

# Spontaneous teratoma in a laboratory rat

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## INTRODUCTION

Teratomas are neoplasms that contain a wide variety of tissues derived from all three germ layers (ectoderm, mesoderm and endoderm). They are extremely rare in rats. Only four cases have been reported in the literature up to now (Schardein & Fitzgerald 1977, Ninomiya 1983, Itoh *et al.* 1985, Maekawa *et al.* 1989). In the present report we describe a spontaneous teratoma located at the tail of a male WKY/Han rat.

## MATERIAL AND METHODS

The rat was observed in the breeding colony of this strain in our institute. After euthanasia by chloroform, a complete necropsy was immediately performed. After fixation in 10 % formalin tissue samples from almost all organs and from the tumour were embedded in paraffin wax. Tissue sections (4 µm) were stained routinely with haematoxylin-eosin.

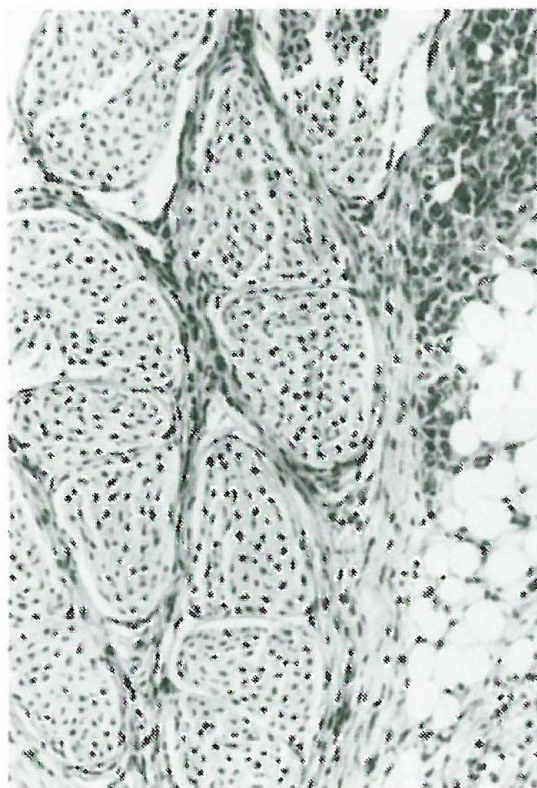
## RESULTS

The tumour was found in a 18 days old male WKY/Han rat. It had a diameter of about 0.5 cm and was located at the lower side of the base of the tail. Histologically, the well-demarcated tumour consisted of tissues that originated from all three germ layers i.e., nervous tissue, bone with bone marrow, cartilage, white and brown fat, smooth muscle, connective tissue, squamous epithelium, glandular epithelium and pancreas. Nervous tissue was represented by well-differentiated bundles of nerves (Fig. 1) and structures resembling closely primitive neuroepithelial rosettes (Fig. 2) with cells containing elongated hyperchromatic nuclei. Islands of cartilage (Fig. 3) varied in size and showed partly initial stages of calcification. In one location differentiated bone (Fig. 4) was found. Its marrow contained only few

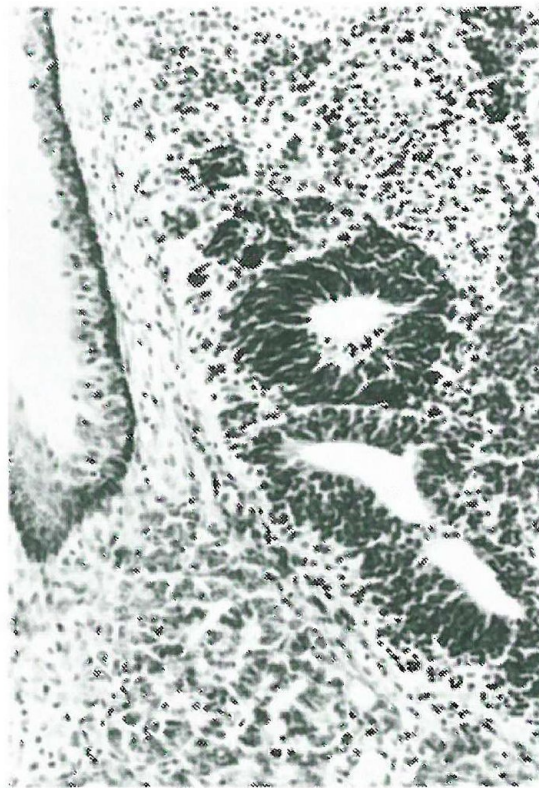
haematopoietic cells but large amounts of fat marrow (Fig. 4). Fatty tissue consisted of white fat (Fig. 1) and of large foci with brown fat (Fig. 7, 8). Most elements of the teratoma were separated by a loose to dense fibrous stromal component (Fig. 6) but focally areas of undifferentiated cells with round, basophilic nuclei (Fig. 5) occurred between the differentiated tissue. Strap-like cells (Fig. 8) similar to smooth muscle cells were observed in few locations. Keratinized as well as non-keratinized squamous epithelium (Fig. 5) was frequently found in the tumour. Glandular structures (Fig. 3, 4) were lined by a cuboidal to columnar epithelium that was focally multilayered and revealed foci of squamous metaplasia in some glands. In two small glands the lining contained goblet-cells. Islands of pancreatic tissue (Fig. 7) that lacked islet-cells also occurred in the teratoma. Mitotic figures were occasionally observed in the glandular lining and the islands of the squamous epithelium but were quite frequent in the undifferentiated areas.

## DISCUSSION

Spontaneous teratomas are extremely rare in rats but can be induced by extrauterine implantation of early eggs, egg cylinders and embryonic parts of 7.5 or 9-day-old rat embryos under the kidney capsule or by displacement of visceral yolk sac in fetectomized, pregnant rats after removal of feti (Sobis 1987). All spontaneous teratomas found in rats before were of extragonadal origin. They were located in the kidney (Schardein & Fitzgerald 1977) and adrenal gland (Ninomiya 1983) of Wistar rats, abdomen of a Sprague-Dawley rat (Itoh *et al.* 1985) and pituitary of a NRC:Donryu rat (Maekawa *et al.* 1989). In accordance with the previous reports, the teratoma of our case report was



*Fig. 1.* Bundles of nerves beside fatty tissue. H. & E.  $\times 100$ .



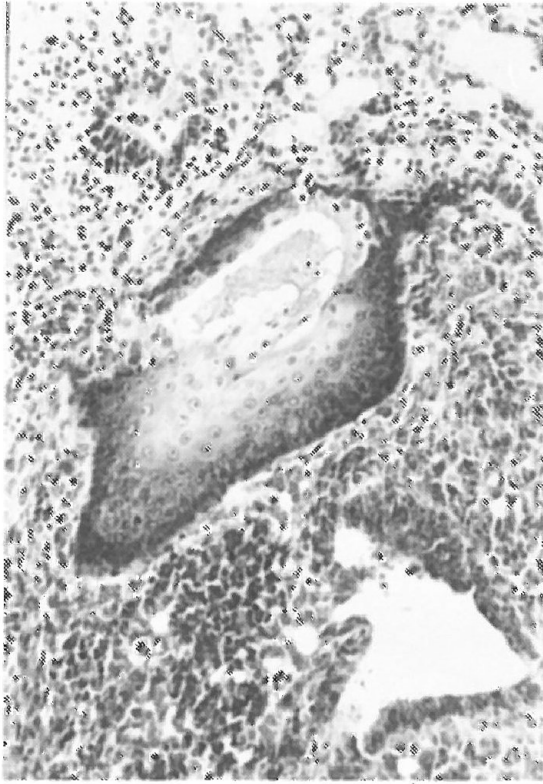
*Fig. 2.* Primitive neuroepithelial rosettes. H. & E.  $\times 100$ .



*Fig. 3.* Glandular structures lined by a columnar epithelium beside an island of cartilage. H. & E.  $\times 100$ .



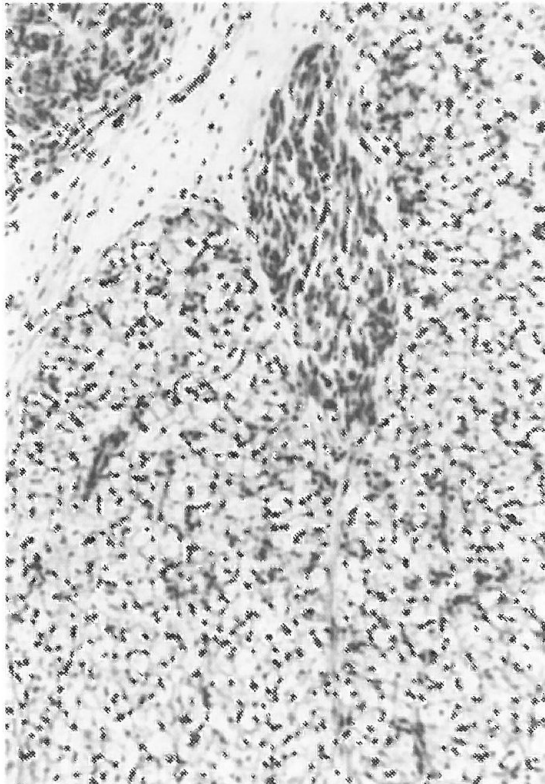
*Fig. 4.* Bony tissue surrounding fat marrow with few hematopoietic cells. H. & E.  $\times 100$ .



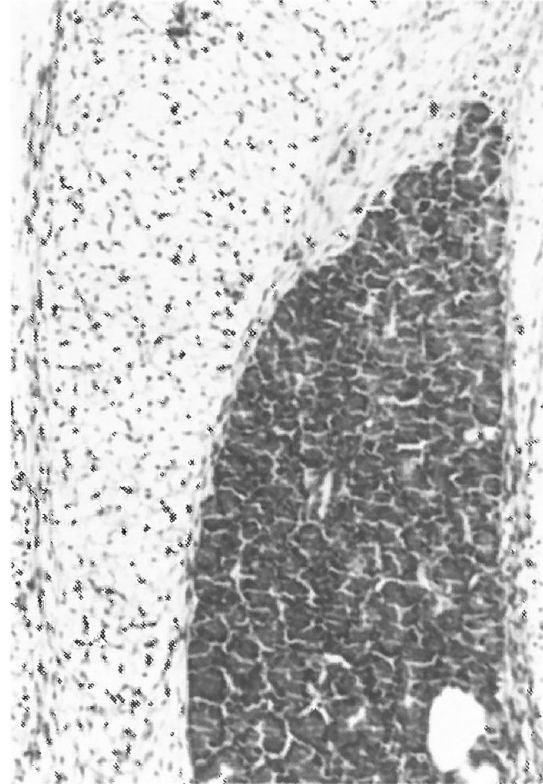
*Fig. 5.* Island of keratinized squamous cells embedded in undifferentiated cells with round, basophilic nuclei. H. & E.  $\times 100$ .



*Fig. 6.* Glandular structures embedded in a loose to dense fibrous tissue. H. & E.  $\times 100$ .



*Fig. 7.* Smooth muscle-like cells surrounded by brown fat. H. & E.  $\times 100$ .



*Fig. 8.* Pancreatic tissue beside brown fat. H. & E.  $\times 100$ .

also observed in a young male. Age of the other rats varied between 35 and 67 days. In man the most common location of extra-gonadal teratomas is the sacrococcygeal region. Teratomas of this location can be already present in newborn children and are considered as the result of parasitic twin formation (Eder 1986). Since the teratoma of the WKY-Han rat was observed at the same site, a similar pathogenesis could be discussed.

Teratomas located in the abdominal cavity have to be distinguished from primary or metastatic malignant mixed müllerian tumours of the uterus which are characterized by a focal or diffuse admixture of epithelial and mesenchymal elements and have been observed previously in LEWIS/Han rats (Kaspereit-Rittinghausen *et al.*, in press). In these neoplasms squamous and glandular epithelium as well as cartilage, bone, smooth muscle, striated muscle, fat and connective tissue can occur (Clement & Scully 1988). However, the tumours lack organoid structures, like pancreas, sebaceous glands or hair follicles etc which are normally observed in teratomas of man and animals.

The histological origin of teratomas is quite unclear. They are looked upon as descendants of germ cells of early embryonic cell origin, since these are multipotential. Because the primary germ cells develop in the visceral yolk sac and migrate to the genital ridges, it might be possible that some cells lose way and start to proliferate at other sites of the body.

#### Summary

A teratoma was observed in a 18 days old male WKY/Han rat. The tumour consisted of a variety of tissues including nervous tissue, bone, cartilage, fibrous tissue, smooth muscle, squamous epithelium, glandular epithelium, brown and white fat as well as pancreatic tissue.

#### Sammendrag

Et teratom blev observeret i en 18 dage-gammel han WKY/Han rotte. Tumoren bestod af en række forskellige vævselementer, herunder nervevæv, knogle, brusk, fibrøst væv, glat muskel, squamøst epitel, kirtlepitel, brunt og hvidt fedt samt pankreasvæv.

#### Yhteenveto

18 päivän ikäisessä WKY/Han urosrotassa havaittiin teratooma, joka sisälsi monia eri kudoksia: hermokudosta, luuta, rustoa, sidekudosta, sileää lihasta, levyepiteeliä, rauhasepiteeliä, ruskeata rasvaa ja haimakudosta.

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