Thomas M. Donnelly, DVM, Column Editor

What's your diagnosis?

Sudden Death in an Anorectic Cynomolgus Macaque

When a biotechnology company sold the property upon which its primary animal facility was found, it moved its crab-eating macaques (*Macaca fascicularis*) to a facility run by a contract research organization (CRO). The biotechnology company had successfully pair-housed nearly all the macaques six years previously as part of its enrichment program. Besides the pair housing, the biotechnology company developed an environmental enrichment program that consisted of sturdy cage toys, shelves and perching branches, novel food treats, and a color television in each animal room that showed cartoon videos. The enrichment program appeared beneficial not only for the monkeys but also for the animal technicians who came to know the behavior, likes and dislikes of each monkey. The biotechnology company's animal facility staff provided the CRO with detailed records not only on the medical history of each animal, but the idiosyncrasies they found with each animal such as its favorite food treats, difficulty or ease in handling, and potential for self mutilation.

The CRO animal facility technicians observed a ten-year-old female monkey pulling hair from its arms soon after its arrival. This monkey did not have a history of behavioral problems, illness, or injury, and it remained pair-housed with the same cage mate in the new facility. Despite the technicians offering the monkey its favorite treats, it shortly progressed to sitting on the floor of its new cage. The facility manager then moved the monkey to a single cage in a room where other monkeys with behavioral abnormalities where placed. Although all the monkeys in this room were single housed, they received more attention in way of favorite treats, food puzzles, and daily monitoring because of their potential for self-mutilation. The facility veterinarian examined the ten-year-old female and took blood for hematology and biochemistry. The clinical examination was unremarkable and the blood results were similar to the normal blood results obtained from the monkey before it was moved to the CRO.

The monkey's behavior seemed to improve slightly in the new room. It stopped pulling hair from its body, but continued to sit on the cage floor. Its appetite decreased; the animal stopped eating monkey chow, but picked at food treats such as fresh vegetables, fruit and raisins, and food puzzles. The monkey did not appear sick or dehydrated, and its stools, although scant, appeared normal. The animal technicians found the monkey dead five days after it was placed in the new room. This was approximately 14 days after the monkey arrived at the CRO.

The CRO veterinarian did a necropsy. The monkey weighed 6.3 kg, and had lost 2.3 kg or 25% of bodyweight, since it arrived at the CRO facility. Despite the weight loss shortly before death, abundant deposits of body fat were still present in the abdomen, with numerous white granules embedded in the yellow abdominal fat. The liver was enlarged with rounded edges, pale, and friable. The kidneys were soft and pale. The stomach contained particles of fruit, vegetables, and raisins.

Microscopically, the veterinarian saw severe diffuse fatty change in the liver. Single large clear vacuoles replaced the cytoplasm of hepatocytes. In the kidneys he saw moderate to severe vacuolation of the proximal renal tubular epithelium. A few tubules were necrotic and contained granular or crystalline material. Vacuoles present in frozen sections of formalin fixed liver and kidney stained with Oil Red O were positive for neutral fats (**Fig. 1**). Mild to moderate, multifocal areas of pancreatic necrosis were present in some lobules. However, the most striking aspects of the pancreas were the pale exocrine pancreatic cells with little or no zymogen granules lining moderate to severe dilated acini. Some dilated acini contained floccular eosinophilic inspissated secretions that were PAS-positive.

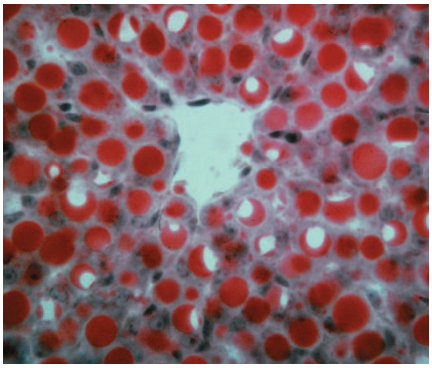

FIGURE 1. Photomicrograph of a liver lobule from a ten-year-old female *Macaca fascicularis*. Single large red-staining vacuoles fill the cytoplasm of the hepatocytes. The section is stained with Oil Red O and the red vacuoles are fat.

What is the cause of death in this monkey? Is this a recognized syndrome? What are the white granules in the abdominal fat? What has happened to the pancreas?

What's your diagnosis?