CHARACTERISTICS OF THE TRANSPLANTABLE CARCINOMA OF THE RAT MAMMARY GLAND (RMK-1)

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The transplantable mammary gland carcinoma is obtained primarily in mice and rats and is widely utilized in experimental oncology for ascertaining some common mechanisms of tumor growths and for working out methods of therapy.

There are indications that the rat mammary gland carcinoma, in comparison with mouse mammary gland carcinoma, possesses more pronounced reactivity to some therapeutic methods; partially, in its reactivity to methods of hormonotherapy, it is similar to the reactivity of human mammary gland carcinoma [6, 7]. This similarity allows us to presuppose that the utilization of rat mammary gland carcinoma as an experimental model could be more perspective in investigations concerning methods of hormonotherapy than utilization of mouse mammary gland carcinoma. Besides, rats are more resistant to infections and various actions, which likewise served as a preference for utilizing them in experimental investigations.

Meanwhile, it is known that in rats, as against mice, there exists a small number of transplantable mammary gland carcinomas. Thus, in agreement with the summary of Dunham and Stewart [2], in rats there are only seven mammary gland carcinoma cultures, and in the USSR, according to the summary of E.E. Pogosyantz, there is only one such culture. The authors were successful in finding in the literature only five works [3, 4, 5, 8, 9] in which there were descriptions of the transplantable rat mammary gland carcinoma.

EXPERIMENTAL METHODS AND RESULTS

In 1958, in the authors' laboratory, there was obtained a transplantable rat mammary gland carcinoma, it was called RMK-1 (rat mammary gland carcinoma). The original tumor was observed in a thoracic mammary gland of a pregnant female 10 months of age (up to that moment the female raised five litters). It is of interest that during the last pregnancy the tumor grew very rapidly. However, after parturition, at the time of lactation, the tumor became ulcerous and almost completely resorbed; in the place of the tumor there remained only a small scarred surface with thickened borders. Soon after termination of the lactation the tumor relapsed and after two months its diameter reached approximately 4 cm; after this the tumor was transplanted subcutaneously, as a suspension, into two-week old females and males.

Macroscopically the tumor was solid with small hemmorhagic foci and insignificant necrosis. Microscopically the tumor appeared as a characteristic for rat alveolar carcinoma, composed of wide traces of poorly differentiated epithelial cells, divided by a small amount of stroma. The tumor cells were small and dark with slightly eosinophilic protoplasm, the nucleus was cyst-like, poor in chromatin. Mitoses were rare. In the epithelial rods there was observed a large number of pseudoglandular nodules with formation of the so called cribrose structures. In the tumor there were observed separate large cystoid nodules, however, nipple-like and nodular formations were absent. The secretory activity of the tumor was expressed moderately. The tumor's stroma was porous, with a large number of cellular elements; in the periphery there were observed lymphohistocytic infiltrations (Fig. 1 and 2).

During the first generation the tumor took in two out of three females. The tumors grew slowly and after 6 weeks reached only about 5 cm in size. During the second generation the tumor was also transplanted into female and male rats, two and three weeks of age. The tumor took in 32 out of 42 females (76.1%) and in 17 out of 19 males (89.4%). In the third generation the tumor was transplansplanted into females and males, three-and four weeks of age; it took in 17 out of 23 females (73.9%) and in 23 out of 31 males (77.4%).

The rate of tumor growth during the second and third generations did not differ from the first. It should be noted that the tumor grew somewhat more rapidly in males than in females. During two weeks after transplantation, the tumor in females and males reached on the average 0.2-0.5 cm after 4 weeks 0.8;,-1.5 cm; after 6 weeks, 1-2.5 cm, and after 8 weeks, 2-4 cm. Spontaneous resorption of tumors reaching the dimensions

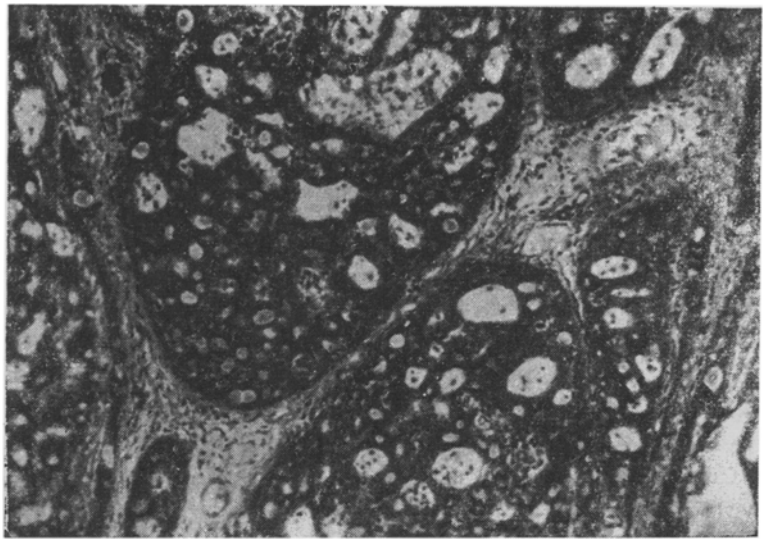

Fig. 1. Poorly differentiated alveolar carcinoma of the rat mammary gland. Large compartments of tumor cells divided by porous stroma. Inside compartments - pseudo-glandular cysts (cribrose carcinoma) containing a small amount of secretions and sloughed cells. Staining with eosin-hematoxylin. Magnification 130 x.

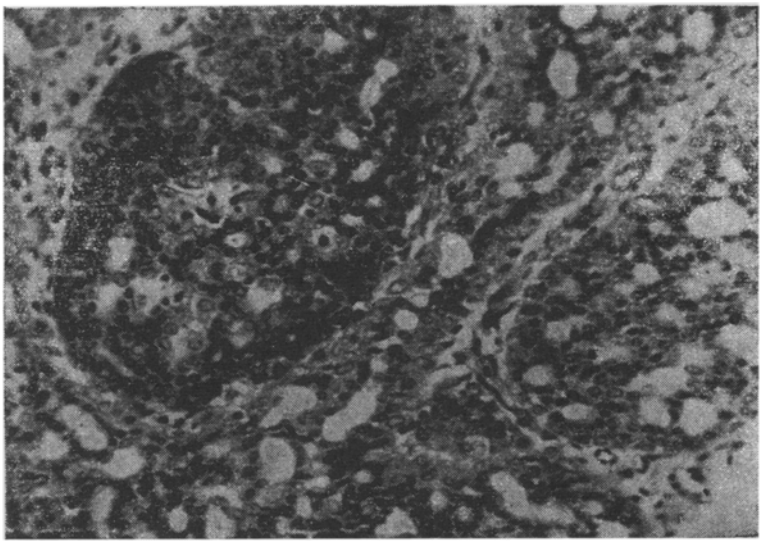

Fig. 2. The same tumor as in Figure 1. The tumor cells are small, dark, with a small amount of protoplasm and with a light cyst-like nucleus. Staining with eosin-hematoxylin. Magnification 270 x.

of 0.5-1 cm was not observed. The life duration of rats with tumors was 2.5-4 months.

There has been obtained the eighth generation of the tumor RMK-1, transplantable to females and males -weanling rats. Essential changes in the percent of transplantability, and also in the macro-and microscopic structure of the tumor during seven generations were not observed; however, the rate of tumor growth became somewhat more rapid. In the seventh generation the mean tumor sizes in 2,4 and 6 weeks after transplantation were correspondingly 1,2 and 3 cm.

In a number of conducted experiments it was established that RMK-1 possesses a clearly expressed reactivity to hormone actions, and it should be expected that the obtained tumor will become of definite interest for experimental oncology.

SUMMARY

Spontaneous carcinoma of the rat mammary gland of unknown origin, which appeared in a normal adult female rat, was inoculated subcutaneously to other rats and, thus, a transplantable RMK-1 carcinoma of

the mammary gland was obtained. At present this carcinoma passed through the 8th generation. The "take" of the tumor 79.2%. The tumor is transplanted to female and male weaning rats, grows slowly and does not metastasize. Rats with the tumor survive up to 4 months. Microscopically, the tumor represents an alveolar low-differentiated carcinoma characteristic of rats. Although the principal strain remained alveolar up to the 14th generation, in some subpassages the tumor was of cystopapillary and solid structure.

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