(3) the malignant cell presumably contains the noninfectious reovirus type 3 viral genome; and

(4) there is a clear morphological and cultural relationship to the Burkitt lymphoma (13).

It is not the purpose of this communication to discuss the possible role of reovirus type 3 in the etiology of Burkitt's African lymphoma as this has been done elsewhere (14). We have recorded our preliminary observations on the association of a murine lymphoma with reovirus type 3 and suggest that this virus may induce two types of transformation in the cells of mice recovered from neonatal infection. One results in neoplasia and the other in chronic immunological injury (hepatitis, pancreatitis and C.N.S. involvement) (3,7). The relationship between the two is yet to be defined.

Summary. Suspensions of spleen cells from a mouse with late chronic infection (272 days) with reovirus type 3 produced a lymphomatous neoplasm; the tumor was easily passaged by the IP route to newly-born mice of the same strain.

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Electron Microscopic Findings of a Murine Lymphoma Associated with Reovirus Type 3 Infection.* (30706)

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As reported in the associated communication, spleen cells from a reovirus-infected mouse (2731/6/272) with the late chronic disease produced a highly malignant lymphoma of the mesenteric tissues of neonatal mice when passed intraperitoneally (1). The lymphoma could be reproduced by intraperitoneal passage of intact cells in newly-born mice.

Methods. Portions of lymphoma were immersed in osmic acid fixative, dehydrated, embedded in araldite and sectioned with a Huxley microtome using glass knives. The sections were examined on a JEM T6 60 KV electron microscope using a 50 μ objective aperture.

Results. The tumor consisted of lymphoblastic cells measuring 6-9 μ in diameter. Ribosomes were plentiful in the cytoplasm. Cytoplasmic organelles consisting of mitochondria, a few strands of endoplasmic reticulum and the lamellae and vesicles of the Golgi apparatus, were seen regularly in these malignant cells (Fig. 1). Centrosomes were often found in the paranuclear region.

Lipid droplets and granular osmiophilic membrane bounded inclusions probably representing phagosomes, were also in evidence in the cytoplasm of these cells. Fine fila-

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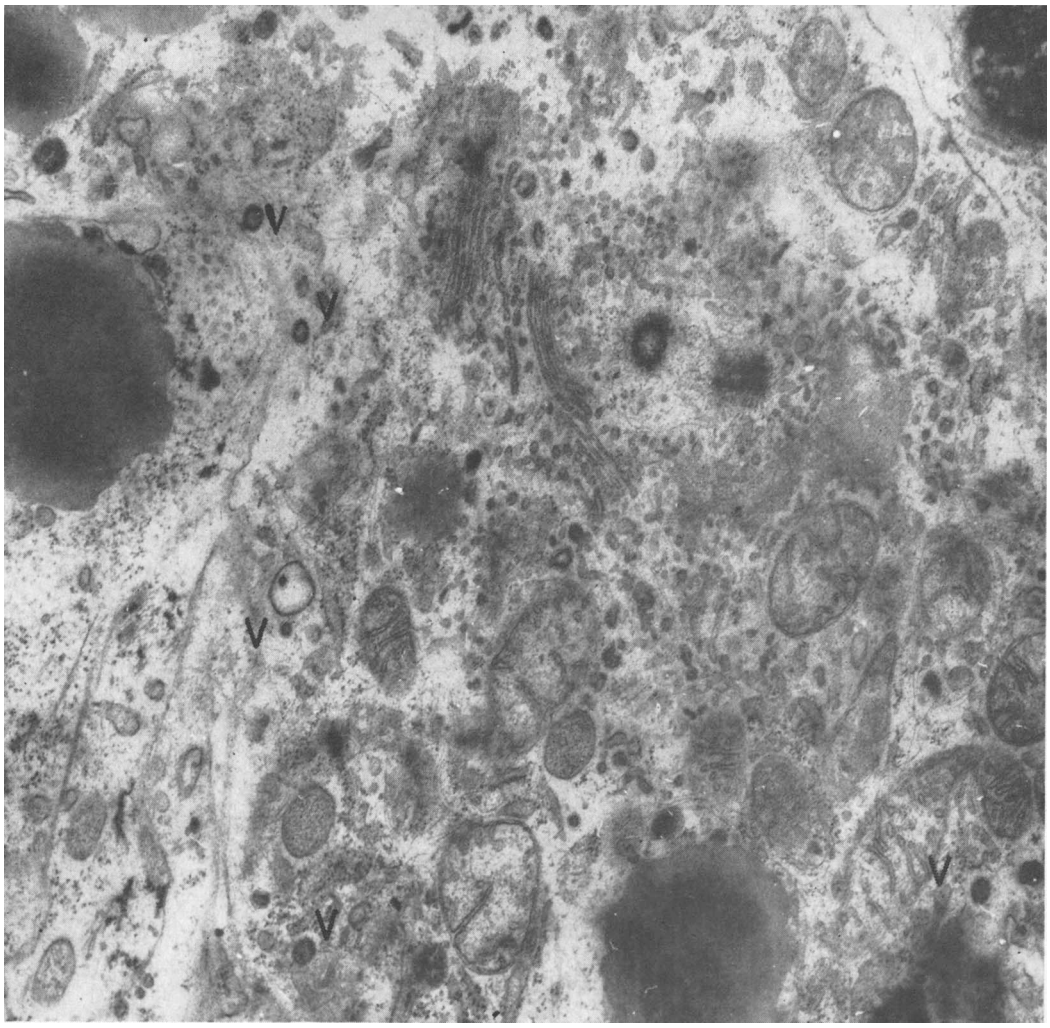

FIG. 1. Portion of a degenerating lymphoblast rich in cytoplasm. Prominent mitochondria, Golgi apparatus, centrosomes and lipid droplets. Fine filaments are scattered throughout the cell. Virus-like particles can be distinguished (V). Mag. 20,100 ×.

ments of indeterminable length and approximately 50 Å in width could be seen traversing the cytoplasm of some of these cells. In some areas these filaments were massed in bundles, and dark osmiophilic granules measuring 200-250 Å appeared in close relation to the bundle of filaments (Fig. 3). The nuclei generally were oval shaped and many showed small identations. Some showed linear nuclear projections consisting of an outer boundary of nuclear membrane and an inner thin core of nuclear material (Fig. 5). Virus-like particles measuring 90-120 mμ in diameter could be found in the cytoplasm of some of

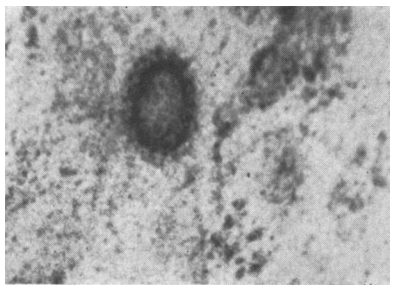

FIG. 2. Higher power of virus-like particle. Note outer capsid-like structure resting on a dense osmiophilic band enclosing a less osmiophilic center. Mag. 60,300 ×.

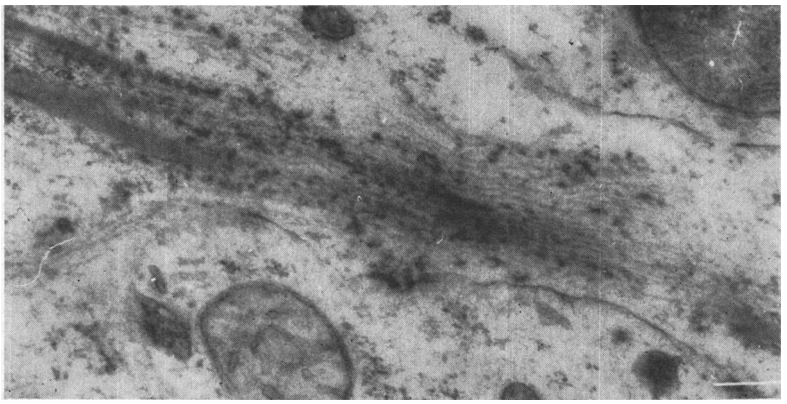

FIG. 3. Bundle of filaments with associated osmiophilic granular material. Mag. 32,800 ×.

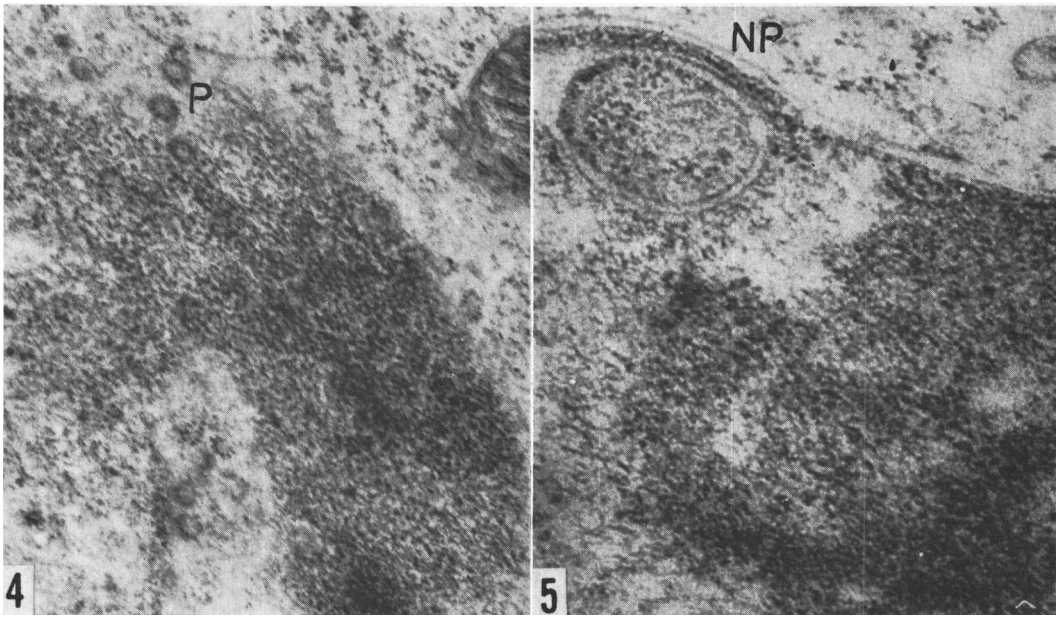

FIG. 4. Portion of a lymphoblast nucleus showing paranuclear virus-like particles 80-90 mμ in diameter (P). These have some similarity to nuclear pores. Mag. 60,000 ×.

FIG. 5. Portion of lymphoblast nucleus showing thin nuclear projection (NP). Mag. 43,000 ×.

these lymphoblastic cells especially those with the more abundant cytoplasm (Fig. 1). The majority of these cells also showed evidence of degeneration.

These virus-like particles consisted of an outer capsule which was subdivided into a number of capsid-like structures. These capsid-like structures rested on an oval-shaped osmiophilic band which enclosed a less osmiophilic center (Fig. 2).

Discussion. The nature of these virus-like particles is not quite clear. Their shape and size does not resemble the electron micrographic appearance of reovirus type 3(4). Similar bodies have been described by Epstein *et al*(2) and Stewart *et al*(3), in their studies of the Burkitt lymphoma cells. The particles they described have been found to measure 100-115 mμ and to have a structure similar to the particles described above.

These authors have remarked on the resemblance that these virus-like bodies bore to *Herpes simplex,* but this virus could not be isolated from the Burkitt lymphoma cul-

tured cells despite a number of attempts.

It is of interest, however, that reovirus type 3 has been isolated from a case of Burkitt lymphoma(5). Thus the above findings suggest a further possibility as to a virus etiology of the Burkitt lymphoma.

On the other hand, these bodies may be a non-specific result of cell degeneration or modified cytoplasmic vesicles. Interpretation at present is difficult.

Particles resembling what Epstein *et al*(2) consider to be immature forms of virus have been seen in the nucleus of some of these lymphoblasts (Fig. 4). However, they are somewhat similar in appearance to tangentially sectioned nuclear membrane pores and therefore not absolutely convincing.

The linear nuclear projections have been described in electron micrographs of cultured Burkitt lymphoma cells(2). The presence of similar projections in the murine lymphoma cells suggests a possible association in the etiological mechanism.

The bundles of filaments associated with osmiophilic granules were a frequent finding. Filaments and tubules have been described in association with the development of the reovirus crystal formation(4). The function of these structures in these lymphoma cells may be related.

Summary. Spleen cells from a reovirus infected mouse produced a lymphoma when injected into neonatal mice. Electron microscopic studies showed the presence of virus like particles in the cytoplasm of the lymphoma cells. These did not resemble reovirus. A resemblance to Burkitt lymphoma is noted.

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Autonomic Pathways Involved in a Sympathetic-Like Action of Pilocarpine on Salivary Composition.* (30707)

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It has recently been shown that stimulation of the rat parotid gland by the parasympathomimetic agent, pilocarpine, causes elaboration of a secretion that contains markedly higher levels of total protein and amylase activity than that evoked by stimulation of the gland by way of its parasympathetic innervation(1). The high levels of amylase observed with pilocarpine stimulation were somewhat reminiscent of levels observed when sympathetic agents were used to evoke secretion (2). When the adrenergic α and β blocking agents were employed in conjunction with pilocarpine, it was found that the sympathetic-like effect of pilocarpine could be differentially modified(3). While it is apparent from those experiments that receptor sites ordinarily stimulated when pilocarpine is employed are inhibited when the adrenergic blocking agents are used, it is not clear whether this stimulation involves a direct action of pilocarpine on adrenergic receptor sites of the gland cells, or an indirect effect through sympathetic routes. This investigation was undertaken to delineate the site of the sympathetic-like action of pilocarpine on rat parotid gland.

Materials and methods. Long-Evans male rats, 5-6 months of age, were fasted for 24 hours (water *ad lib*) prior to experimenta-

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