Bilateral Ovarian Teratomas in a Mouse*

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Solid ovarian tumors of all types are very uncommon in the lower animals, and teratomas of the ovary are exceedingly rare. In 22,000 autopsies on mice, Slye, Holmes, and Wells (12) found only 46 with solid tumors of the ovary, and of these only one was a teratoma. Many of the mice they examined, moreover, were from stock having a high incidence of tumor formation.

The present paper reports the spontaneous occurrence of bilateral teratomas of the ovary in a mouse of the “Swiss” albino strain. The mass in the right ovary measured 23 X 19 X 20 mm. and that in the left ovary 17 X 10 X 10 mm. (Fig. 1). Both presented a mottled appearance suggesting, in the gross, the heterogeneous composition which was verified in histological sections. In the smaller tumor some remaining ovarian tissue was found, including one small follicle. The right ovary appeared to be almost entirely replaced by the teratomatous growth. The two tumors were similar in composition, consisting of several recognizable embryonic tissues in varying degrees of differentiation. There were large areas of nervous tissue (Fig. 3). Other areas contained glandlike structures, cysts filled with mucoid secretion, gastric mucosa, squamous cells forming epithelial pearls, and small nodules of cartilage (Fig. 5).

Extending over a considerable portion of the surface of one of the tumors was a deeply basophilic layer of cuboidal cells resembling the germinal epithelium which normally covers the ovary. In one locality, illustrated in Figure 4, the cells of this epithelium gradually became columnar and assumed the appearance of mucous cells. Extending inward from the mucus-secreting epithelium were tubular structures resembling typical gastric glands in which both chief and parietal cells were recognizable. The germinal epithelium of the ovary normally produces epithelial ingrowths which differentiate into totipotential primary oocytes (4). If the layer of cuboidal cells covering this tumor was derived from the original covering of the ovary, then its smooth transition into gastric mucosa would seem to suggest that the cells of the germinal epithelium may be capable of differentiating directly into the various embryonic tissues found in ovarian teratomas.

Solid ovarian teratomas are generally thought to arise by parthenogenetic development of ovarian eggs (3, 5). Experimental evidence for this theory was derived from the work of Bosaeus (1), who removed unfertilized ova from frog ovaries, stimulated them with a needle to initiate development, and then reimplanted them into the same frog. In this way he produced teratomata. Similar experiments involving stimulating mammalian ova to develop parthenogenetically have not been done. However, fertilized mouse and rat ova have been successfully transplanted to several extra-uterine sites. The results of these experiments have differed considerably. Nicholas (10, 11) transplanted rat ova beneath the kidney capsule and to segments of gut. In these sites he obtained an accelerated growth of various embryonic tissues but no differentiation of placenta or fetal membranes. Some of these growths survived for as long as 54 days.

In experiments reported in detail elsewhere we have transplanted segmenting mouse ova to the anterior chamber of the eye, the abdominal cavity, under the capsule of the kidney, and into the substance of the brain (6, 7). In over 60 successful transplants to these several extra-uterine sites the resulting growth consisted of placental trophoblast and often a rudimentary yolk sac. These placentomas had a limited life-span corresponding in duration to the growth period of the normal mouse placenta. In none of these transplants did we observe a disorganized growth of tissues and organs such as occurs in teratomata.

Spontaneous parthenogenetic development of eggs has been observed several times in the ovaries of guinea pigs (2, 8). In those guinea pigs, de-
FIG. 1.—Photograph of the teratomas of the right and left ovaries in situ. ×1.5.

Fig. 2.—A concretion formed in an area of nervous tissue within one of the tumors. Toluidine blue. ×300.

Fig. 3.—Section of tumor showing an area of nervous tissue typical of that which was very abundant in the mass in the left ovary. Hematoxylin and eosin. ×300.

Fig. 4.—A section of unusual interest at the surface of the tumor. The cuboidal epithelium covering the tumor in the upper half of the figure gradually becomes a columnar epithelium of mucus-secreting cells in the lower half. Growing into the mass from this epithelium are tubular glands which at higher magnification showed all the characteristics of gastric mucosa. Eosin and methylene blue. ×120.

Fig. 5.—One of several bars of cartilage found in the tumors. Eosin and methylene blue. ×150.
Development of the ova resulted in a growth of trophoblast and trophoblastic giant cells. To our knowledge no ovarian teratomas have been reported in this species.

Thus, eggs of experimental animals developing in the ovary and in other extra-uterine sites commonly produce placentomata without differentiation of the embryo, but under certain conditions they appear to be capable of forming teratomatous masses of embryonic tissues without development of placental structures. It is not known what determines which of these alternatives will be taken by an ovum.

Differentiation of both placenta and embryonic tissues and organs in the same mass has not been observed in these experiments. It is interesting that in the literature on human ovarian tumors there are numerous reports of choriomas and of teratomas, but there are scarcely any accounts of tumors which contained both fetal tissues and placental elements (9).

SUMMARY

A case of spontaneously occurring bilateral ovarian teratomas in a mouse has been described and discussed in relation to recent experimental work bearing upon the origin of teratoid tumors.

REFERENCES

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