

Exploratory view into abdominal fat necrosis in mice

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Background

Abdominal fat necrosis is a condition found in a variety of species including mice. It is a problem of mature animals, more commonly occurs in cattle and is characterised by the formation of necrotic fat masses in the abdominal cavity. Fat necrosis has historically been termed lipomatosis. However this term is no longer appropriate because the masses are neither neoplastic nor hyperplastic.

Animal and Plant Health Agency (APHA) undertakes research into Transmissible Spongiform Encephalopathies (TSEs) part of which uses a mouse bioassay of various transgenic mouse lines. TSEs are a group of slowly progressive fatal neurodegenerative disorders which include Bovine Spongiform Encephalopathy (BSE) in cattle, Scrapie in sheep and goats and Chronic Wasting Disease (CWD) in deer, moose and reindeer. BSE is zoonotic and was linked to the emergence of variant Creutzfeldt-Jakob Disease in humans.

In APHA's mouse colonies, the mice affected are female tgSHPXI mice, a transgenic line bred, maintained and intracerebrally inoculated for prion disease studies. On post mortem the Fat Necrosis has been shown to affect fatty tissue surrounding the uterine horns.

Observations

All mice are observed daily (Figure 1 healthy mouse) per standard procedure and mice inoculated with a prion disease are closely monitored for clinical signs indicating the onset of the disease to ensure the humane endpoint in the project licence is observed

All signs of ill health in inoculated mice are recorded on the animals' cards and a named veterinary surgeon is requested to look at those animals and advise on next action if required.



Figure 1.

Clinical signs of abdominal fat necrosis observed are: weight loss and/or sunken sides. If suspected these mice will be weighed (to provide an objective baseline) and offered wet diet on the floor of the cage.

The mice suspected of Abdominal Fat Necrosis are closely monitored for the condition deteriorating. Clinical endpoints for these mice have been a sudden loss in weight and/or disinterest in food and piloerection (Figure 2 and 3).

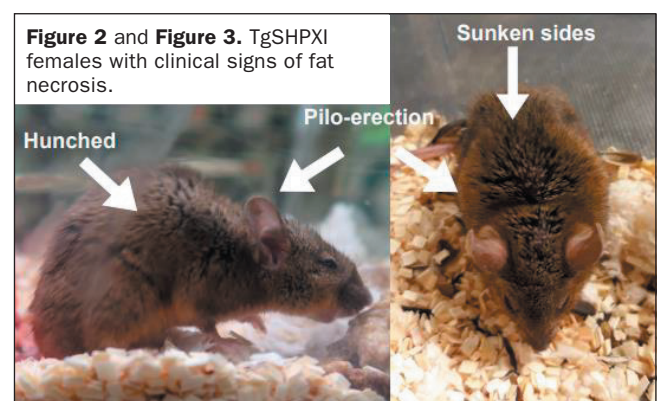


Figure 2.

Figure 3.

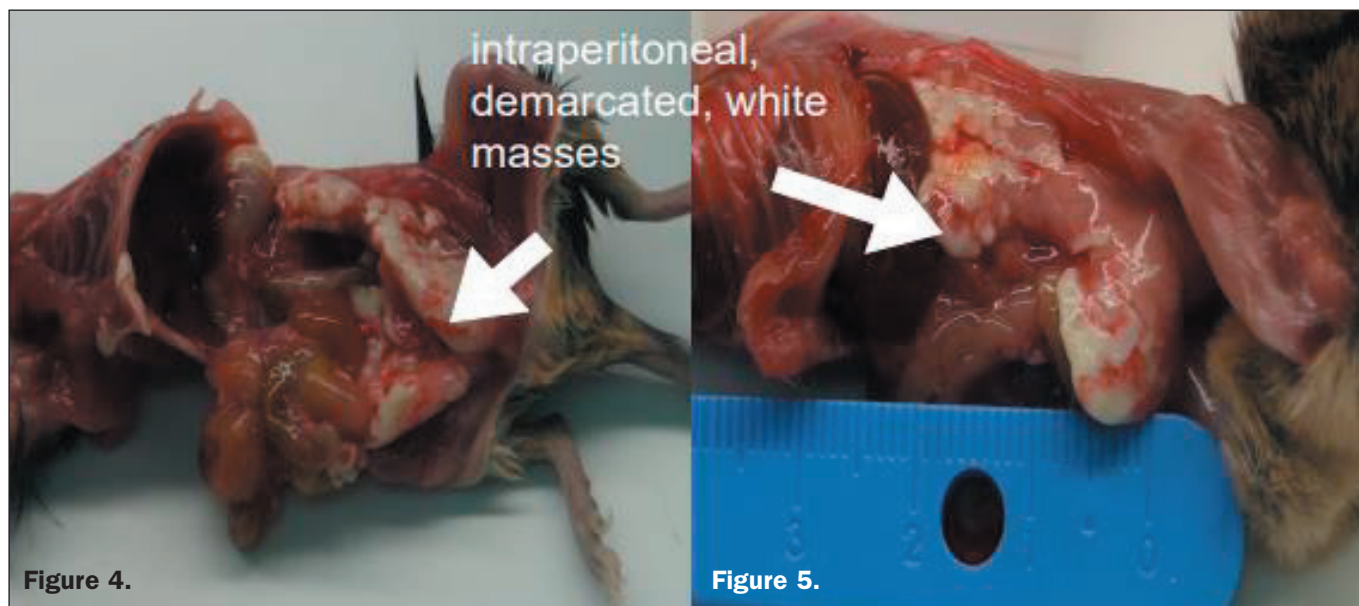


Figure 4 and Figure 5. Shows fat necrosis in tgSHPXI female mice.

Results

Between 01/2019 and 365/2022, out of 498 tgShpXI mice there were 7.83% suspect abdominal fat necrosis suspects of which 4.23% so far have been confirmed by histology. The remainder are awaiting screening.

TgSHPXI's which have been suspected of abdominal fat necrosis have typically shown symptoms at around 8 months old.

When samples of abdominal fat necrosis were sent to histology it was initially thought that these masses were tumours; only after histological assessment they were characterised as fat necrosis.

Through performing a post-mortem examination, we have been able to see what areas are affected by Abdominal Fat Necrosis. In figures 4 and 5 you can see intraperitoneal, demarcated, white masses. Sample collection of affected tissues and organs is ongoing alongside observations for clinical signs.

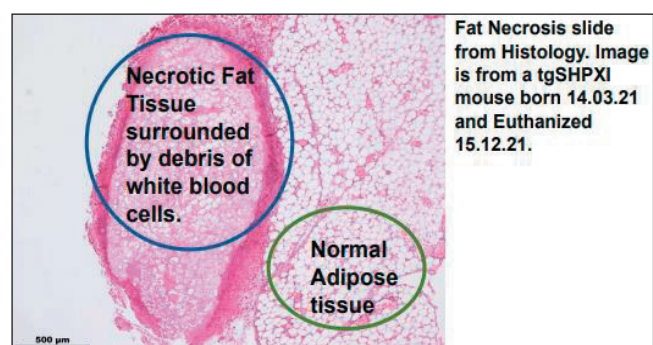


Figure 6. Shows both necrotic fat tissue and normal adipose tissue.

Discussion

There are 3 known causes of abdominal fat necrosis found in other species, one of which is the ongoing consumption of feeds containing high concentration of fatty acids.¹ In 2021 sunflower seeds for environmental enrichment were discontinued for all mice.

Original signs of abdominal fat necrosis were seen in the previous tgSHPXI line. This mouse line has been refreshed and named TgSHPXIG. Unfortunately fat necrosis has also been identified in this rederived line.

It is still undetermined as to how the tgSHPXI mouse line is affected by abdominal fat necrosis. Investigations are still ongoing to help determine the causes of the identified fat necrosis.

Acknowledgements

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References

- ¹ The MSD Veterinary by Peter D. Constable. Last review/revision Apr 2021 | Modified Oct 2022. <https://www.msdsvetmanual.com/digestive-system/abdominal-fat-necrosis/abdominal-fat-necrosis-in-animals>