the general nuclear and cytoplasmic characteristics of small lymphocytes, except that the cytoplasm is more extensive and invariably contains a lighter staining circular area close to the nucleus. These cells represent fibroblast differentiation products. A few are in mitosis. They are prospective macrophages. A few contain 1 or 2 fragments of hemoglobin debris. A final stage, sparsely represented, appears to be one in which these cells with their ingested hemoglobin debris in the shape of minute dark brown granules have suffered disruption in the intercellular spaces of the superficial parenchymal hepatic cells. Here the granules are finally ingested by the liver cells to be converted into bilirubin.

Three additional striking details concern the apparently functional specificity among the subserous macrophages, these not ingesting both nuclear and cytoplasmic fragments at the same time but only one or the other variety; the presence of a few phagocytic eosinophils with hemoglobiniferous fragments; the presence of a few multinucleated giant cells; and the occurrence of a number of "cannibal" macrophages which have ingested one or several older macrophages and occasionally one or several eosinophils. Apparently the phagocytic capacity of peritoneum is determined at least in part by its location with respect to tissue that can dispose most advantageously of the phagocytosed materials.

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## Experimental Scurvy in the Guinea Pig.

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Increasing abstinence and loss of weight, decreasing activity and drowsiness, or marked nervousness and greatly heightened activity in some animals, are characteristic of early scurvy. In later stages, stiffness, weakness and even complete helplessness may supervene in the hind quarters, especially of young animals. Many animals were very fat at time of death. Gross hematuria and melena, drooling and a foul odor were sometimes present.

Evidences of pain were noticed seldom, and bleeding and ulcerated gums, loose incisors, fever and constipation were never observed. Thirst and chewing movements, even when complete anor-

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exia seemed present, were noted in most animals, and a lowered temperature in all of them. Not infrequently a relatively large mass of soft, foul feces protruded from the anus in the late stages. and a foul odor seemed to emanate from the mouth. Swollen joints were seen only in very young pigs.

Recovery from the scorbutic condition was often possible in young animals, which had suffered an apparent paralysis of the hind quarters, as late as approximately 6 hours before death, but these pigs always had permanently rigid hind legs because of lack of mobility at the knee. Ankylosis at the knee was never encountered. General edema was encountered only once in a large series of animals, but some edema was relatively common in the peri-vesical fat.

At necropsy the well-known subcutaneous and deep hemorrhages, even into the central and peripheral nervous systems, were present and grossly pseudo-pneumonic areas in the lungs occurred in most animals. Next to these changes, the most conspicuous change was the occurrence of fatty degeneration of the liver, even up to pure whiteness at the caudal margins. Fatty infiltration and degeneration were also found in the kidneys, adrenals, lungs, pancrease and, to some extent in some animals, in the skeletal muscles, and in one case it was present in a very marked degree in the walls of the pancreatic artery.

The intestine often was totally unresponsive to pinching and the stomach sometimes was greatly distended with gas. The molar teeth were invariably loose beginning with the last, and the implanted portions were reduced in length and caliber. Hemorrhages were present in the pulp of the incisors also, but there was no evident change in the physical properties of any of the teeth.

Vacuolation and fenestration were present in many organs, including the bone marrow and the central nervous system, and pronounced hydropic degeneration was present in the skeletal, the gastro-intestinal and the arterial musculatures.

Desquamation and disintegration of epithelia was quite common in the bronchial and intestinal tracts, in the kidneys and urinary bladder and in the biliary and pancreatic ducts. Complete disintegration of epithelia was observed also in the liver, kidney, adrenal and testis, and plaques of liver cells were found in some large hepatic veins. Plaques of epithelium from the convoluted tubules were present in the collecting tubules, and degenerated germinal epithelium in the *ductus deferentes*. Degenerative changes also were found in the interstitial cells of the testes, in those of the pancreatic islands and in nerve and ganglion cells and nerve fibers.

Proliferative changes were encountered only in the costal cartilages and bone marrow and the predominant picture was one of destruction. The walls of small vessels were found completely disintegrated and those of larger vessels frequently were entirely destroyed locally, and although the presence of intravascular hemolysis was not established, the histologic study of tissues from scorbutic pigs gave the impression that a lytic process almost universal in extent was present, and that the hemorrhages were due to destruction of the walls of blood vessels through lysis.

Marked fetal scurvy was also obtained and presented all the characteristics of scurvy in the mature guinea pig.

In a study of the blood, McCormick found a decrease in the number of erythrocytes, hemoglobin and color index, and an apparent decrease in fragility, a relative decrease in the number of lymphocytes and an absolute increase in the polymorphonuclears. There also was an increase in the reticulated and nucleated blood cells and leucocytes. A large series of counts on normal animals, as well as a first count on the experimental animals, served as a basis for comparison. None of the scorbutic animals had a rise in temperature, as determined by rectal measurements.

## 3920

## Permeability of the Upper Respiratory Mucous Membrane for Bacteria and Their Products.

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Observations made in this laboratory during the past year or two have disclosed the fact that, in the case of the rabbit at least, bacteria and their products readily and invariably pass through the mucous membrane of the upper air passages when in contact with or growing upon its outer surface.

When virulent pneumococci are put into the nares they soon appear in the blood stream and set up a rapidly fatal infection. Less virulent organisms also find their way into general circulation but the resulting infection is frequently overcome and the animal recovers. If killed pneumococci are put into the nares the organisms themselves cannot be demonstrated in the blood but antibodies speci-