

The age of the animal, within a range of 4 to 8 months, and the fact that the animal has or has not been used for assay of the estrogenic hormones apparently plays no rôle in this response to smearing. Likewise the reaction is not confined to our own strain of rats since the group of animals secured from an unrelated colony responded in the same manner. These same animals, as noted earlier, also eliminated a deficiency of vitamin A as a factor. The participation of the hypophysis may be eliminated also since a group of hypophysectomized rats showed a similar hyperplasia of the vaginal epithelium in response to smearing. This behavior is not peculiar to rats alone since a similar, though less extensive growth of the vaginal epithelium was observed in a group of mice smeared 3 times daily.

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Nuclear Inclusions Suggestive of Virus Action in Salivary Glands
of the Monkey, *Cebus fatuellus* L.*

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Evidence is fast accumulating that we must recognize a special group of salivary gland viruses. All of them have been discovered by chance. They are so benign that attention was not directed to them by distinctive clinical symptoms. What attracted notice was the extraordinary hypertrophy of certain acinous, or duct, cells accompanied by the formation in their nuclei of inclusions resembling those caused by viruses.

The first inclusion-laden cells were reported under the heading of "protozoan-like bodies" in the parotids of 2 infants by Ribbert¹ and in the submaxillary glands of guinea pigs by Jackson.² Credit is due to Goodpasture and Talbot³ for recognizing the close resemblance between the bodies in humans and guinea pigs and for pointing out the similarity of both to the intranuclear inclusions described by Tyzzer⁴ in varicella. Lipschütz⁵ then rediscovered the intranu-

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¹ Ribbert, H., *Centr. allg. Path. u. path. Anat.*, 1904, **15**, 945.

² Jackson, L., *J. Infect. Dis.*, 1920, **26**, 347.

³ Goodpasture, E. W., and Talbot, F. B., *Am. J. Dis. Child.*, 1921, **21**, 415.

⁴ Tyzzer, E. E., *J. Med. Res.*, 1906, **14**, 361.

⁵ Lipschütz, B., *Arch. f. Dermat. u. Syph.*, 1921, **136**, 428.

clear inclusions in herpes admirably described and illustrated by Kopytowski,⁶ and emphasized the great importance of these bodies in "inclusion diseases" in general. But Kuttner and Cole⁷ and Kuttner⁸ led in the demonstration that the inclusions in guinea pigs are actually caused by a virus. Investigators, while examining the salivary glands of other animals, have been on the lookout for nuclear inclusions with the result that they have been reported in rats,⁹ moles,^{10, 11} mice¹² and hamsters.¹³ Finally Kuttner and Wang¹³ have proved that the intranuclear inclusions in hamsters, mice and wild rats are caused by a virus which is very similar to the submaxillary gland virus of guinea pigs.

In the course of experiments on the effect of treatment with irradiated ergosterol we have also encountered large, nuclear inclusion containing cells in the parotids and submaxillaries of 2 adult *Cebus fatuellus* monkeys but not in the sublinguals. The presence of these bodies was not revealed by any particular clinical symptoms. The animals appeared to be quite normal when they were killed. The nuclear inclusions were only found in the intercalated and secretory ducts and not more than 4 were seen in any one section. Occasionally they were accompanied by a mild degree of lymphocytic infiltration. In their properties, the cells and the inclusions were remarkably uniform. No intermediate stages could be found between them and the neighboring unaltered duct cells. Final stages in disintegration of the hypertrophied cells were likewise lacking. Similar uniformity was emphasized by Farber and Wolbach¹⁴ in humans and by the Rectors^{10, 11} in moles. In shape the cells were roughly spherical with diameter ranging from 12-19.2 μ . The range in nuclear diameter was 8.4-13.2 μ and in inclusion diameter 3.6-7.2 μ . After fixation in formalin-Zenker and coloration with hematoxylin and eosin, the nuclear inclusions were strongly acidophilic. A distinct halo was always interposed between the inclusion and the nuclear membrane. Faintly basophilic cytoplasmic inclusions were often found between the nucleus and the lumen. These were roughly spherical and ranged in diameter from 1.5 to

⁶ Kopytowski, W., *Arch. f. Dermat. u. Syph.*, 1900, **54**, 17; 1903, **68**, 55, 387.

⁷ Kuttner, A. G., and Cole, R., *Proc. Soc. Exp. Biol. and Med.*, 1926, **23**, 537.

⁸ Kuttner, A. G., *J. Exp. Med.*, 1927, **46**, 935.

⁹ Thompson, M. J., *J. Infect. Dis.*, 1932, **50**, 162.

¹⁰ Rector, L. E., and E. J., *Proc. Soc. Exp. Biol. and Med.*, 1933, **31**, 192.

¹¹ Rector, E. J. and L. E., *Am. J. Path.*, 1934, **10**, 629.

¹² Thompson, J., *Am. J. Path.*, 1934, **10**, 676.

¹³ Kuttner, A. G., and Wang, S. H., *J. Exp. Med.*, 1934, **60**, 773.

¹⁴ Farber, S., and Wolbach, S. B., *Am. J. Path.*, 1932, **8**, 123.

6 μ . The sublingual gland of 1, the parotids of 11 and the submaxillary glands of 13 *Macacus rhesus* monkeys given irradiated ergosterol in the same experiments did not show any inclusions like those in *Cebus fatuellus*. The status of these nuclear inclusions in *Cebus fatuellus* is on a par with that of those in humans and moles. They are sufficiently like the inclusions which have been demonstrated to be of virus etiology in guinea pigs to suggest a similar causation. The group of salivary gland viruses is probably a large one.