

# Histopathology of Rabies

R. E. KISSLING, Bacteriologist (Veterinarian)\*

The inflammatory response of the central nervous system to rabies is very much the same as with other viral, bacterial, chemical, and physical irritants. The distribution of lesions is rather constant in rabies. The most severe changes are observed in the thalamus, pons, and medulla. These areas of the brain show neuron degeneration, necrosis, and neuronophagia. There is moderate diffuse infiltration with microglia and occasionally polymorphonuclear leucocytes.

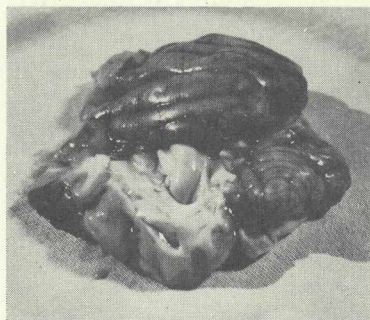
The blood vessels of the brain stem present the swollen endothelium, and lymphocytic collars so common in any pathological condition of the central nervous system. This lymphocytic exudate usually is confined to the adventitial spaces. Petechia and perivascular hemorrhage is common and often quite extensive in the thalamus, medulla oblongata, and spinal cord.

In keeping with the spread of the virus by neuronal pathways, the white matter also presents lesions. This may range from slight vacuolization of the myelin sheaths to complete demyelination, depending upon the duration of the disease. These areas will show infiltrations by large mononuclear cells filled with fat containing vacuoles.

In addition to the diffuse cellular infiltration into the nervous tissue, there also are sharply delimited accumulations of glial cells (Babès' rabies nodule). At one time, these were considered pathognomonic for rabies; but since they may occur in other conditions, such as typhus and encephalitides, no special importance can be attributed to their presence.

The neocortex usually shows very little damage except mild neuron degeneration.

The Negri body is the pathognomonic inclusion body for rabies, and a positive diagnosis can be made upon the demonstration of its presence. The bodies may be found in almost any portion of the central nervous system and also in the peripheral ganglia. However, they are most numerous and most consistently found in the hippocampus in the large ganglial cells adjacent to the fimbria, and in the Purkinje cells of the cerebellum. The cerebral cortex also contains Negri bodies in a



Negri bodies are generally most numerous and most consistently found in the hippocampus shown here bulging from the floor of the lateral ventricle.

fair percentage of cases.

The sizes of the Negri bodies show remarkable variation ranging from 2 to 30 microns in diameter. They vary in shape from round to oval. When located in the dendritic processes, they may be distorted by the limits of the cell into triangular or flattened forms. Negri bodies occur only in an intracytoplasmic position.

The Negri body possesses definite tinctorial affinities. The ground substance or matrix shows an affinity for acid dyes. Embedded within this matrix are one or more basophilic bodies, the so-called "inner granules." There are also the "mulberry" forms, which consist of a cluster of refractile acidophilic granules in which are located the characteristic inner granules. Inner granules may be lacking in very small inclusions, and therefore these have no diagnostic significance.

The dorsal root and cranial nerve ganglia show the ballooning type of neuron degeneration, neuronophagia, and perivascular lymphocytic infiltration seen in the central nervous tissue. The presence of these changes in the ganglion nodosum of the vagus nerve is always suspicious of rabies, but cannot be considered as a final diagnostic criterion due to the rare occurrence of changes in this ganglion in other diseases.

When virus is present in the submaxillary salivary glands, these structures show degeneration of the acinar cells and infiltration by mononuclear cells. Other glands with similar structure, such as the pancreas and lachrymal glands, also may present these changes.

\*Virus and Rickettsia Section, Laboratory Services, Montgomery, Ala.