2013-5-2 **Cerebellum, Spleen-Raccoon** Ahmed M. Abubakar
BOVINE PATHOLOGY

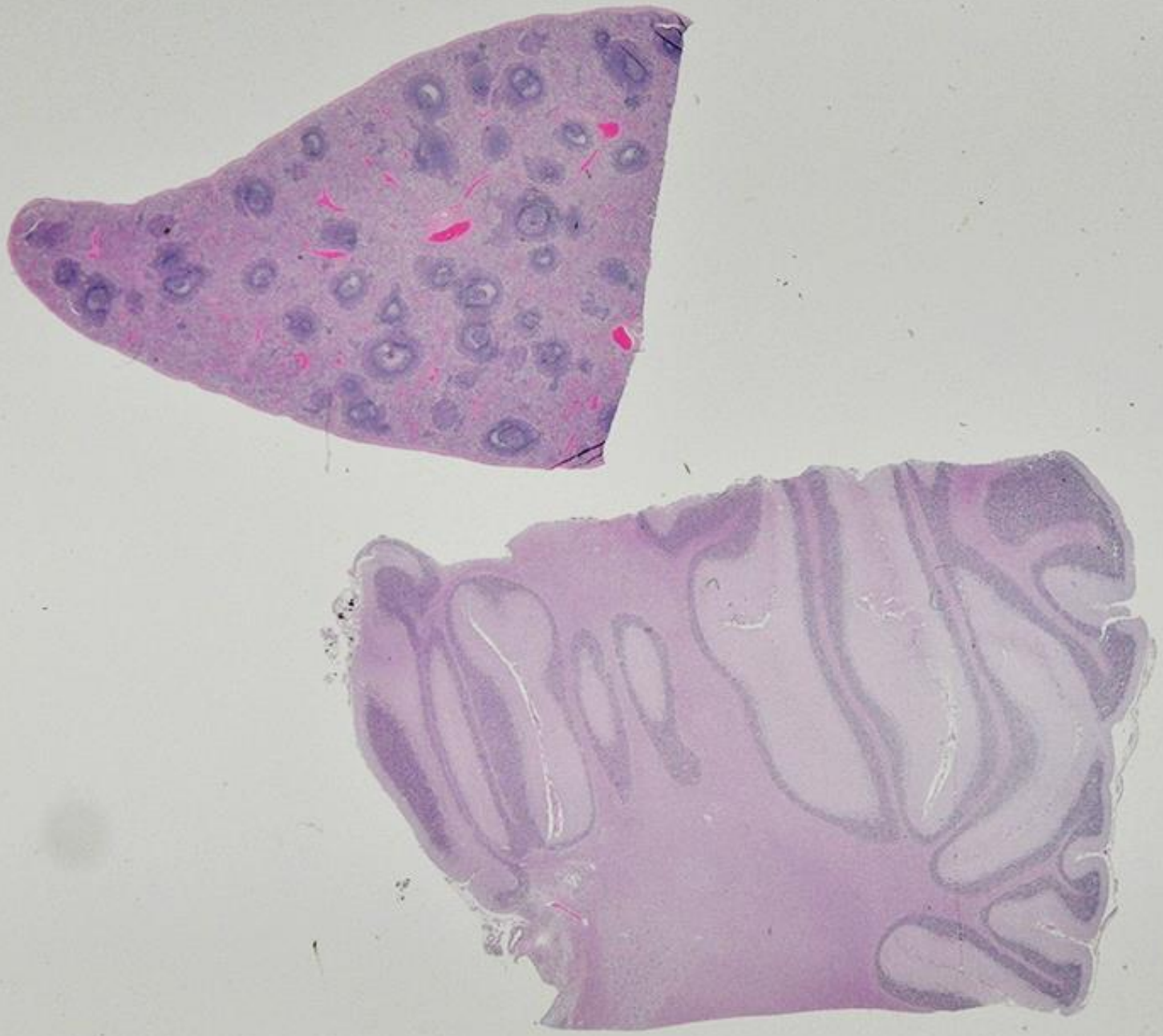
- **CONTRIBUTING INSTITUTION** :College of Veterinary Medicine UC Davies
- **Signalment:** Wild-caught juvenile male raccoon, ( *Procyon lotor*)
- **History:** Exhibiting neurological deficits, wounds on the tail, pale mucus membrane, ataxia, head tremors and mild inappentence, was given palliative care
- **Gross Pathology**:
  - Ø Had adequate fat store, liver diffusely and markedly enlarged , pale with irregular, undulating surfaces. The spleen was markedly enlarged and meaty
  - Ø All lymph nodes were very pale and enlarged, lungs were collapsed with occasional pinpoint pale subpleural foci.
  - Ø Gastrointestinal tract has scant content with small dry feacel matter in the large intestine
- **Histopathology Description:**
  - Ø Cytoplasm neural and glial cells were markedly distended up to x3 normal size by aggregate , clear vacuoles which displaced the nucleus to periphery of the cell
  - Ø Multifocally swollen eosinophilic axons were observed in the granular layer
  - Ø Spleen showed formy macrophages expanded the germinal centers and formed extensive sheet that replaced and effaced the red pulp
  - Ø There was a mixed culture when the liver, lungs and mesenteric lymph nodes were cultured, Salmonella arizonae resulted in fecal PCR, Lysosmal Enzyme Analysis of the brain showed the absence of sphingomyelinase, affected neuros and macrophages were Oil red O, PAS, Sudan Black, Luxol fast blue and acid fast negative,

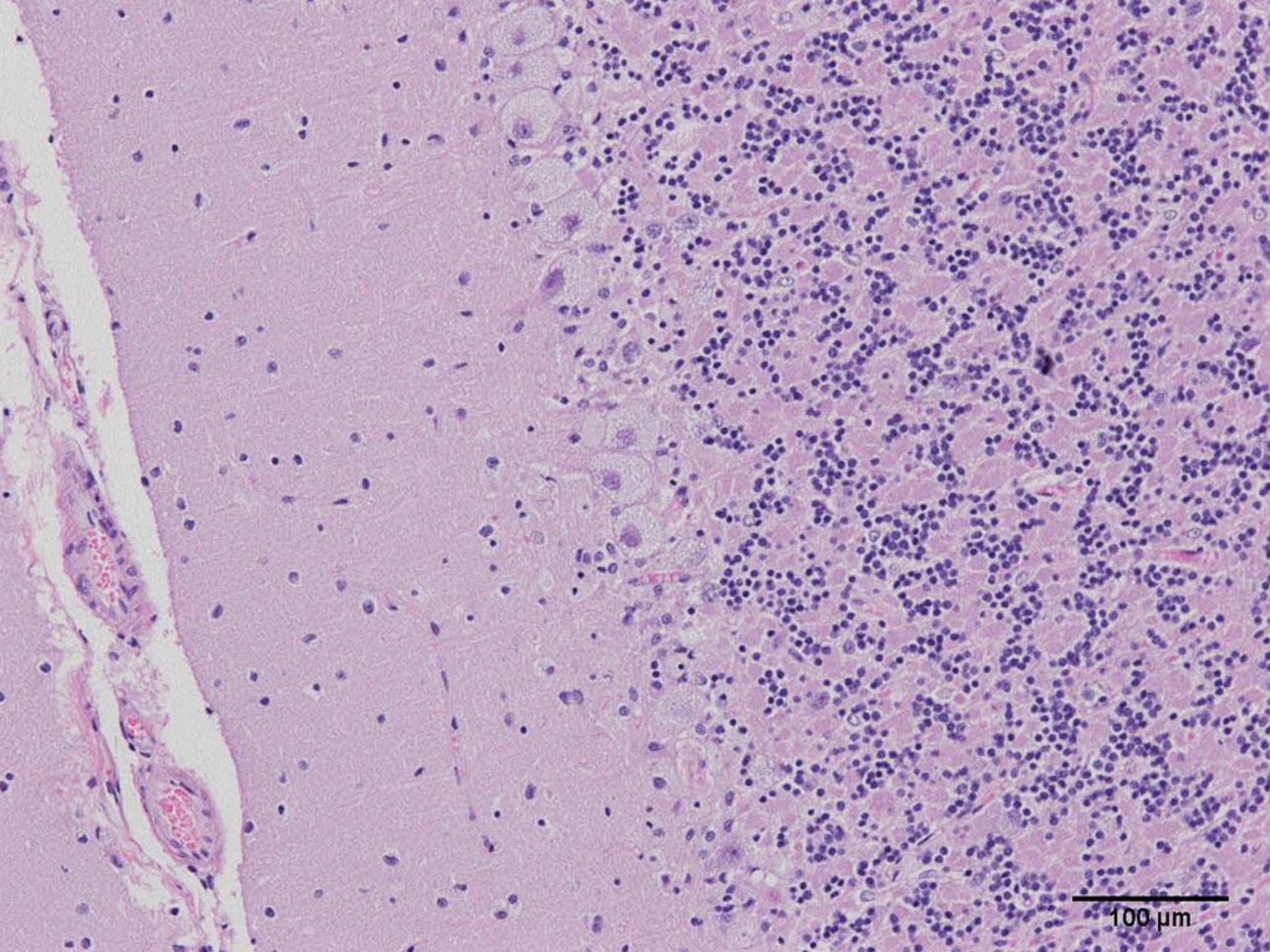
## Contributor 's Morphologic Diagnosis:

- Cerebellum showed severe diffuse neural and glial cell vacoulation and swelling with occasional multifocal spheroids ,suspect storage disease. Spleen showed germinal centers and red pulp severe diffuse histiocytosis ( suspect storage disease)

## Contributor's Comment:

- Aggregates of foamy macrophages were seen in tissues like; lymph nodes, tongue , intestine, colon, liver and lung. Cerebral neurons and glial cells were similarly affected. Cytoplasmic foaminess observed in renal tubules
- TEM revealed lysosomal accumulation of lamellar material consistent with lysosomal storage disease (LSD) , but ultrastructural analysis is relatively non specific to the type of storage. Histohemistry, immunohistochemistry and flourescent microscopy may be used to identify storage material , but gold standard is by means of biochemical analysis
- Lysosomal enzyme analysis revealed a complete absence of sphingomyelinase activity hence is a criterion for the diagnosis of sphingomyelin lipidosis also known as Nieman –Pick disease (NPD)
- Sphingomyelin lipidosis belongs to a group of sphingolipidosis lysosomal storage disease that includes GM1 and GM2 gangliosidosis and globoid cell leukodystrophy
- The involvement of neurons in most LSDs is due to both the high metabolic activity and life span of these cells which allows for gradual accumulation of undegraded substrate
- Ultrastructural pathology offers useful information in diagnosis of LSDs and help categorize the type of LSD
- The defect in NPD is the lack of sphingomyelinase enzyme , it can be inherited through autosomal recessive mode of inheritance .

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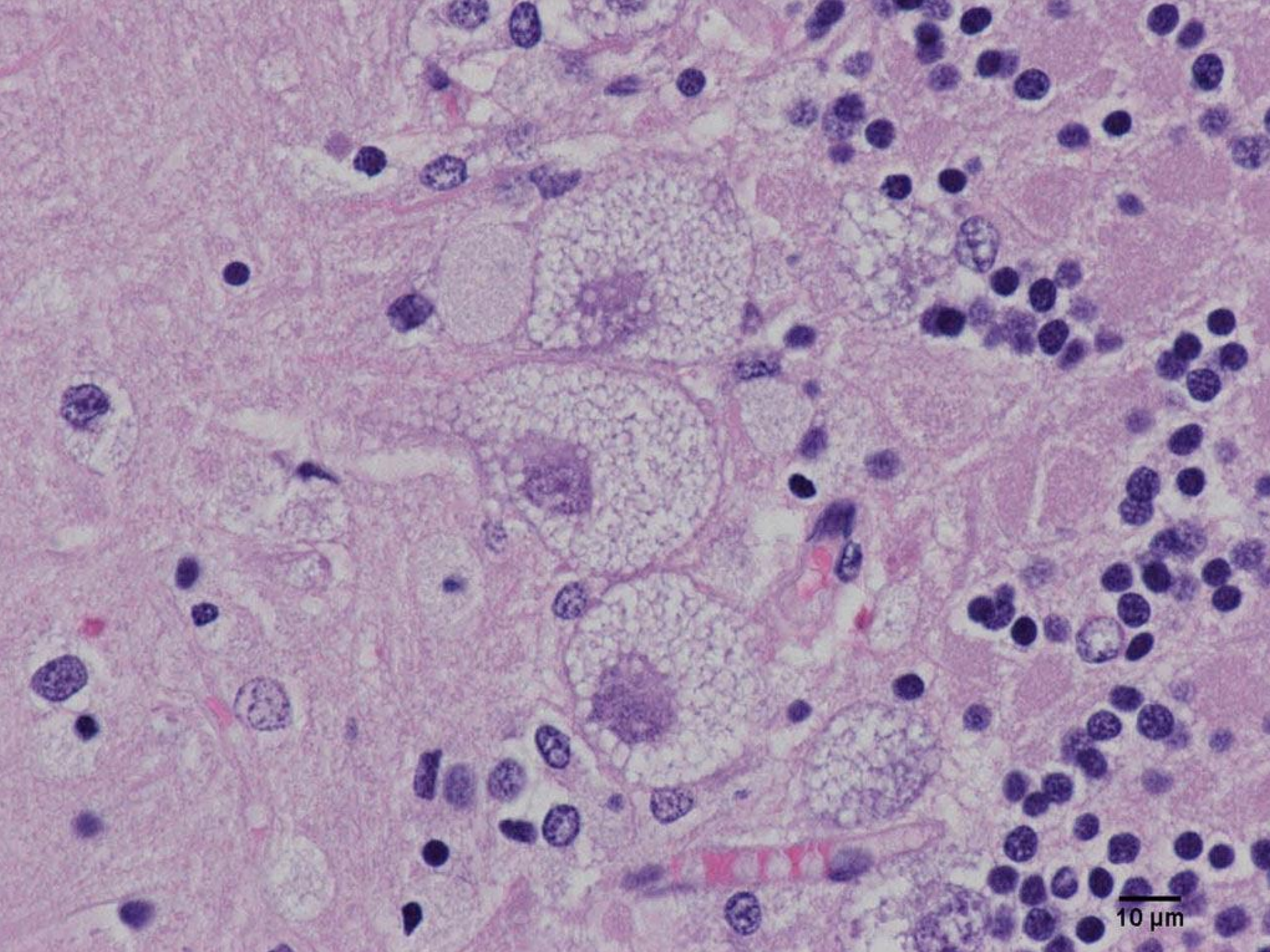
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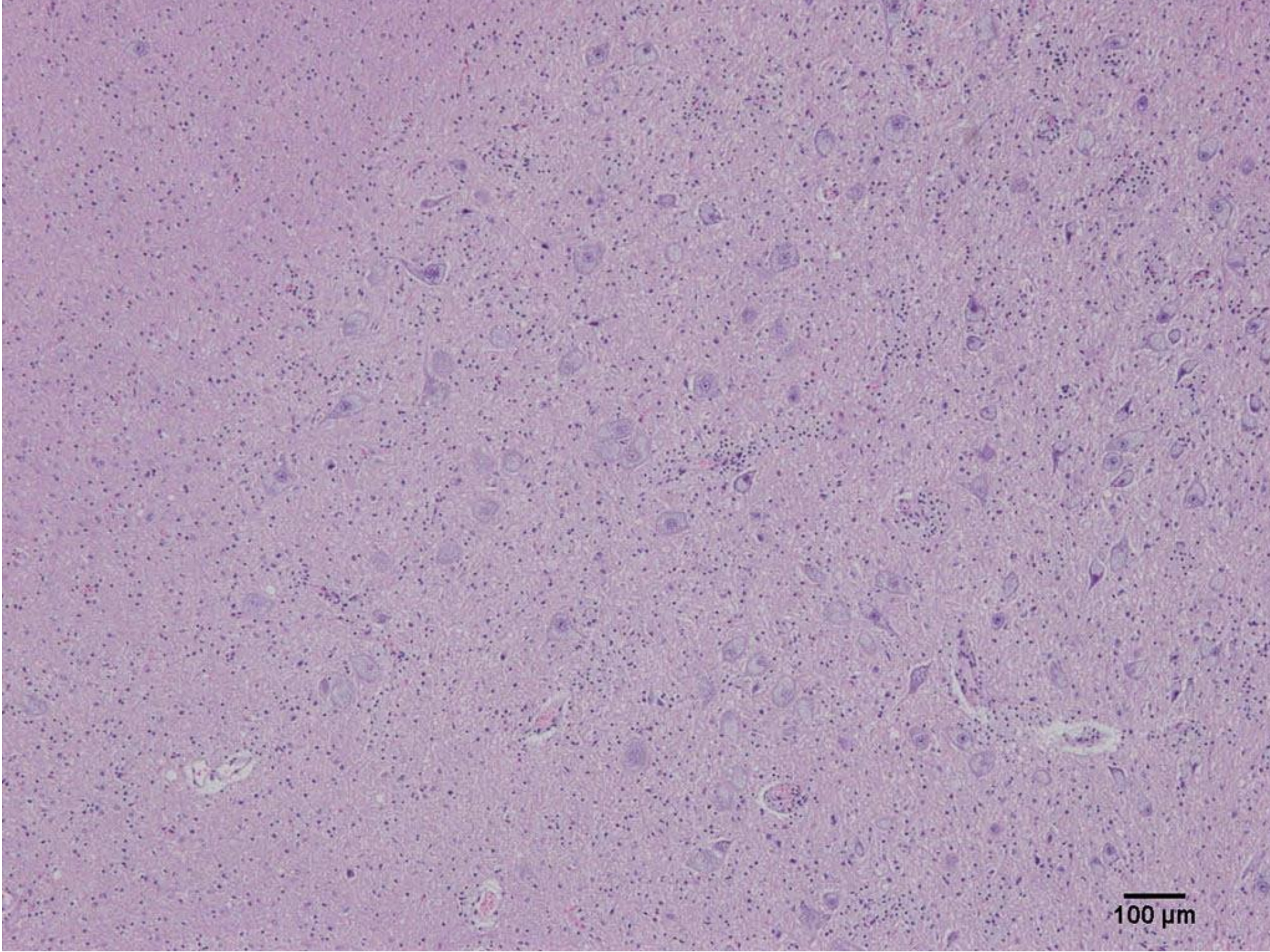
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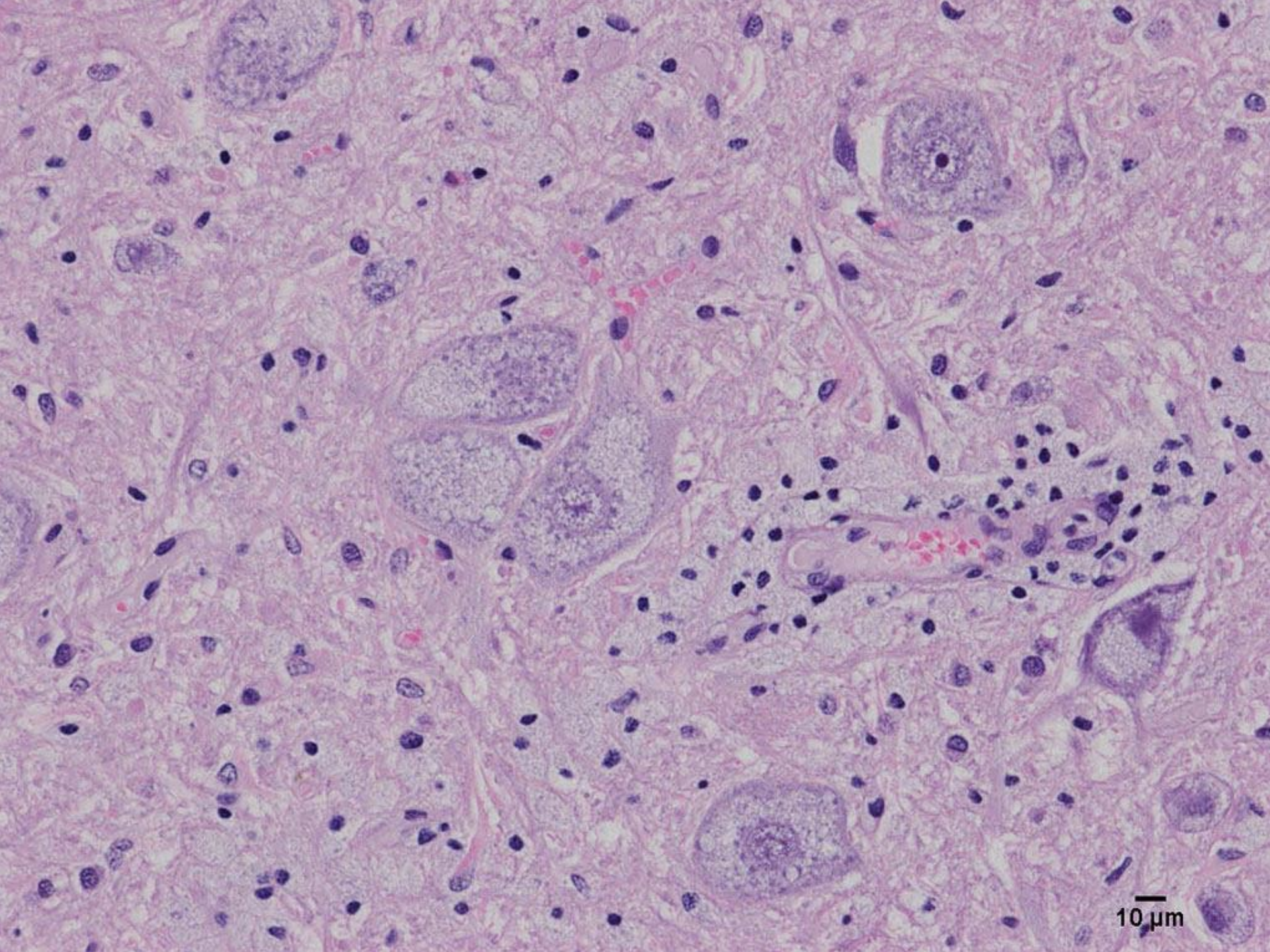
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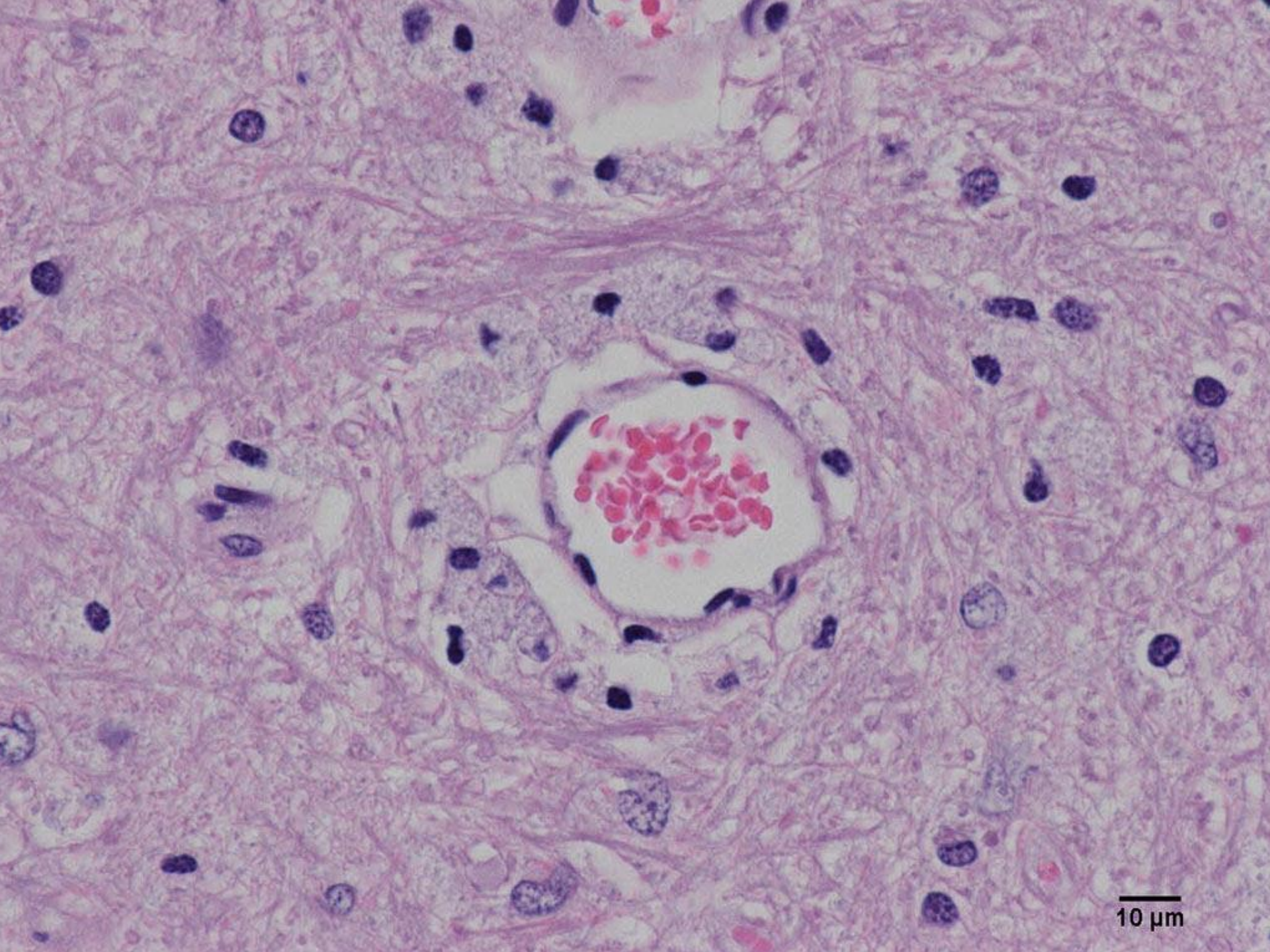
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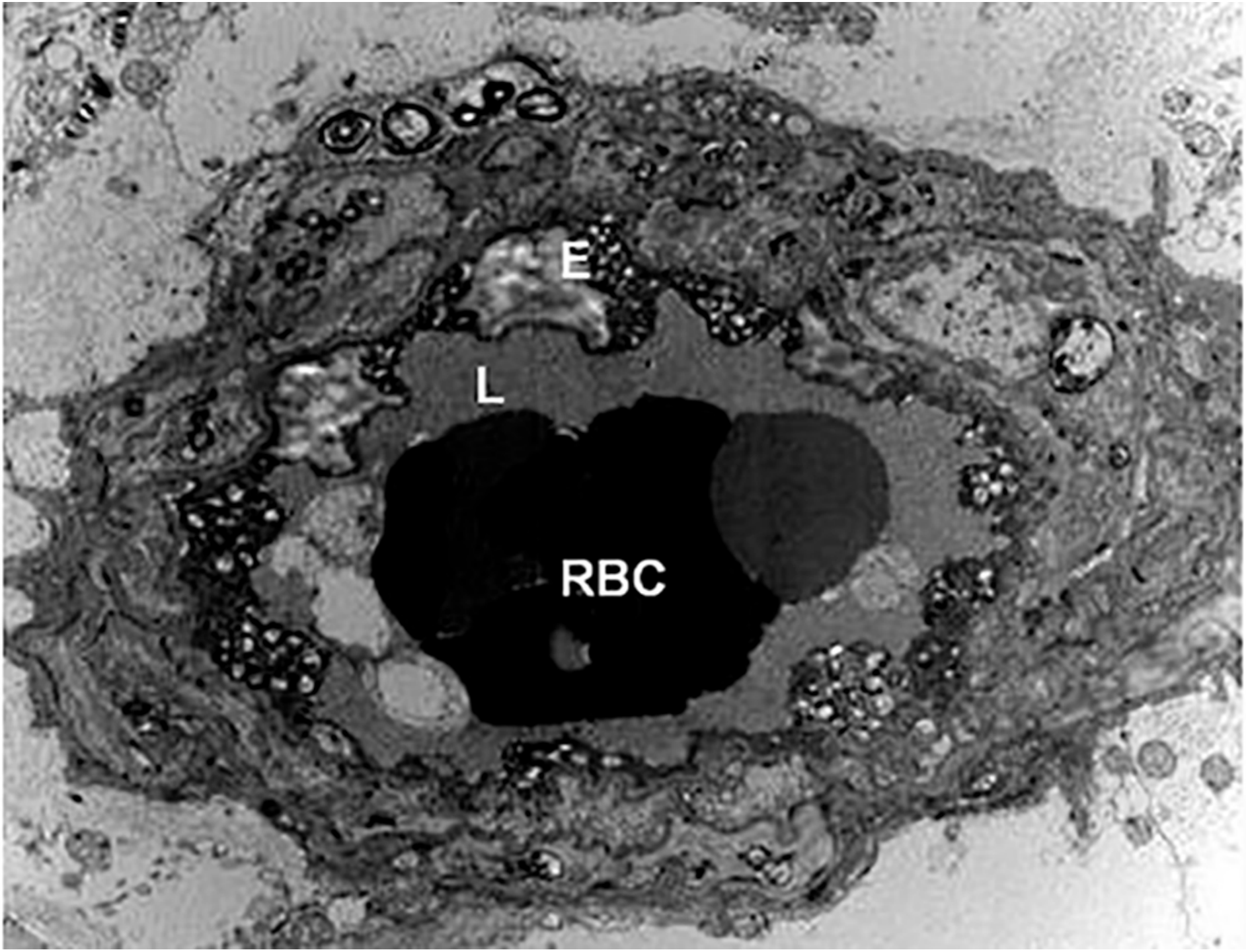
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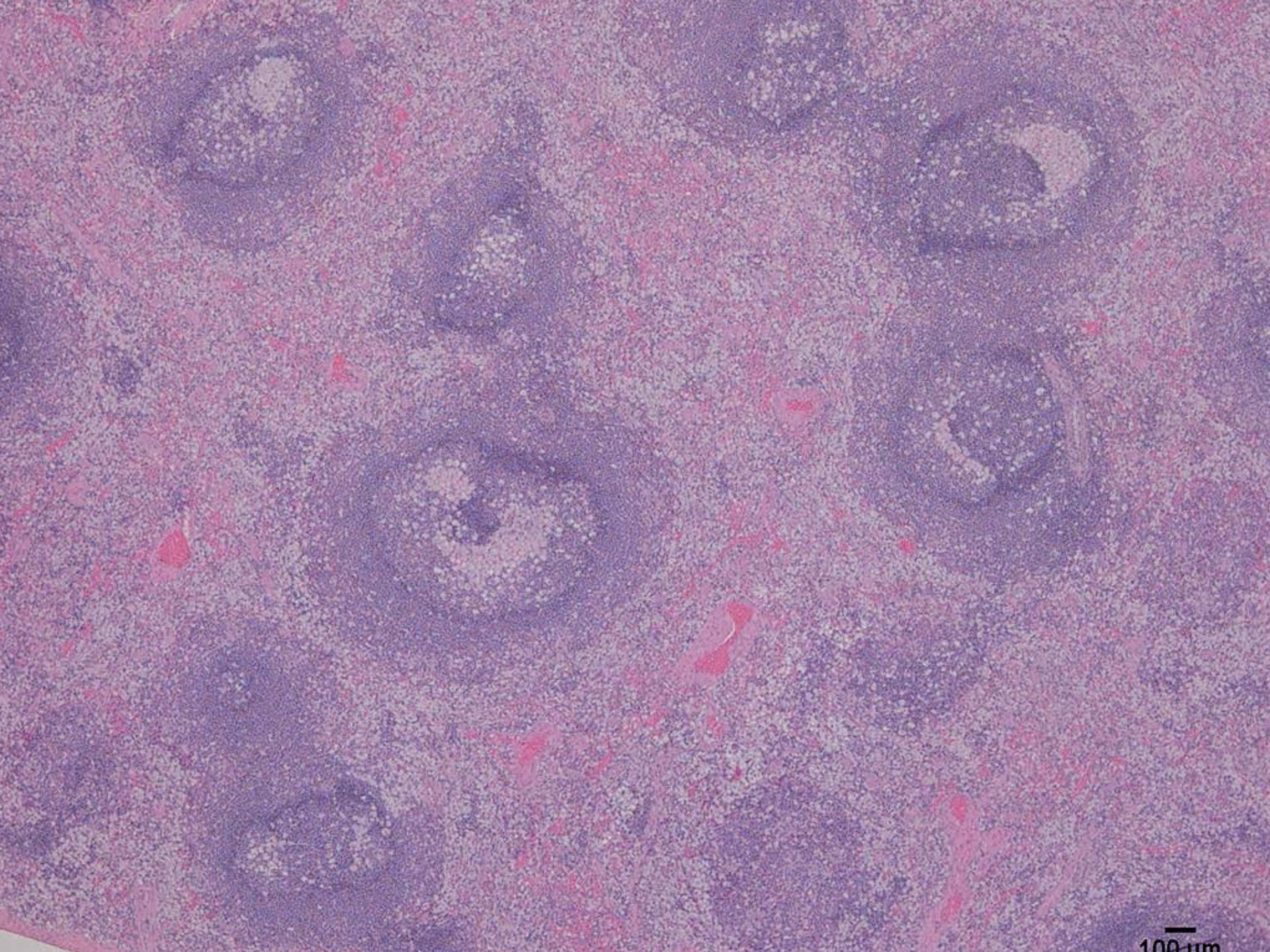
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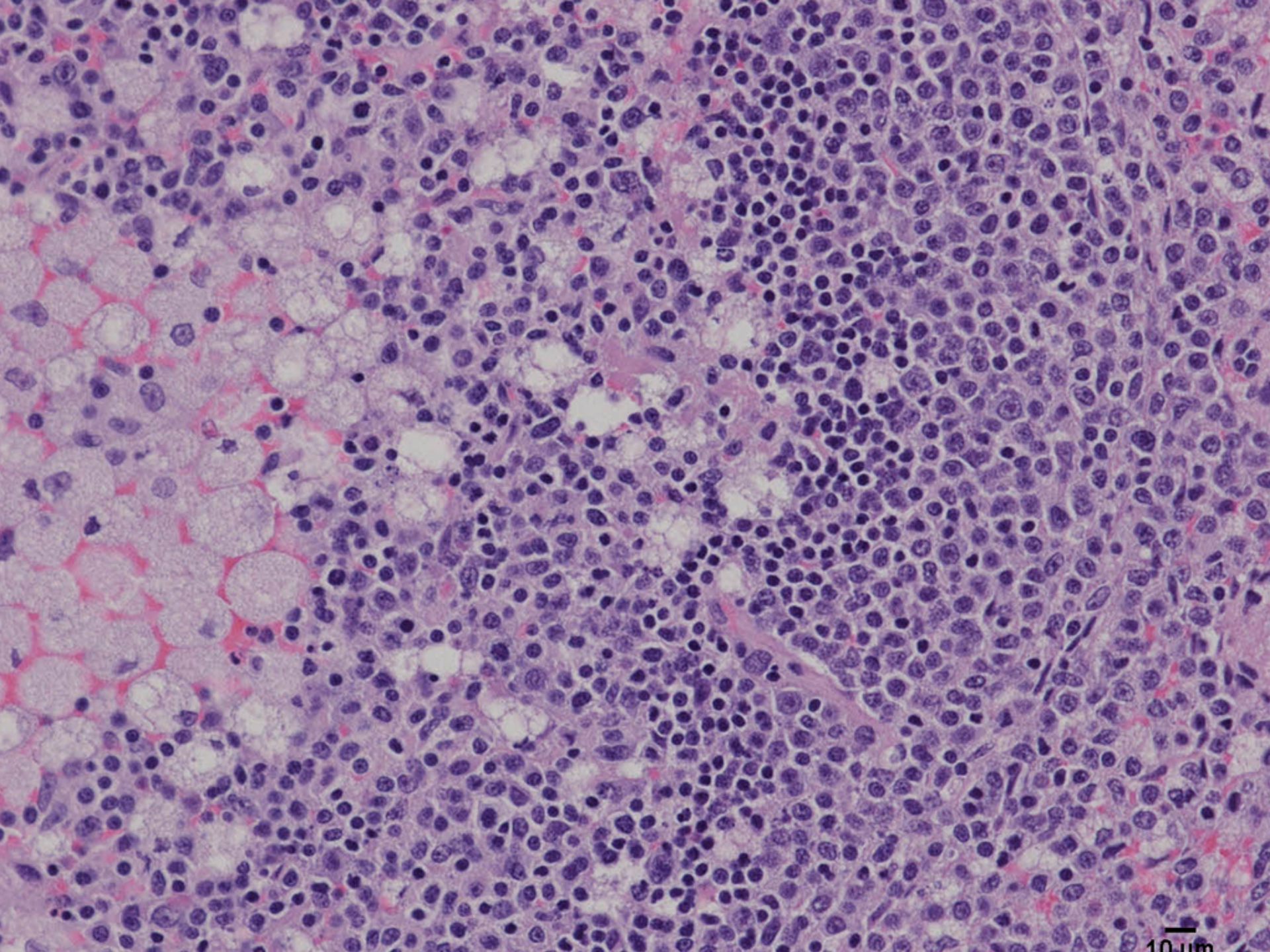
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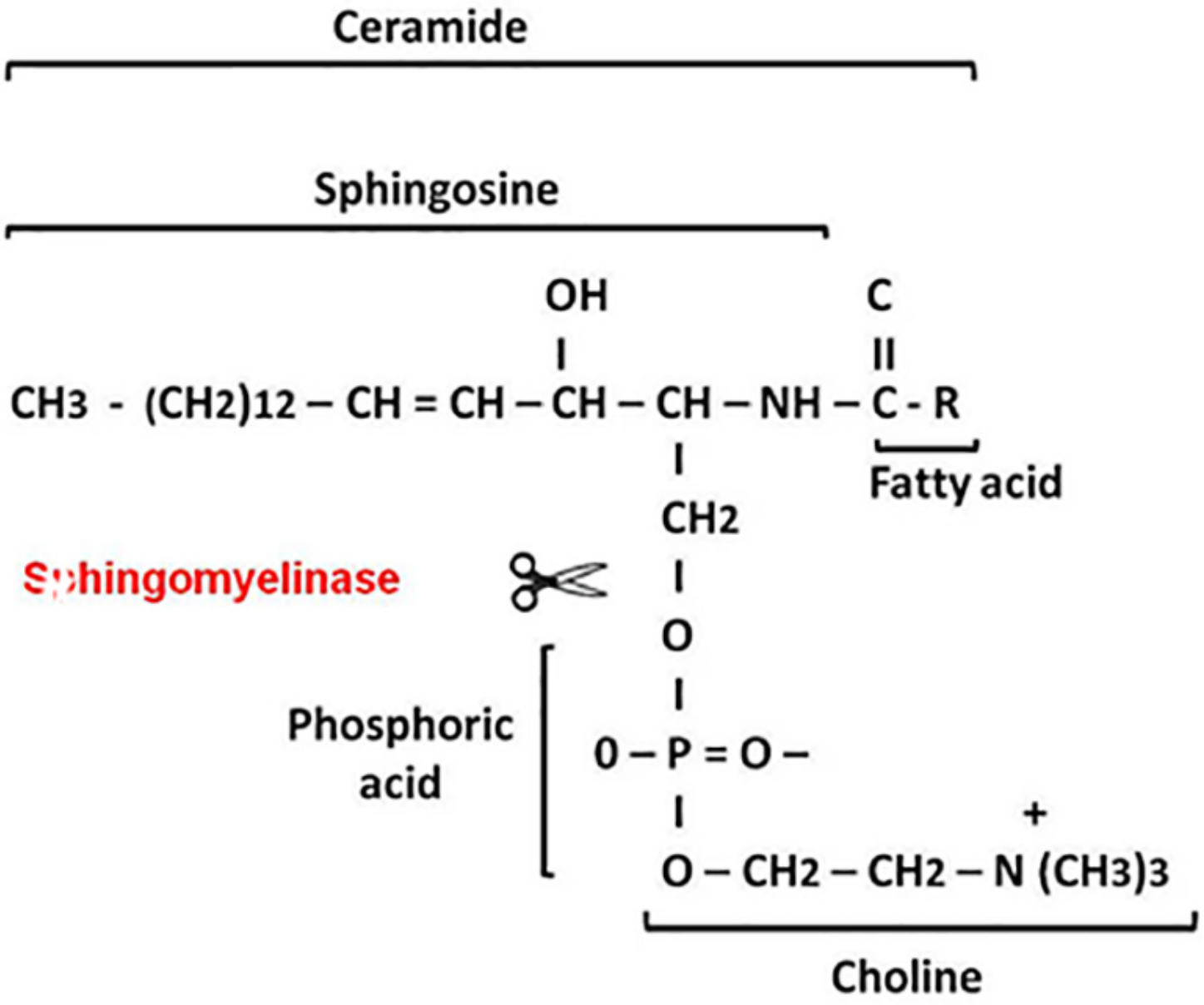
Ceramide
Sphingosine
OH
C
CH3 - (CH2)12 – CH = CH – CH – CH – NH – C - R
Fatty acid
CH2
Sphingomyelinase
O
Phosphoric acid
0 – P = O –
+
O – CH2 – CH2 – N (CH3)3
Choline

- **JPC Diagnosis:** Cerebellum: Neuronal, glial cell and endothelial cytoplasmic vacuolation, diffuse, marked with gliosis. Spleen: Histocytosis, diffuse, marked with cytoplasmic vacuolation.
- **Conference comment**:
  - The case suggested examples of NPD after reviewing some selected inherited and acquired LSDs of veterinary importance
  - Another type of LSD glucocerebrosidosis reported in Sydney Silky Terriers, which microscopically manifests in hepatic and lymph node sinusoidal macrophages and some neurons but not Purkinje cells or spinal cord
  - Globoid cell leukodystrophy also known as galactocerebrosidosis was reported in dogs, cats and polled Dorset sheep and was classified within the sphingolipidosis group LSD
  - Galactocerebroside are important components of myelin but high concentrations are cytotoxic which accumulates in oligodendrocytes and Schwann cells causing extensive cellular degeneration and necrosis halting active myelination
  - In many other LSDs like galactocerebrosidosis, neurons are not typically involved in the accumulation of excess storage materials
  - In α - and β- mannosidosis , neurons macrophages and secretory epithelial cells are mostly affected although material is typically lost during tissue processing.
  - Acquired LSDs often result from the injection of swainsonine a toxic plant by grazing livestock , injection by pregnant sheep also result in abortion and fetal malformation
  - In most LSDs , veterinary species show neurological impairment but due to similarities in clinical signs as well frequent overlap of gross and microscopic lesion in many types of LSDs, electron microscopy and measurement of lysosomal enzyme activity are often necessary to elucidate a specific etiology