

Afferent nerve fibers to veins have been observed only in the adventitia, where they run a straight course without extensive plexus formation. Sensory end-organs connected with these fibers have been observed in the larger veins, but not in the distal smaller ones.

Some of the earlier investigators have described delicate nerve fibers, presumably afferent in character, which terminate in the intima. No nerve fibers could be observed in the intima in any of our preparations. No ganglion cells were observed along any peripheral vessels.

The afferent end organs described above are morphologically similar to certain of those described by Sunder-Plassman (1930)<sup>1</sup> in the carotid sinus and those described by Larsell (1921, 1922, 1935)<sup>2</sup> and Larsell and Dow (1933)<sup>3</sup> in the respiratory tract.

### 8758 C

#### Coexistence of Nuclear Inclusions in Salivary Glands and Kidneys of Wild Rats.\*

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The purposes of this study were: (1) To ascertain whether intranuclear inclusions, similar to those found in wild rats in England<sup>1, 2</sup> and China,<sup>3, 4</sup> occur also in the United States. (2) To discover whether, if present, they are restricted to salivary glands as has been described.<sup>3</sup> (3) To demonstrate whether a virus, responsible for their formation, is transmissible to laboratory rats.

A series of 120 wild rats was collected at 16 different locations in St. Louis. All were trapped or shot on rubbish heaps, except 8 which were captured at a meat packing plant; and all were brown

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<sup>1</sup> Sunder-Plassman, Paul, *Zeitschr. f. Anat. und Entwg.*, 1930, **93**, 567.

<sup>2</sup> Larsell, O., *J. Comp. Neur.*, 1921, **33**, 105; *ibid.*, 1922, **35**, 97; *ibid.*, 1935, **61**, 407.

<sup>3</sup> Larsell, O., and Dow, R. S., *Am. J. Anat.*, 1933, **52**, 125.

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<sup>1</sup> Hindle, E., and Stevenson, A. C., *Tr. Roy. Soc. Trop. Med. and Hyg.*, 1929-30, **23**, 327.

<sup>2</sup> Hindle, E., *Nature*, 1932, **129**, 796.

<sup>3</sup> Kuttner, A. G., and Wang, S. H., *J. Exp. Med.*, 1934, **10**, 773.

<sup>4</sup> Kuttner, A. G., and T'ung, S., *J. Exp. Med.*, 1935, **62**, 805.

rats (*Rattus norvegicus*) except 2 which were black (*Rattus rattus*). Their weights ranged from 45 to 541 gm. with an average of 300.2 gm. There were 50 males and 70 females. The parasites found in 100 members of the series have been described.<sup>5</sup> Tissues were fixed in Zenker's fluid and stained in hematoxylin and eosin. Care was taken to examine all of them with as nearly as possible equal thoroughness.

Nuclear inclusions were found in both the submaxillary glands and kidneys of 24, and in the kidneys alone of 87 of these wild rats. Evidently, therefore, the limitation to the salivary glands reported by Kuttner and Wang<sup>4</sup> for Chinese wild rats did not hold for wild rats in the St. Louis area, but these investigators showed that, when white rats were injected with salivary glands containing inclusions, inclusions were formed in their kidneys. This indicates that a single virus may be responsible in this series for the formation of the nuclear inclusions in both salivary glands and kidneys.

Examination failed to reveal the natural occurrence of nuclear inclusions in the submaxillaries and kidneys of 50 white rats in our colony. An attempt was made to transmit a virus from wild rats to white rats. The kidneys of 2 wild rats, proved to contain typical inclusions, were emulsified in sterile salt solution and passed through a Berkefeld N filter. Four lots, each of 2 rats, were given intraperitoneally 1 cc., subcutaneously 1 cc., intraglandularly (submaxillary) 1 cc., and intracerebrally 0.5 cc., respectively, of the filtrate. They were killed at intervals up to the 20th day but no inclusions could be found in salivary glands, kidneys or nervous system.

The inclusions in the submaxillaries of these wild rats resemble those previously reported in other species<sup>6-10</sup> but they differ from the inclusions described and figured by Thompson<sup>8</sup> in the salivary glands of white rats; which are not surrounded by similar unstained areas and are smaller. They were, moreover, absent in rats of less than 245 gm., whereas Thompson found inclusions only in young rats and not in 12 rats 6 months old. The smallest rat exhibiting renal inclusions weighed 102 gm. and only 3 rats over 100 gm. failed to show them. It is likely that the age of virus invasion, under the conditions prevailing in this series, is fairly definite and that it usually attacks the kidneys first and then spreads to the sub-

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<sup>5</sup> Tsuchiya, H., and Rector, L. E., *J. Parasit.*, 1935, **21**, 426.

<sup>6</sup> Ribbert, H., *Centralbl. f. allg. Pathol. u. path. Anat.*, 1904, **15**, 945.

<sup>7</sup> Jackson, L., *J. Inf. Dis.*, 1920, **26**, 347.

<sup>8</sup> Thompson, M. J., *J. Inf. Dis.*, 1932, **50**, 162.

<sup>9</sup> Rector, L. E. and E. J., *Proc. Soc. Exp. Biol. and Med.*, 1933, **31**, 192.

<sup>10</sup> Thompson, J., *Am. J. Path.*, 1934, **10**, 676.

maxillary glands in some animals. The virus appears to be quite benign, because there were no accompanying infiltrative or degenerative changes in the kidneys, and, in the submaxillary glands, such alterations were more often absent than present. Measurements of the inclusions reveal considerable uniformity in size which is thought<sup>11, 12</sup> to indicate a static rather than an active process. Whether this virus in wild rats is capable of infecting humans is an open question although inapparent salivary gland viruses are remarkably species specific. It has been shown, however, that a virus ordinarily restricted to the salivary glands under certain conditions may be induced to extend widely through the body.<sup>13</sup>

### 8759 P

#### Mechanism of Formation of Hexosemonophosphate in Muscle and Isolation of a New Phosphate Ester.

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Experiments performed on intact frog muscle indicated that hexosemonophosphate, in contrast to hexosediphosphate, is formed by esterification with inorganic phosphate.<sup>1</sup> A further study of this problem was carried out on minced frog muscle which was almost completely inactivated (in regard to lactic acid formation) by 3 to 4 extractions with distilled water. When such muscle, which contains only 2 to 4 mg. % of organic, acid-soluble P, is incubated anaerobically for 3 hours in isotonic phosphate buffer, the organic P content rises to 8 to 13 mg. % due to the formation of hexosemonophosphate. Addition of small amounts of adenylypyrophosphoric or of adenylic acid greatly enhances the formation of hexosemonophosphate, as shown in Table I. The experiments indicate that hexosemonophosphate is formed from inorganic phosphate and that adenylic acid serves as the mediator of this reaction.

Observations after short periods of incubation showed that the first phosphorylation product is not hexose-6-phosphoric acid

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<sup>11</sup> Rector, E. J. and L. E., *Am. J. Path.*, 1934, **10**, 629.

<sup>12</sup> Cowdry, E. V., and Scott, G. H., *Am. J. Path.*, 1935, **11**, 647.

<sup>13</sup> McCordock, H. A., and Smith, M. G., *J. Exp. Med.*, 1936, **63**, 303.

<sup>1</sup> Cori, G. T., and Cori, C. F., *Summaries of Communications, XVth International Physiological Congress*, p. 66, 1935.