buting them to dissociation of the acids and subsequent effect on the arsenic in the external solution. These differences in the rate of penetration seem to be due to effects on the protoplasm initiated by changes in both the internal pH of the cell and the pH of the bathing solution.

Details of this paper will be published shortly in the U. S. Public Health Reports.

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Suppurative otitis of the albino rat.

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It has been observed in colonies of albino rats that certain individuals become affected with a condition characterized chiefly by the following phenomena: The animal persistently holds its head tilted to one side; instead of running in a straight line it does so in a curve in the direction of the deviation of the head; and when suspended by the tail the body spins rapidly around in the same direction. It was also subsequently discovered that deafness on one or both sides accompanies these symptoms. According to private communications this condition has been observed in various breeding stations in this country, and Greenman and Duhring[1] make mention of this condition under the heading of Middle Ear Disease.

The colony under our observation consists of four strains obtained from different sources which will probably be traced to a common strain. The disease has been studied for the past twelve months, and out of 2,700 animals, twenty-three became affected at various periods. Of these, three died, two apparently from the disease, and one as a result of pneumonia. The other

[1] Greenman and Duhring, Breeding and Care of the Albino Rat, Wistar Institute of Anat. and Biol., Philadelphia, 1923, 102.

twenty did not seem very sick, and outside of the symptoms mentioned behaved like normal rats. Nor did the disease entirely prevent reproduction or raising of the young.

Autopsy of such animals invariably revealed a purulent condition of the ear of the affected side, associated with purulent rhinitis, and nothing remarkable in the rest of the organs. Microscopical examination of the affected ear showed the middle ear filled with pus, and osteomyelitis of the auditory bulla (mastoiditis). The inflammatory process could be traced from the middle ear into various structures of the internal ear.

The inflammatory process is characterized by the presence of a dense leucocytic exudate in the lumen of the middle ear and its mucosa, with marked destruction of the latter, and replacement by granulation tissue. There is also an osteitis of the bony ear with extensive bone absorption and excessive new bone formation involving even the base of the skull. Thus, places could be found in many sections of the series where the process from the middle ear was continued into the bony and membraneous parts of the internal ear, whereby not only the semicircular canals and the vestibular structures were filled with exudate or granulation tissue, but also the cochlea. Diffuse inflammatory infiltration of both leucocytes and small cells was found in the neighboring soft parts, and in several places in and about the vestibular and cochlear nerves, and in the spiral and vestibular ganglia.

Evidently the peculiar symptoms of this disease represent a disturbance in equilibration based upon a labyrinthitis following an infectious middle ear disease, which in turn is related to the affection of the nose. The inflammation could be traced from the nose through the Eustachian tube into the middle ear.

Thus the process in the middle ear apparently precedes the onset of the above symptoms. It therefore became important to determine the incidence of middle ear disease in the colony. For this purpose a number of animals were killed (mostly discards) and the middle ears examined. It was then found that out of 152 rats, 79 (about 50 percent) had pus in one or both ears. Many of these rats also showed deafness on the affected side.

In contrast to the above, another group of 42 animals were examined in their prime, and of these 9 (about 22 percent) showed pus in one ear only.

It was therefore evident that we were dealing in the colony with an infectious disease starting probably in the nose, leading to suppurative middle ear disease, which occasionally continued into the internal ear, and which gave rise to symptoms of disequilibration and deafness.

Pathological changes similar to those mentioned above are described in three rats with similar symptoms, by Droogleever Fortuyn.[2] He utilized the degenerative changes produced in the eighth nerve and its ganglia by the otitis, for the purpose of studying the tracts of that nerve.

Daniels and Armstrong[3] have recently found suppurative middle ear disease associated with nasal sinusitis in rats fed on diets deficient in fat soluble Vitamin A. They have demonstrated middle ear disease in six out of sixteen rats, and conclude that the vitamin deficiency plays an important rôle in bringing about the infection. In experiments with deficient diets we found that the percentage of animals infected on a diet deficient in minerals is even greater than in animals on a diet deficient in Vitamin A.

Exciting Cause.—From the bacteriological, serological, and experimental work so far accomplished, it appears that the exciting agent of both the nasal and aural affections is a small gram-negative, somewhat pleomorphic, motile, non-spore-bearing bacillus. In its smallest form it appears quite as short but not quite as slender as the *B. influenzae*. Although initial cultures of this micro-organism grow slowly, later generations grow readily on ordinary culture media under aerobic conditions. Further work with regard to its identity and its immunological characters is in progress. Serum of diseased rats occasionally agglutinates strains of the bacillus in low dilutions.

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[2] Droogleever Fortuyn, Ae. B., *Psychiatrische en Neurologische Bladen*, Amsterdam, 1918, xxii, 211.

[3] Daniels, A. L., and Armstrong, M. E., *J. Am. Med. Assn.*, 1923, lxxxi, 828.

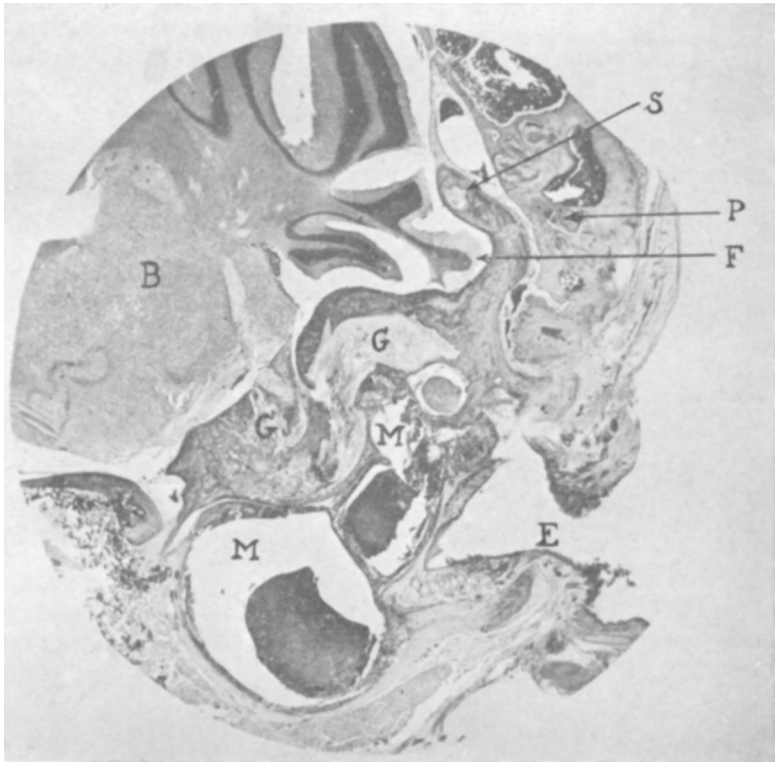

FIG. I.

Frontal section of head at the auditory organ.

E.—External auditory meatus.
M.—Middle ear containing pus.
G.—Granulation tissue replacing internal ear.
S.—Acute exudate and granulation tissue in semicircular canal.
F.—Flocculus of cerebellum.
P.—Productive osteitis.
B.—Brain.

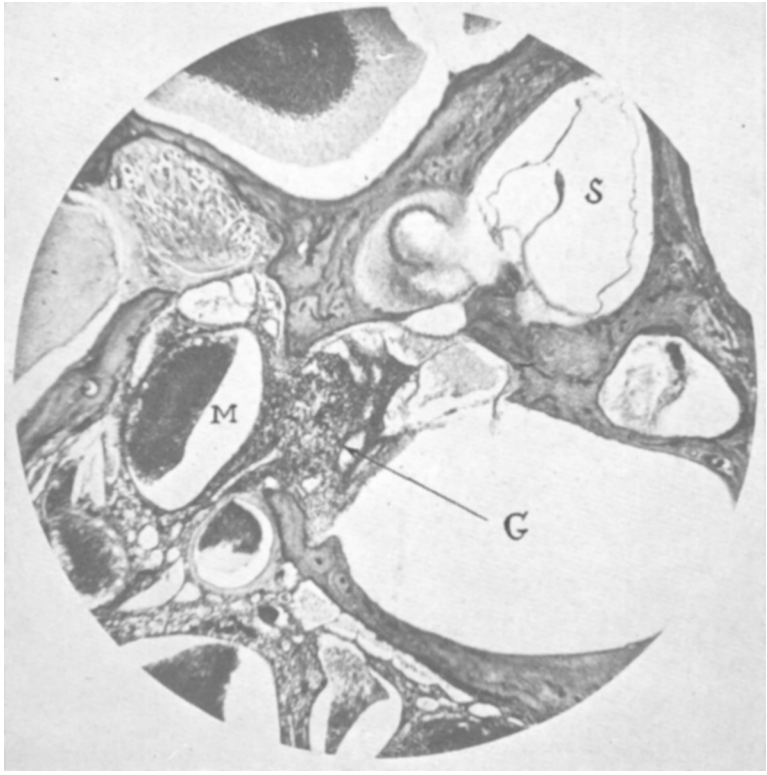

FIG. II.

Section as Fig. 1 (higher power).

M.—Middle ear showing pus.
G.—Granulation tissue breaking through bone from middle to internal ear.
S.—Saccule of internal ear.