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PANCREATIC PATHOLOGY IN DASYURID MARSUPIALS

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Abstract: The pancreas of 231 dasyurid marsupials was examined. Focal interstitial pancreatitis was found in 22 animals, an exocrine adenoma in an Antechinus macdonnellensis and an islet cell adenoma in an Antechinus apicalis. Glycogenic vacuolation of islet cells found in one Antechinus sp. nov. and one Antechinus rosamondae is taken as evidence for spontaneous diabetes mellitus.

INTRODUCTION
During the last 11 years a histopathological survey has been carried out on 366 dasyurid marsupials of 14 species maintained at La Trobe University. The pancreas has been examined in 231 of these animals.

MATERIALS AND METHODS
In dasyurid marsupials the pancreas is a digitate structure in the mesentery abutting the duodenum. Large mesenteric lymph nodes lie close by. The pancreas, associated lymph nodes and most often the adjacent piece of duodenum were removed and fixed in formal acetic alcohol for at least 24 h, then kept in 70% alcohol until processed to paraffin. Paraffin sections were stained routinely with haematoxylin and eosin. The following additional methods were used on occasion: Periodic acid Schiff, Giemsa, Gordon and Sweet's method for reticulin and Alcian-blue-van Gieson.

RESULTS
The normal histology of the pancreas in dasyurid marsupials is very similar to that in man. The exocrine tissue is arranged in lobules with a clearly defined duct system and islet tissue is scattered fairly uniformly throughout. The ampullary region of the bile duct has a complex glandular pattern.

No gross lesions were seen in the pancreas of any animal. Focal interstitial pancreatitis characterized by interstitial collections of lymphocytes and plasma cells, often in widely separated areas, and associated with a varying amount of destruction of glandular tissue was found in 22 animals (Table 1).

In most animals the changes were slight and could well have been associated with adjacent inflammatory changes in gut or peritoneum due to parasitic infection. In one A. laniger there was an associated Toxoplasma cyst. In the S. crassicaudata with a severe interstitial pancreatitis (Fig. 1) the bile duct was dilated. This animal also had myocarditis due to Toxoplasma and a severe, mainly interstitial, pneumonia.

An exocrine adenoma was found in one A. macdonnellensis (Fig. 2) and an islet cell adenoma in one A. apicalis (Fig. 3). Neither animal had any other lesion which could be associated with these neoplasms and no clinical abnormality was recognized.

Vacuolation of islet cells was found in two animals: a male Antechinus sp. nov. and a male A. rosamondae (Fig. 4). The Antechinus sp. nov. was unexpectedly found dead 9 months after capture. At post mortem some 15 h after death there was no other significant finding apart
from interstitial pulmonary oedema. The \( A. \) \( \textit{rosamondae} \) was maintained in the laboratory for 5 months before it died while being handled. Its condition had been poor and food intake low for 3 weeks before death. At post mortem there was

TABLE 1. Frequency of occurrence of pancreatic lesions in dasyurid marsupials.

<table>
<thead>
<tr>
<th>Species</th>
<th>Number Examined</th>
<th>Interstitial Pancreatitis</th>
<th>Neoplasia of Islet Cells</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \textit{Antechinomys} ) ( \textit{laniger} )</td>
<td>8</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>( \textit{Antechinus} ) ( \textit{apicalis} )</td>
<td>5</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>( \textit{Antechinus} ) ( \textit{bellus} )</td>
<td>2</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>( \textit{Antechinus} ) ( \textit{bilarini} )</td>
<td>13</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>( \textit{Antechinus} ) ( \textit{macdonnellensis} )</td>
<td>27</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>( \textit{Antechinus} ) ( \textit{rosamondae} )</td>
<td>34</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>( \textit{Antechinus} ) ( \textit{sp. nov.} )</td>
<td>14</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>( \textit{Antechinus} ) ( \textit{stuartii} )</td>
<td>17</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>( \textit{Dasycercus} ) ( \textit{cristicauda} )</td>
<td>25</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>( \textit{Dasyuroides} ) ( \textit{byrnei} )</td>
<td>49</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>( \textit{Planigale} ) ( \textit{maculata} )</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>( \textit{Sminthopsis} ) ( \textit{crassicaudata} )</td>
<td>5</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>( \textit{Sminthopsis} ) ( \textit{leucopus} )</td>
<td>28</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>( \textit{Sminthopsis} ) ( \textit{macroura} )</td>
<td>1</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\)The Ninbing Antechinus
\(^2\)Islet cell adenoma
\(^3\)Exocrine adenoma

FIGURE 1. Severe interstitial pancreatitis in a \( \textit{Sminthopsis crassicaudata} \). H&E \( \times 70 \)
parasitic pneumonia and gastritis, an early enteritis and a spermatic granuloma in one epididymis. The vacuoles in the islet cells were strongly PAS positive (Fig. 5). This staining disappeared following diastase.

FIGURE 2. Poorly demarcated exocrine adenoma in an Antechinus macdonnellensis. The cells in the adenoma have few secretory granules and large nuclei. H&E × 100

FIGURE 3. Islet cell tumour in an Antechinus apicalis. H&E × 140
DISCUSSION

The aetiology of the interstitial pancreatitis could not be determined with any certainty. In one A. laniger this was associated with Toxoplasma cysts, but in other animals in the series, tox-

FIGURE 4. Vacuolation of islet cells in an Antechinus rosamondae: Note karyomegaly of central islet cell. H&E × 450

FIGURE 5. Heavy staining (black) of vacuoles by P.A.S. technique. This staining disappeared after diastase treatment. P.A.S. × 500
In the absence of pancreatic pathology, plasmosis was present in the majority of the animals. The focal interstitial pancreatitis was almost certainly of no significance to the well being of the animal. However, in the S. crassicaudata the severity of the lesion could have contributed to death.

An exocrine adenoma would not be expected to upset function. An islet cell tumour can, on occasion, be associated with the secretion of a variety of hormones, including insulin, gastrin and glucagon. In some such tumours more than one of these hormones may be secreted. The identification of hormonal constituents in the tumour is best done by immunoperoxidase techniques which we have not carried out. However, there is a suggestion that characteristic histologic patterns may more frequently be associated with some hormones than others. In the present example, it is possible that the hormone secreted would have been insulin or gastrin as the histological pattern conforms to the Type 1A of this suggested classification.

Glycogenic vacuolation of the islets was one of the features noted in a careful review of islet cell changes in guinea pigs with spontaneous contagious diabetes. Similar changes also have been reported in diabetic hamsters. Blood glucose levels have not been estimated in any of our dasyurids but both animals which had glycogenic vacuolation died suddenly. In the Antechinus sp. nov. found dead the possibility that vacuolation could have been related to autolysis was considered, but rejected as the adjacent acinar tissue was not obviously autolyzed and the vacuoles contained glycogen. The vacuolated islets in these two Antechinus is put forward as evidence of the occurrence of spontaneous diabetes mellitus in dasyurid marsupials.

The karyomegaly (Fig. 4) seen in association with glycogenic vacuolation was also seen in two additional A. rosamondae. One animal was approaching 2 years of age (males of this species live for approximately 1 year in the wild). The other animal had had a recent pregnancy. Karyomegaly of islet cells is seen in infants of diabetic mothers and is generally taken to be a lesion associated with hyperglycaemia. If this association holds good with dasyurid marsupials, then it may be that A. rosamondae is particularly prone to develop spontaneous diabetes mellitus.

LITERATURE CITED