

Bijou's abnormally large clitoris leads to big surprise

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Bijou, a French bulldog bitch

Bijou is an 18-month old French bulldog that appears perfectly normal at first glance. She is healthy and her behavior is exemplary. However, her owner brought her to the Université de Montréal Faculty of Veterinary Medicine because he was intrigued by a particular feature: she has a disproportionately large clitoris!

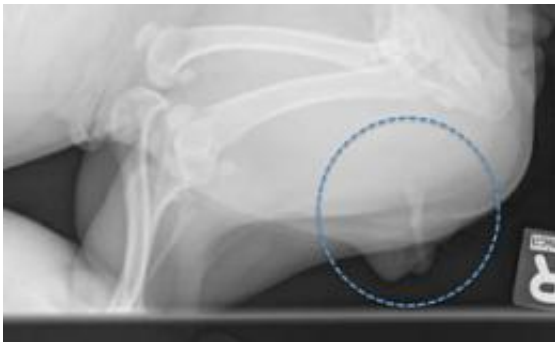
The anatomical exam concluded that the vagina and uterus are normal. However, an ultrasound revealed the presence of a tissue that could be a non-developed prostate, and a subsequent x-ray identified a baculum (or penile bone) inside the clitoris, which is a trait of male dogs.

Analysis of the gonad tissues confirmed the presence of degenerated testicles containing seminiferous canals but no spermatocyte cells. And

genetically, the dog's chromosomes are XX, which is determinant of the female sex.

Absence of the SRY gene

The veterinarians conducting the medical examinations were about to be surprised yet again. Until now, these anomalies were rare but well documented. There are many cases of sexually female individuals with male characteristics. These individuals are usually carriers of the SRY gene, typically located on the Y chromosome, which triggers the genetic process of masculinization of the fetus.



Radiography showing the penile bone in the the clitoris of a French Bulldog.

However, it can occur in both humans and animals that translocation of the SRY gene during the spermatogenesis process makes it emerge on the X chromosome instead. The second sexual chromosome provided by the mother is naturally an X chromosome, which will result in double X individuals, hence females, but with masculine traits given the presence of the SRY gene. In humans, this anomaly occurs in one of 20,000 births.

However, this is not what happened to Bijou because the analyses show that the SRY gene is outright absent. “She is a female with two X chromosomes and testicles despite the absence of the SRY gene,” says baffled Professor David Silversides who diagnosed Bijou at the veterinary genetics laboratory in Saint-Hyacinthe.

Similar anomalies were reported in various farm animals such as pigs, horses, goats and twenty or so dog breeds. However, Bijou is the first French bulldog diagnosed with this unique condition in North America and the second in the world.

The SRY gene is absent in 20 percent of hermaphrodite cases, according to Professor Silversides. “In goats, we know the gene at the source of these malformations but we are completely ignorant about the process in other species including humans,” says Silversides. At least nine [genes](#) could be at play in dogs but every lead has been a dead end.

Searching for the recessive gene

These cases are troubling because based on current genetic knowledge the SRY gene is necessary to the development of masculine features. If an individual has a Y chromosome on which the SRY gene is either absent or inactive, that individual will genetically be male with sterile female genitalia. But the case of Bijou demonstrates that an unknown molecular environment can lead to the development of masculine tissues despite the absence of the triggering gene.

Professor Silversides puts forth the hypothesis of a recessive gene present in the genome of the species that both parents must have in order for the phenotype to be expressed. The case of Bijou could provide new leads while also providing insight into the process in humans.

To do so, however, it would be necessary to examine Bijou’s parents,

brothers and sisters, which requires the collaboration of the breeders. “Unfortunately, the breeders aren’t very cooperative in such situations and our efforts have been unsuccessful,” says Silversides.

Given the now two diagnoses in French bulldogs, Professor Silversides believes that the genetic mutation can potentially reoccur and is determined to inform breeders of the risk of genital malformations with this breed.

Provided by University of Montreal

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