A SURVEY OF NEOPLASIA IN DOMESTIC SPECIES OVER A 40-YEAR PERIOD FROM 1935 TO 1974 IN THE REPUBLIC OF SOUTH AFRICA. III. TUMOURS OCCURRING IN PIGS AND GOATS

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ABSTRACT


A survey was carried out on all the neoplasms in pigs and goats which are recorded in the registration files of the Section of Pathology of the Veterinary Research Institute at Onderstepoort over a period of 40 years, from 1935 to 1974. The tumours encountered in these 2 species were tabulated separately according to their type and site of origin.

In pigs, 24 tumours were recorded, and in goats, only 21. Of the porcine neoplasms 13 (54%) were lymphosarcomas, 5 (20.8%) were cutaneous squamous cell carcinomas and 2 (8.4%) were embryonal nephromas.

In goats, 8 (38%) of the tumours were squamous cell carcinomas, 50% of which occurred in the perineal region. Malignant melanomas and papillomas each made up 19% of the total, whilst lymphosarcomas accounted for 14% of the total caprine tumours.

INTRODUCTION

Amongst the domestic animals, the occurrence of tumours in pigs is usually low. Sastry & Tewelhaus (1965) and Monlux, Anderson & Davis (1956) in the United States of America (USA), and Plummer (1956) in Canada recorded, respectively, incidences of only 5.3% (37 out of 709), 3.2% (32 out of 1006) and 4.4% (28 out of 636) for porcine tumours as a proportion of the total tumours encountered in domestic animal species. In the Republic of South Africa (RSA), Jackson (1936) recorded only 4 tumours in pigs out of a total of 316 tumours amongst cattle, sheep, goats, horses and pigs. In a survey conducted in Israel the incidence was also low, only 2 out of a total of 709 tumours in domestic animals being recorded (Nobel, Klopfner, Perl & Nyska, 1979). In Holland, a slightly higher incidence (10% out of 333) of porcine tumours than in the countries mentioned above was recorded (Misdorp, 1967).

Lymphosarcomas were the most common tumour encountered in pigs in Holland (Misdorp, 1967), the USA (Sastry & Tewelhaus, 1965), Canada (Plummer, 1956), and the United Kingdom (Cotchin, 1960), and were the only type recorded amongst pigs in Israel (Nobel et al., 1979). Embryonal nephromas are also regarded as a common porcine tumour and in one survey in the USA they were the most common type of tumour recorded (Monlux et al., 1956), whilst in other surveys they were the second most frequent type (Plummer, 1956; Sastry & Tewelhaus, 1965; Misdorp, 1967). In the RSA, however, Jackson (1936) did not encounter any lymphosarcomas or embryonal nephromas in a series of 4 porcine neoplasms. Schulz & Schute (1960) reported on the occurrence of multiple acanthomas in the skin of swine in the RSA.

The numbers of caprine tumours recorded in surveys conducted in various countries have also been low. In the United Kingdom, Cotchin (1960) recorded only 4 caprine tumours out of a total of 452, 3 of which were lymphosarcomas. In India, melanomas and squamous cell carcinomas of the skin and papillomas of the skin or lips were the most common caprine neoplasms (Damodaran & Parthasarathy, 1972). Zubaidy (1976), in Iraq, in a series of 4 neoplasms, noted squamous cell carcinomas of the skin to be the most frequent type. Jackson (1936), in the RSA, recorded a relatively high number of caprine tumours, namely, 46 out of 316 tumours in cattle, sheep, horses, pigs and goats. Of these 46 tumours, 20 were melanomas and 20 squamous cell carcinomas.

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MATERIALS AND METHODS

The material for this survey was obtained from formalin-fixed tissues submitted to the Section of Pathology of the Veterinary Research Institute (VRI) at Onderstepoort by private or state veterinarians or stock inspectors from all parts of the RSA.

The registration files for each year of the survey were carefully screened and all cases diagnosed as neoplasms were noted. The pertinent data on these cases were recorded in separate registration files. The written reports for each individual tumour were also examined and any other significant data were noted and added to those obtained from the registration files. The tumours encountered in the 2 species were tabulated in separate tables according to their types and sites of origin. In the case of the goat, a series of tumours were re-cut and re-examined under the light microscope, so that any tumours which were referred to in the past by terms no longer in use could be reclassified, using current terminology. All the tumours in both the pig and the goat have been tabulated in this way.

RESULTS

The 24 porcine and 21 caprine tumours recorded are tabulated in Tables 1 & 2 respectively. Features of a malignant melanoma on the ear of a goat are depicted in Fig. 1–4.

**TABLE 1**

<table>
<thead>
<tr>
<th>Type</th>
<th>Site</th>
<th>Number</th>
<th>% of 24 tumours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lymphosarcoma</td>
<td>Lymph node and other organs</td>
<td>8</td>
<td>54%</td>
</tr>
<tr>
<td></td>
<td>Kidney</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ovary</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Leukaemia</td>
<td>Skin</td>
<td>1</td>
<td>4.2%</td>
</tr>
<tr>
<td>Squamous cell carcinoma</td>
<td>Kidney</td>
<td>1</td>
<td>20.8%</td>
</tr>
<tr>
<td>Embryonal nephroma</td>
<td>Liver</td>
<td>2</td>
<td>8.4%</td>
</tr>
<tr>
<td>Hepatocellular carcinoma</td>
<td>Liver</td>
<td>1</td>
<td>4.2%</td>
</tr>
<tr>
<td>Bile duct adenoma</td>
<td>Liver</td>
<td>1</td>
<td>4.2%</td>
</tr>
<tr>
<td>Granulosa cell tumour</td>
<td>Ovary</td>
<td>1</td>
<td>4.2%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>24</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Pigs**

Out of the 24 tumours recorded in pigs, 13 (54%) were lymphosarcomas the site and origin of which could not be ascertained (Table 1). Eight involved various lymph
nodes, although the specific lymph nodes affected could not be determined from the available data. Three cases had a generalized distribution involving lymph nodes and other tissues, especially the liver and kidney. One lymphosarcoma reportedly arose in the kidney and another in the ovary.

Squamous cell carcinomas accounted for 5 (20.8%) of the total tumours. Embryonal nephromas were the 3rd most frequently encountered type of tumour, although they accounted for only 2 (8.4%) of the 24 tumours. Two tumours, occurring in the ovary, included 1 lymphosarcoma and 1 granulosa cell tumour. There were 2 tumours arising in the liver, a hepatocellular carcinoma and a bile duct adenoma. One case of leukaemia was recorded, but the type could not be determined from the registration files.

**Goats**

Twenty-one tumours were recorded in goats (Table 2). Out of these, 8 (38%) were squamous cell carcinomas of the skin, 4 (19%) were malignant melanomas, and 4 papillomas. Four (50%) of the cutaneous squamous cell carcinomas occurred in the perineal region. Malignant melanomas were encountered at various sites, including the perineal region, vulva and ear. The histopathological features of a malignant melanoma on the ear of a goat are depicted in Fig. 1–4. Three out of the 4 papillomas were of cutaneous origin, whilst one arose in the oral cavity. Two of the cutaneous papillomas originated on the ear. Lymphosarcomas were the 3rd most commonly encountered tumours, accounting for 3 (14%) out of the 21 tumours. One mesothelioma and 1 haemangiosarcoma were also recorded.

**TABLE 2 Tumours in goats from 1935 to 1974**

<table>
<thead>
<tr>
<th>Type</th>
<th>Site</th>
<th>Number</th>
<th>% of 21 tumours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Squamous cell carcinoma</td>
<td>Skin—udder</td>
<td>1</td>
<td>38%</td>
</tr>
<tr>
<td></td>
<td>Skin—unspecified</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Skin—perineum</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Malignant melanoma</td>
<td>Skin—perineum</td>
<td>1</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Skin—unspecified</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vulva</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ear</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Papilloma</td>
<td>Skin—ear</td>
<td>1</td>
<td>19%</td>
</tr>
<tr>
<td></td>
<td>Skin—unspecified</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oral cavity</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Lymphosarcoma</td>
<td>Lymph node—unspecified</td>
<td>3</td>
<td>14%</td>
</tr>
<tr>
<td>Haemangiosarcoma</td>
<td>Skin—unspecified</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>Mesothelioma</td>
<td>Peritoneum</td>
<td>1</td>
<td>5%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>21</td>
<td>100%</td>
</tr>
</tbody>
</table>
The commonest type of neoplasm encountered in the pig was the lymphosarcoma, which accounted for 13 (34%) of the 39 tumours. Similar incidences have been reported in other countries, among them Canada, England, and the USA (Plummer, 1956; Cotchin, 1960; Sastry & Tewhaus, 1965). Mis Dop (1967) in Holland reported a somewhat lower incidence of 37.5% for lymphosarcomas. In all these surveys the lymphosarcoma was also the most frequent type of porcine neoplasm encountered. No lymphosarcomas were recorded in pigs in a survey of 1960 (Migaki, Nelson et al. 1960). In all these surveys the lymphosarcoma has been noted mostly in younger pigs of porker or baconer age (7-8 months) and only rarely in older pigs (5-6 years) or baconer age (9-10 months) or older sows (11-12 months). Eight in every 10 lymphosarcomas involved the lymph nodes on their own or the lymph nodes and other organs, especially the liver, kidneys and spleen (Plummer, 1956; Cotchin, 1960; Mis Dop, 1967). According to Monlux et al. (1956), the sublumbar, renal and iliac lymph nodes were the sites most frequently affected. They also reported a case of cervical vertebral involvement. Cotchin (1960) noted that the anterior mediastinal lymph nodes were frequently affected, whilst in a series of 92 lymphosarcoma cases reported by Misdorp (1967), the mediastinal lymph nodes were frequently affected in pigs. Large lymph nodes in the pelvis, vulva and perineum were noted to be the most frequent site for cutaneous squamous cell carcinomas in the goat. The high sunlight intensity in the RSA may account for the high incidence of squamous cell carcinomas in goats. In sheep, squamous cell carcinomas, after haemangiosarcoma, were the type of tumour most frequently encountered in the RSA (Bastianello, 1982).

The most frequent caprine tumour in this survey was the cutaneous squamous cell carcinoma, which accounted for 3 (38.1%) of the total. Jackson (1936), recorded 20 (43.5%) out of 46 tumours as cutaneous squamous cell carcinomas, whilst Zubaidy (1976), in Iraq, recorded 3 out of 4 tumours to be of this type. In contrast to these findings, only 2 (18%) out of a series of 11 tumours in goats in India were squamous cell carcinomas (Damodaran & Parthasarathy, 1972), while none were recorded amongst 6 tumours from goats in Israel (Nobel et al., 1979). Four out of the 8 squamous cell carcinomas in this series occurred in the perineal region. Jackson (1936) and Zubaidy (1976) also reported the perineal region to be the most frequent site for cutaneous squamous cell carcinomas in the goat. The high sunlight intensity in the RSA may account for the high incidence of squamous cell carcinomas in goats. In sheep, squamous cell carcinomas, after haemangiosarcoma, were the type of tumour most frequently encountered in the RSA (Bastianello, 1982).

The second most frequently encountered caprine tumour was the malignant melanoma, which accounted for 19% of the total. Jackson (1936) recorded a considerably higher incidence (43.5%) for this neoplasm. The latter probably arose because of the inclusion of several tumours originating from the Angora goat. Thomas (1929) noted that malignant melanomas, especially of the perineum, vulva and anus, were by far the commonest tumour of the Angora goat. The number of malignant melanomas recorded in this survey was too low to arrive at any significant conclusions as to their site of origin.

However, 3 occurred, 1 in the perineal region, 1 in the vulva and 1 on the ear. Jackson (1936) noted that the perineum and ear were the most frequent sites for the development of this tumour. Damodaran & Parthasarathy (1972), in India, recorded 3 (27.2%) melanomas out of a total of 11 tumours, although in this case the perineum and ear were not involved.

Cutaneous papillomas accounted for 19% of the total caprine tumours. In contrast to this finding, Jackson (1936) reported only 1 papilloma out of 46 neoplasms. In India, papillomas together with melanomas were the tumours most commonly encountered in goats (Damodaran & Parthasarathy, 1972), whilst, in Israel, 5 out of 6...
tumours were papillomas (Nobel et al., 1979). Three out
of the 4 papillomas in this series were cutaneous in ori-
gin, although the exact site could only be determined in 1
case. Smit (1962) identified the udder as a common site
for cutaneous papillomas in goats. Davis & Kemper
(1936), reporting on papillomatosis in Saanen milking
goats, stated that no papillomas were observed on the
teats or udder. Instead, they reported that the commonest
sites were the neck, head, shoulders and fore-limbs
above the knees.

The only other significant neoplasm recorded in goats
was the lymphosarcoma, which was the 3rd most fre-
cent type of tumour and accounted for 14% of the 21
tumours. Amongst 6 tumours recorded in goats in Israel,
1 was a lymphosarcoma (Nobel et al., 1979) while Cot­
chin (1960), in the United Kingdom, reported 3 out of 4
caprine neoplasms to be lymphosarcomas.

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