The tumor to be described arose spontaneously in a young male rat, about five months old, weighing 60 grams. When first observed, it appeared as a flattened oval mass, about 2.5 by 1.5 cm. in diameter, occupying the skin of the left thoracic region, and resembled an epithelioma such as occurs frequently on the human face. At the center the tumor was ulcerated, with an uneven granular surface. The margins of skin about this were nodular, raised, thickened, and slightly undermined, and of a reddened shiny appearance which shaded rather abruptly into the normal tissues. The consistency of the mass was distinctly firm, and it was freely movable on the deeper parts.

The tumor was removed by operation, and the major part of it was inoculated into 204 rats and, in two places, into its bearer. Serial paraffin sections which were made of the remaining tissue showed the following histological characteristics:

The tumor was in direct connection with the skin (fig. 1) and extended into the subcutaneous tissue but not into the muscle; it was composed of rounded and irregular alveolar masses of cells having the same staining and morphological characteristics as the basal cells of the epidermis and skin appendages (fig. 2). There were all gradations from typical basal cells to those of a spindle shape. The cells were of small size, with a deeply staining nucleus and relatively small amounts of protoplasm giving the alveoli a very dark appearance. In places these cells were in strands and whorls resembling a spindle-cell sarcoma (fig. 3). Here and there, in the center of cellular areas,
were glandular (fig. 4) or cystic structures filled with cell débris and lined by squamous cells in layers; there was, however, no production of keratin. The overlying skin was not abnormal except at one point where the strands of tumor cells and the basal layer of the epidermis were continuous. Staining with the Bielschowski method showed no intercellular collagen fibrils.

The interalveolar connective tissue showed marked proliferation and in places resembled sarcoma. As may be seen in the photomicrographs there was an unusual amount of lymphocytic infiltration about the tumor alveoli.

Seven weeks after inoculation, a few nodules were palpable in the 204 rats, and after nine weeks eighteen nodules in all were present. These increased in size with extreme slowness and six

**Fig. 1.** Basal-cell epithelioma of rat (primary tumor). $\times$ 200
of them reached dimensions sufficient for transplantation into a second generation. The largest was about 1 by 1.5 cm. and required 240 days for its growth.

Transplantations into a second generation were as follows:
1. Tumor 0.9 by 1 cm. 61 days post inoculation into 108 rats.
2. Tumor 0.8 by 1 cm. 62 days post inoculation into 120 rats.
3. Tumor (transplant into original tumor-bearing animal) 1 by 1.3 cm. in diameter 111 days after inoculation into 48 rats.
4. Tumor 1 by 1.3 cm. 119 days after inoculation into 54 rats.
5. Tumor 1.2 by 1.3 cm. 135 days after inoculation into 60 rats.
6. Tumor 1 by 1.5 cm. 240 days after inoculation into 68 rats.

In the first five series of the second generation, comprising 390 animals, several minute nodules appeared, but these failed to grow. A difficulty was experienced in the high mortality of
the animals from intercurrent disease. In the sixth series of the second generation one reached a size suitable for transplantation. This was transplanted into 48 rats, but failed to grow. One fragment was inoculated into the original animal and grew rather rapidly to a size 1 by 1 cm., when unfortunately the animal died. The histology of this tumor was peculiar. While the characteristic basal cells occurred and the arrangement was typical in places of the spontaneous tumor, elsewhere there was an adenomatous arrangement and in one part a solidly alveolar type of tumor was found with dense masses of cells closely investing blood capillaries.

Microscopical sections of all tumors removed for transplantation showed the same general morphological characteristics as

![Image of basal-cell epithelioma of rat](image)
the original growth. Further propagation of the tumor, owing to failure of the grafts, proved impossible and the tumor is now extinct.

Very interesting has been the observation of the grafts into the original animal, which lived for 377 days after the original tumor was removed. Into this animal two transplants from the spontaneous tumor were made, one into the right axilla and a second into the right groin. Growth in these did not start for nine weeks, or later than the appearance of the nodules in some of the other rats of the first generation. This is contrary to the usual experience in autotransplantation. As soon as growth had begun, however, both tumors grew progressively and fairly rapidly, until at 111 days after inoculation the tumor
in the axilla had attained a size of 1 by 1.3 cm., when it was removed for transplantation. Two fragments of 0.003 gram were inoculated into the left axilla and left groin. These grew to a size of 0.5 by 0.5 cm. each and then completely receded. The tumor in the right groin remained stationary without increase or decrease of size after the removal of the axillary tumor. Three hundred and seventy-seven days after inoculation, the animal died and this tumor was removed for microscopical examination. It showed in places the same histology as the original tumor and elsewhere a peculiar adenomatous arrangement of the cells. It was free from degenerative changes and mitoses were very scarce.

Subsequently, two grafts from a tumor of the second generation were transplanted on right and left sides beneath the skin of the back of the animal in which the tumor originated. Both of these after reaching the size of a split pea completely receded. Failure to grow was not referable to infection of the tumor for it grew in other animals.

If we attempt to analyze these fluctuations of growth energy in the original animal we meet with some very interesting questions. If the primary growth and subsequent recession of the four grafts that underwent resolution be regarded as the development of immunity in the animal, why was not the tumor in the right groin likewise absorbed? Furthermore, the development of any immunity whatsoever to its own growth by a spontaneous tumor animal has been thought not to occur (1) and certainly ordinary immunizing injections of homologous tissue fail completely to cause it. Yet if we do not regard the recession of four grafts in an animal as the development of a species of immunity, how is it to be interpreted? The phenomenon of the recession of one spontaneous tumor while others continue to grow has been observed in rare instances before; thus Haaland (2) records an instance of a tumor in one groin receding in the animal in which it arose while an axillary tumor of the same variety continued to grow. He records also an instance of complete temporary recession of a spontaneous tumor of the vulva. Both these phenomena are, however, conspicuously rare.
A second feature worthy of note is the remarkable length of time (266 days) which the graft in the right groin of the original host remained dormant without increase or decrease of size. This is most unusual. This nicely adjusted balance which permits cancer cells to live so long in a host and yet not perceptibly multiply is more characteristic of the benign tumors, which until quite recently have not been successfully transplanted, or of lymph-node metastases, which in man have been recorded as lying dormant for ten years or more.

Another question which is aroused by the failure of the four grafts in the original animal is, why cells which are native to one animal should first grow in another animal and then on return to the original host fail to grow? These things are contrary to the customary experience in autologous transplantation and merit further research.

This tumor, as far as can be ascertained, is the only basal-cell epithelioma that has been found in an animal. Its sluggish growth rate and ability to lie dormant for long periods is quite analogous to the behavior of the same type of tumor in man.

REFERENCES