fluctuant mass, tachypnea, vaginal bleeding, and nonpruritic alopecia of trunk or inguinal area.<sup>9</sup> Diagnosis is typically via clinical signs and ultrasonography. Ovariohysterectomy is the treatment of choice and success with hormone injections (e.g., GnRH agonists) was variable.<sup>9,10</sup>

Uterine hyperplasia and neoplasia tends to occur in animals that are > 6 years of age whereas those that are 7 - 12 months of age had a higher prevalence of uterine inflammation.<sup>5</sup>

Routine castration of guinea pigs can be performed via scrotal approach; however, closure of the inguinal ring is important to prevent herniation of intestines or urinary bladder into scrotum.<sup>10</sup> Postoperative abscesses are not uncommon in guinea pigs' castration surgeries.

## Chinchillas

Chinchilla females have 2 uterine horns. Presence of 2 cervixes was discussed; however, the following is currently known.<sup>11</sup> Chinchillas have 2 uteri and 2 cervical canals housed in 1 anatomical cervix; officially termed as 'uterus duplex bicollis and vaginal simplex' (2 uteri, 2 cervixes, and 1 vagina). Although reproductive complications of chinchillas are not commonly reported in female chinchillas, they do occur. Penile encirclement of hair in some male chinchillas may result in ischemic damage to penis and should be observed for and included in a routine examination.

## Ferrets

In US, most ferrets are ovariohysterectomized or castrated at 6 - 8 weeks of age. In other countries, ferrets are left intact or 'chemically sterilized', typically with a deslorelin (GnRH agonist) implant. Females are sexually mature at 8 - 12 months of age. Duration of pregnancy is 39 - 42 days. Pseudopregnancy lasts 40 - 42 days.<sup>6</sup> Ferrets are seasonally polyestrous. In male ferrets, testes enlarge during December - July when spermatogenic activity occurs. Females are in persistent estrus from end of March to early August. Prolonged estrus or persistent estrus cause severe anemia, thrombocytopenia, and bone marrow suppression. Fifty-five percent of thrombocytopenic females were in persistent estrus with a mortality rate of 40%.<sup>6</sup> Ferrets

can have a hematocrit of < 25%.<sup>12</sup> Treatment involves stabilizing the ferret with blood transfusions, supportive care, and ovariohysterectomy. Gonadectomy is discouraged as it has been linked with development of hyperadrenocorticism.<sup>13</sup>

Urethral obstruction can occur in ferrets due to hyperadrenocorticism from an enlarged prostate.<sup>12</sup> Cryptorchidism is reported in < 1% of ferrets.<sup>14</sup>

## Rodents – mice and rats

Benign fibroadenomas of the mammary gland are common in rats. These growths tend to be locally invasive and can develop anywhere along the mammary chain. Surgical treatment is the treatment of choice. Secondary or additional masses can develop shortly after surgery, or other complications (e.g., seromas or dehiscence) can occur. Although treatment with deslorelin implants was attempted, it was not successful in decreasing occurrence.<sup>15</sup> Performing ovariohysterectomy prior to development of mammary fibroadenomas, or by 5 - 7 months of age, reduced the development of these spontaneous tumors by 95%.<sup>16</sup>

Mice, however, tend to develop malignant mammary adenocarcinomas and have been associated with mouse mammary tumor virus, and are commonly used in human breast cancer research.<sup>17</sup>

## Hedgehogs

Hedgehogs have 2 uterine horns. Uterine neoplasia is not uncommon. Neoplasia include endometrial stromal nodules (13.3%), nonneoplastic endometrial polyps (6.67%), and mammary gland adenocarcinoma (7.6%).<sup>18</sup> Primary neoplasia of uterus and ovary was adenocarcinoma followed by stromal sarcoma, and leiomyosarcoma.<sup>19</sup> Mammary gland adenocarcinoma was observed in 9% of cases, 8.49% reproductive disorders and in 1 case of pyometra.<sup>20</sup> Adenomas have also been reported. Reproductive neoplasia were diagnosed in females from 2 to 5 years of age.<sup>19</sup> Ovariohysterectomy of affected animals prolonged their lives and should be performed where possible.<sup>10</sup>

## Sugar gliders

These animals are marsupials and have 2 uterine horns, and 2 lateral vaginas that open into 1 cul-de-sac divided by a septum.<sup>6</sup> Males have large prostate, 2 pairs of Cowper's glands (bulbourethral glands), have pendulous scrotum, and bifid penis.<sup>6</sup> External urethral opening is located at the base of penis so if there is penile trauma the distal penis can be amputated.<sup>10</sup> Sugar gliders are easily castrated via electrocautery and the pendulous stalk of testes is incised.<sup>10</sup> Sugar gliders are known to self-mutilate postoperatively and should be monitored.

## Conclusion

Species-specific differences exist in reproductive anatomy and reproductive disorders. Thorough understanding of each spe-

cies and better knowledge of their conditions will enable appropriate diagnosis and therapy for each animal.

## Conflict of interest

None to declare

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