

ON THE CELLULAR TYPES OF THE PINEALOMA

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It is known that pinealomas, teratomas and various gliomas occur in the region of the pineal body.^{1,2)} Of these tumors the structure of the pinealoma is usually regarded as characteristic consists of a mosaic of illdefined groups of large rounded cells bordered by zones of small darkly-staining cells.³⁾ Such a histological structure, however, may also be often observed in areas of pineal teratomas, teratomas occurring elsewhere in the body, and dysgerminoma or seminoma. Especially, the "pinealoma" areas in pineal teratomas closely resemble pinealoma, and it may be often difficult to distinguish the two tumors if the "pinealoma" areas develop on one side not associated with other differentiated tissues. Thus, the above description of the histological appearance of pinealoma seems unsatisfactory. Confusion regarding the structure of pinealomas has been caused by including under the title some teratomas,⁴⁾ and the so-called "pinealoma" should be distinguished into true pinealoma and pineal atypical teratoma. The cellular types of true pinealoma, therefore, require minute observation, and the present paper has been prepared with the object of placing the conception of the so-called "pinealoma" in order.

MATERIAL AND OBSERVATION RESULTS

As material, four examples of pineal tumors, besides seminomas and dysgerminomas for comparison, were used. Case 1 (a 19-year-old male) (fig. 1) and 2 (a 16-year-old male) have been diagnosed as pinealoma and case 4 (a 11-year-old male) (fig. 3) as pineal teratoma because of the presence of other tissues, while case 3 (a 13-year-old female) (fig. 2) was first regarded as pinealoma only, by observing microscopically a part of the tumor, but later this diagnosis was found erroneous by the finding of other types of tissues. The pineal bodies in cases 1, 2 and 4 were replaced by tumor tissue, and in case 3 was intact. In every case pubertas praecox was not found. For microscopical examination Hematoxylin-Eosin stain, Phosphotungstic Acid Hematoxylin stain, Hortega's method, Cajal's method and others were applied. Here the findings with Hematoxylin-Eosin stain will mainly be described.

As described above both the pinealoma and the "pinealoma" areas of the teratoma are composed of solid masses of large spheroidal cells, separated by a stroma which is infiltrated in many places by small cells superficially indistinguishable from lymphocytes. They are apparently in close resemblance though the rates of containing large and small cells are variable in locations or cases

Received for publication September 4, 1954.

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(figs. 4-7). Of the two groups of cells the large cells were first examined. In pinealomas the large cell has a large, spherical or oval, vesicular nucleus with one or two large eosinophil nucleoli and a few small scattered grains of chromatin. The membrane of the nucleus is thin and appears rather soft. Multinucleated cells are occasionally present. The cytoplasm is voluminous and finely granular though homogeneous at sight. Blephaloplasten were not noted in any specimen. Most of the large cells have no processes but a few may have one or more delicate processes ending in bulbs. It is characteristic that the cells with prolongations have clear polarity (fig. 8). On the other hand in teratomas the large cell has a rather oval or polygonal, showing a uniformity of large and small sizes, nucleus with mainly one basophil nucleolus and a large amount of diffuse chromatin or of thick grains; the atypical picture is greater than in pinealoma. The membrane of the nucleus appears thick and firm. The cytoplasm is more scanty, and so the nucleocytoplasmic ratio is larger than in pinealoma. Besides, the cytoplasm has stronger affinity for basic dyes (fig. 9). The large cells have process-like structures, but these are irregular and, observed in detail, are regarded as the cytoplasm itself degenerating. The large cells of the pinealoma correspond to the pineal parenchyma cells that are developing, and the areas of "pinealoma" structure in the teratoma are evidently similar to dysgerminomas or seminomas which are usually regarded to originate from the undifferentiated germinal cells.

It was also interesting to note that the course of degeneration in the large cells was traced. As characteristics of the degenerative cells in pinealoma, the nucleus becomes kidney-shaped or crescent-shaped and one-sided, almost all on the opposite side of the cell-pole, and becomes picnotic (figs. 10, 11). On the contrary in teratoma the membrane of the nucleus is firm so that changes in the cytoplasm become conspicuous before those of the nucleus; the cytoplasm shows vacuolisation or granulation (fig. 12, 13). Occasionally naked nuclei are present. Generally, degeneration in the pinealoma predominates in the nuclei and in the cytoplasm in the teratoma. Also in the pinealoma, proceeding still more, degeneration of the nucleus is followed by that of the cytoplasm (fig. 14).

On observing the relation of each large cell, in pinealoma the cells form a network connected to each other by the processes but appear independent. In teratoma the large cells indicate a distinct epithelial character and have a tendency to collect together; they may often represent a glandular arrangement.

A comparison between the large cells of the pinealoma and of the pineal teratoma indicates the following (table 1).

In the small round cells there are few characteristic findings regarded from the standpoint of differentiation of the two tumors. It was noted in the pinealoma that cells, which may be analogous to the immature forms of the large cells and regarded as the smaller cells composing the peripheral zones of the lobules of fetal pineal, were present in the small round cells. These cells are evidently distinguishable from lymphocytes; they differ from lymphocytes in their nuclear structure and have a more voluminous cytoplasm. There are various transitions between them and the large cells (fig. 15). Presence of these transitional forms may be considered as one of the characteristics in pinealoma.

TABLE 1. The Comparison between the Pinealoma and the Teratoma

Tumors → Large cell ↓	Pinealoma	Teratoma
Nucleus; Form	round, oval, kidney-shaped or crescent-shaped	oval or polygonal (not uniform)
Chromatin; Quantity Distribution	less fine reticular and spotted (vesicular)	more thick spotted or diffuse
Nucleolus; Number Nature	1-2, occasionally 3 large and eosinophil	mainly 1 small and basophil
Nucleus-membrane	thin and soft	thick and firm
Form of cell-division	longitudinal or transverse	obscure (two nuclei touched together)
Nucleocytoplasmic ratio	smaller	larger
Cytoplasm; Nature	eosinophil and finely granular	basophil and often degene- rative
Processes of cell	1-2, delicate	obscure (irregular, spindle- shaped or fusiform)
Polarity	clear	not clear
Atypical picture	not so distinct	relatively distinct
Characteristic of degene- rative cells	nucleus: kidney-shaped, crescent-shaped (picnotic)	cytoplasm: vesicular, gra- nular (naked nucleus)
Correlation of cells	relatively independent	epithelial (fascicular or gland-like)

Figs. 18-21 illustrate the pattern of the cellular types observed in the pinealoma, the pineal teratoma and dysgerminoma. Still other types of tissue in case 3 and 4 are shown in figs. 16 and 17; in one area of case 3 a few tubules lined with columnar, mucus-secreting epithelium and a nodule of cartilaginous appearance with myxomatous and loose fibromatous stroma (fig. 16) and in areas of case 4 adenomatous structure (fig. 17).

DISCUSSION

We agree with the view of Russell,⁴⁾ that the tumor usually called "pinealoma" is an atypical teratoma. Existence of true pinealomas, however, is certainly recognized, and the reasons have been given for settling the cellular types of the true pinealoma. Since an atypical teratoma may be excluded from pinealomas by the histological appearance, the uncertain term of so-called "pinealoma" should not be used as confusing.

The nature of the small cell has been discussed so far by many authors,⁵⁾⁶⁾ but their opinions are still divided and here we have avoided a discussion.

The problem of "ectopic pinealoma" is very interesting. Numerous examples have been published in which a tumor with "pinealoma" structure has occupied sites in the brain other than the pineal body, the latter being intact. We are unable at present to affirm if all of these belong to atypical teratomas. We will like to recall here the description⁷⁾ that the term pinealoma also is used to designate any neoplasm arising elsewhere in the brain provided the origin can be traced histologically to the pineal body.

Finally it has been reported that cases of pinealoma were often experienced

in Japan, though rare in Europe and America,⁸⁾ but we fear that atypical teratomas have been reported erroneously diagnosed as pinealomas, and we consider pinealomas are probably much more rare.

CONCLUSION AND SUMMARY

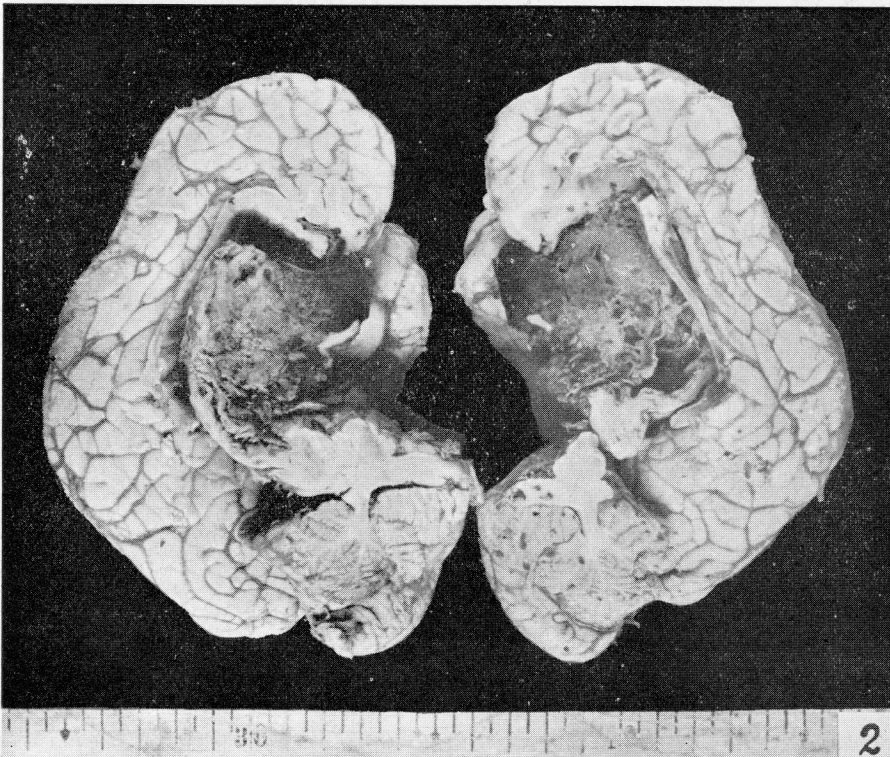
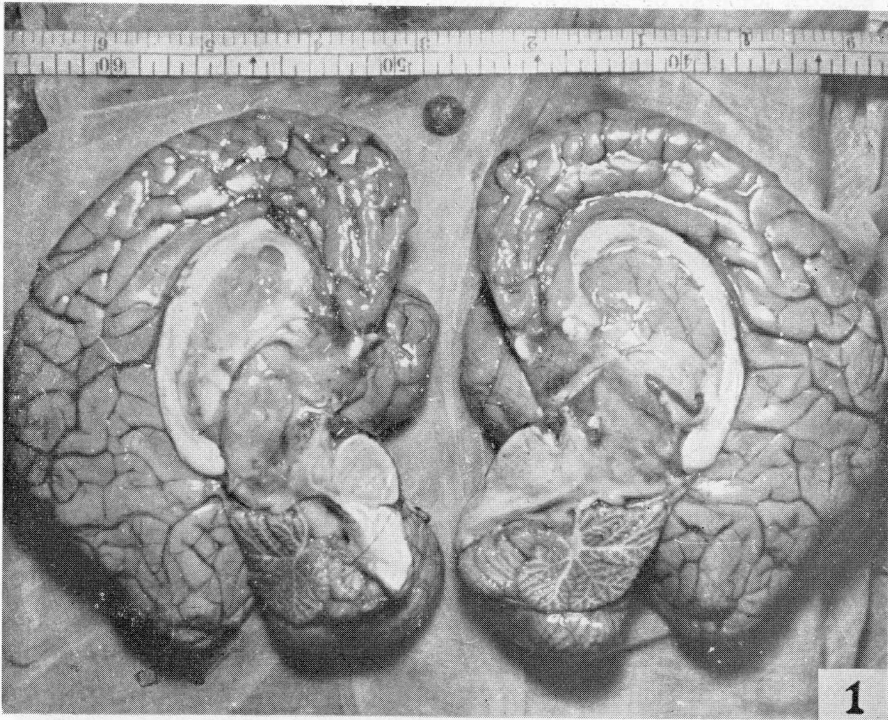
Pinealoma can be clearly distinguished from "pinealoma" structure in pineal teratoma, by the cellular types, in particular by the large round cells. This fact may suggest that a true pinealoma certainly exists. As Willis has pointed out, the whole subject of pineal tumors and their structure is in need of review, especially by a complete examination of the tumors and careful cytological study. We believe our observations contribute to this problem.

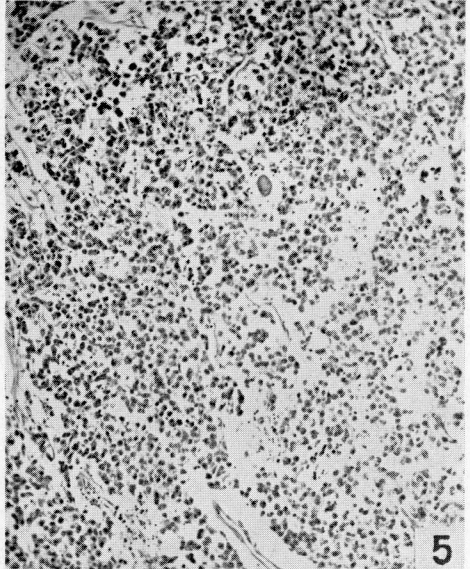
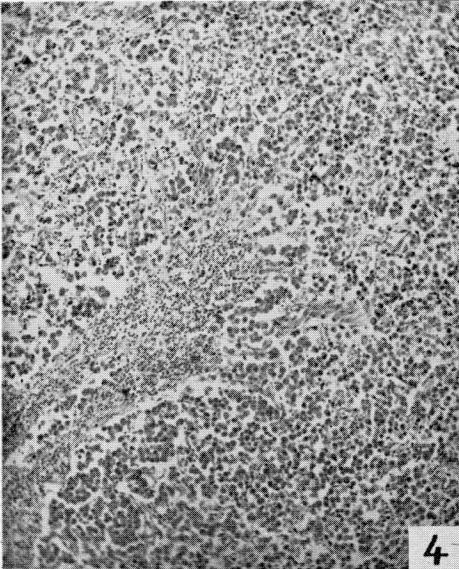
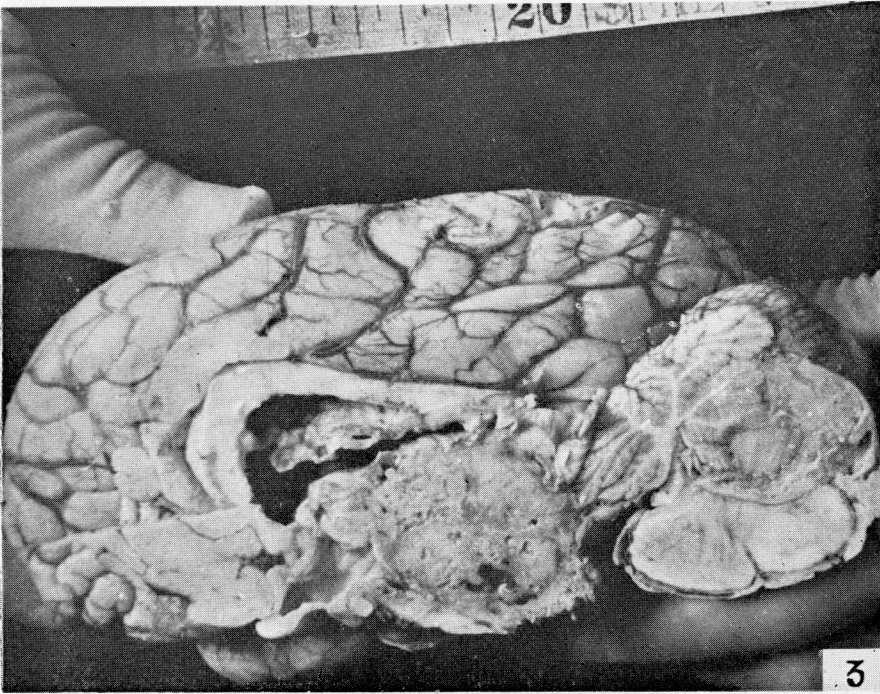
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EXPLANATION OF FIGURES

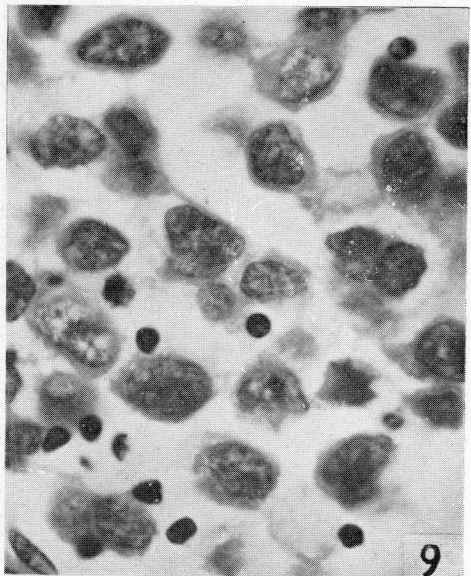
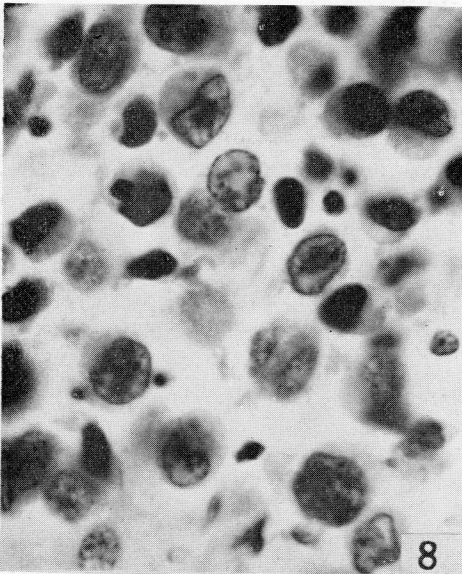
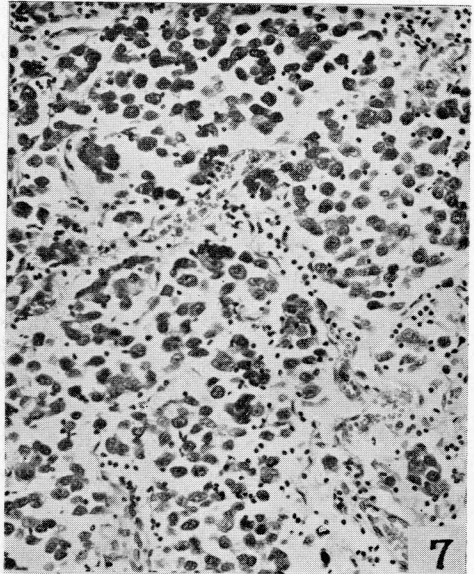
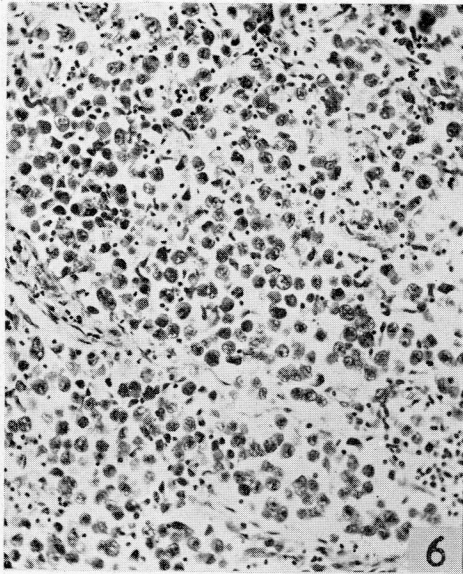
1. Pinealoma (case 1). Mid-sagittal section of brain. No. 9.
2. Pineal teratoma (case 3). Mid-sagittal section of brain. No. 8.
3. Pineal teratoma (case 4). Mid-sagittal section of brain. From S. Ito's case. No. 10. (s. 2434).
4. Pinealoma, showing large spheroidal cells separated by zones of small cells. $\times 100$.
5. "Pinealomatous" area of pineal teratoma. See the close resemblance to fig. 4. $\times 100$.
6. 7. Pinealoma and pineal teratoma. $\times 200$.
8. Pinealoma, showing the fine structure of large cells. $\times 1000$.
9. Pineal teratoma. Notice a difference in the cellular types to fig. 8. $\times 1000$.
10. 11. A degenerative area of pinealoma, showing the nuclei one-sided, kidney-shaped or crescent-shaped, and the cytoplasm becomes granular. $\times 200$ and $\times 1000$.
12. 13. A degenerative area of pineal teratoma, with cytoplasm showing vacuolization or granulation, and the nuclei remaining relatively intact. $\times 200$ and $\times 1000$.
14. Pinealoma, showing further degeneration. Notice vesicular cytoplasm and compare it with fig. 11. $\times 1000$.
15. Small darkly-staining cells in pinealoma, so-called lymphoid cells. $\times 1000$.
16. Other types of tissue in pineal teratoma (case 3); a few tubulus lined with columnar, mucus-secreting epithelium and a nodule of cartilaginous appearance with myxomatous and loose fibromatous stroma. $\times 200$.
17. Other types of tissue in pineal teratoma (case 4); irregular adenomatous structure. $\times 200$.
18. 19. Pattern of the cellular types observed in pinealomas.
20. Similar illustration of pineal teratomas.
21. Similar illustration of dysgerminomas.





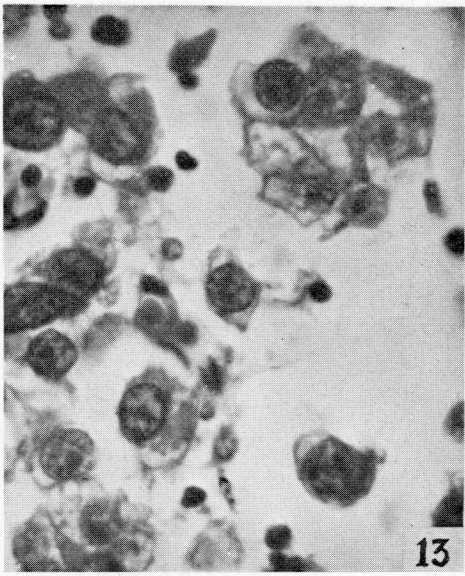
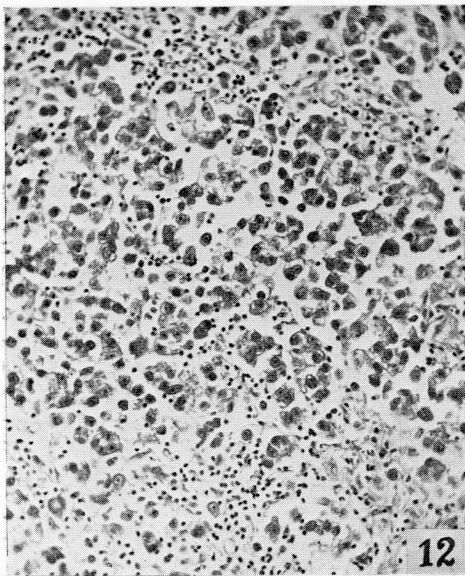
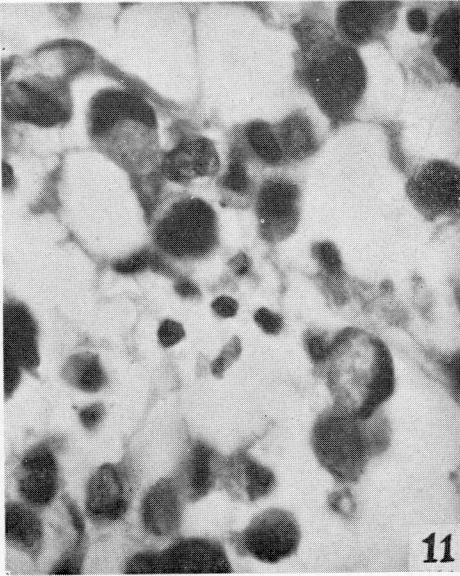
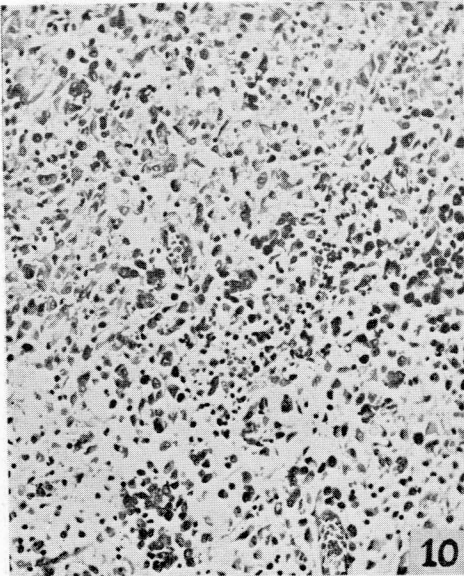
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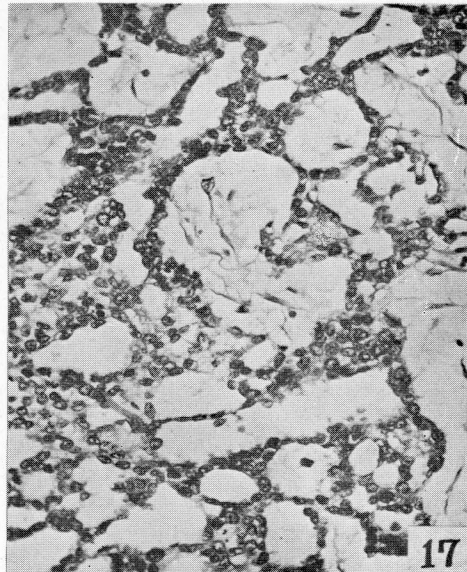
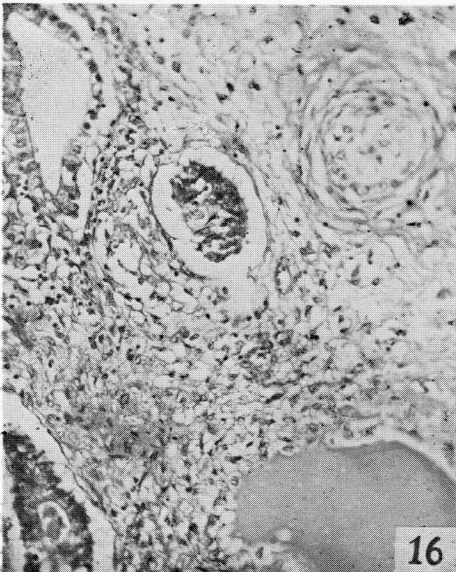
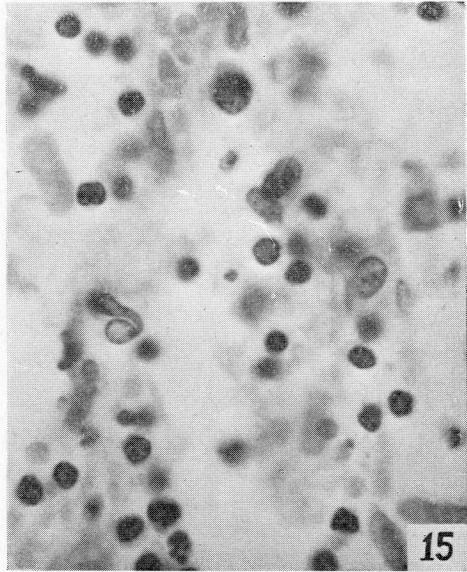
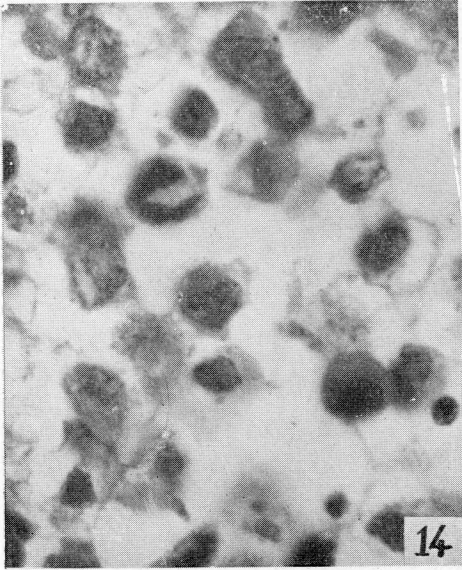
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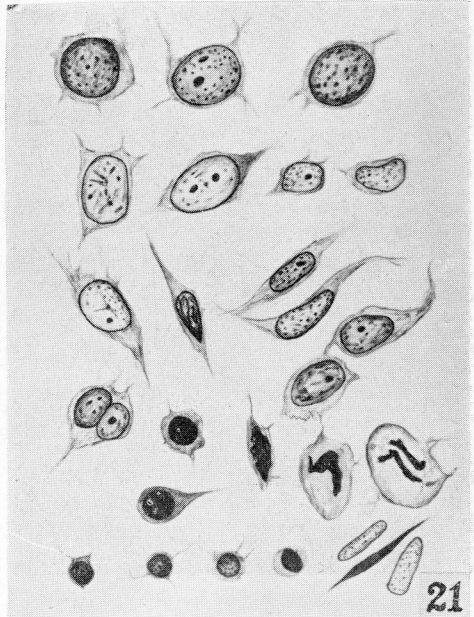
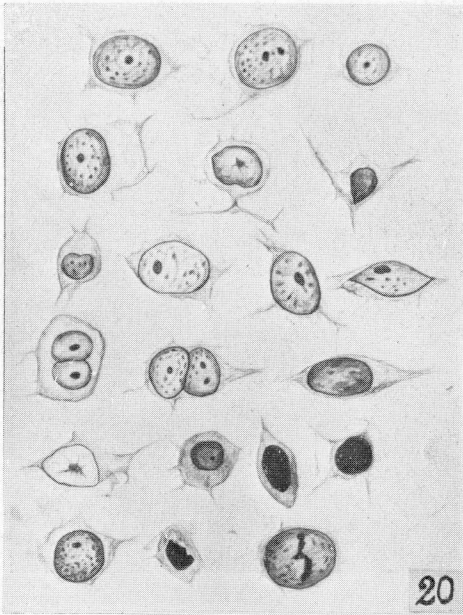
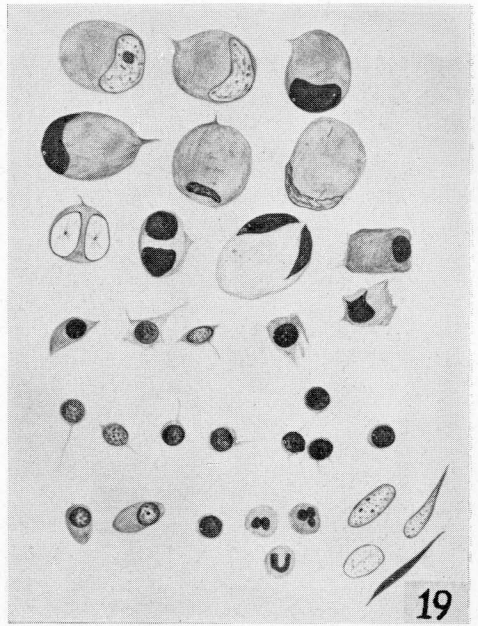
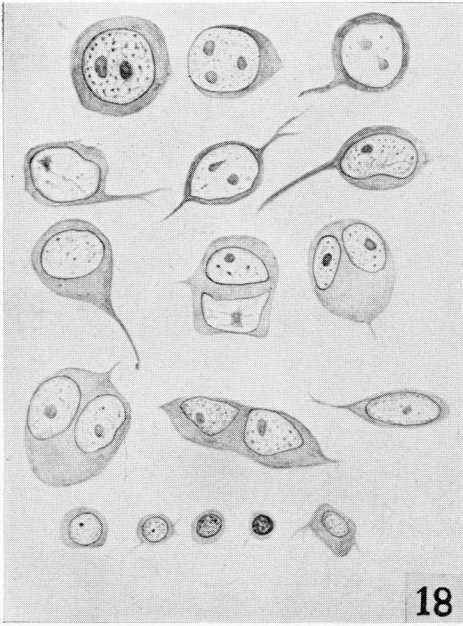
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