NEURODEGENERATIVE DISEASE WITH LAFORA BODIES IN AN EMU (*DROMAIUS NOVAEHOLLANDIAE*)

M.A. Jimenez Martinez*, P.J. de Andres Gamazo*, J. Garcia Garcia†, B.L. Saldia† and E. Martinez Nevado†

*Animal Medicine and Surgery, Complutense University of Madrid and †Zoo Aquarium Madrid, Madrid, ES

INTRODUCTION

- Lafora disease is an autosomal recessive neurodegenerative disease in humans.
- Caused by loss of function mutations in ***EPM2A*** or ***EPM2B*** genes coding for **laforin** or **malin**.
- It is characterized by **cytoplasmic polyglucosan deposits (Lafora bodies) in neuronal bodies** and **dendrites** and neurodegeneration.
- Polyglucosan deposits are intensely periodic acid-Schiff (PAS) positive.
- Clinically characterized by **progressive myoclonus epilepsy**.
- A similar storage disease was diagnosed in an emu (*Dromaius novaehollandiae*) upon light and electron microscopic examination.

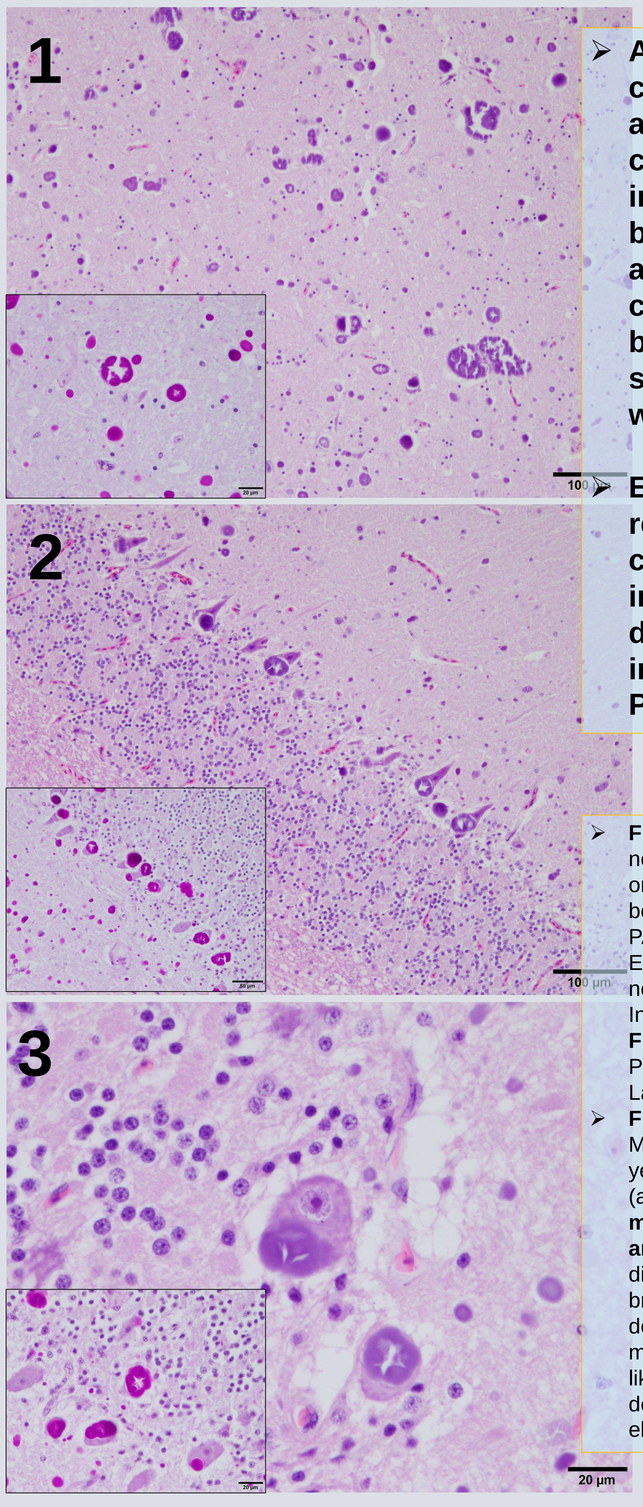
CASE DESCRIPTION

A 20 year old female emu (*Dromaius novaehollandiae*) with severe, clinical signs of neurodegeneration, incoordination, hypermetria, ataxia and emaciation, was humanely euthanized at a zoological facility. Neurological signs had become evident 4 months prior and progressed in severity with no response to treatment during this time.

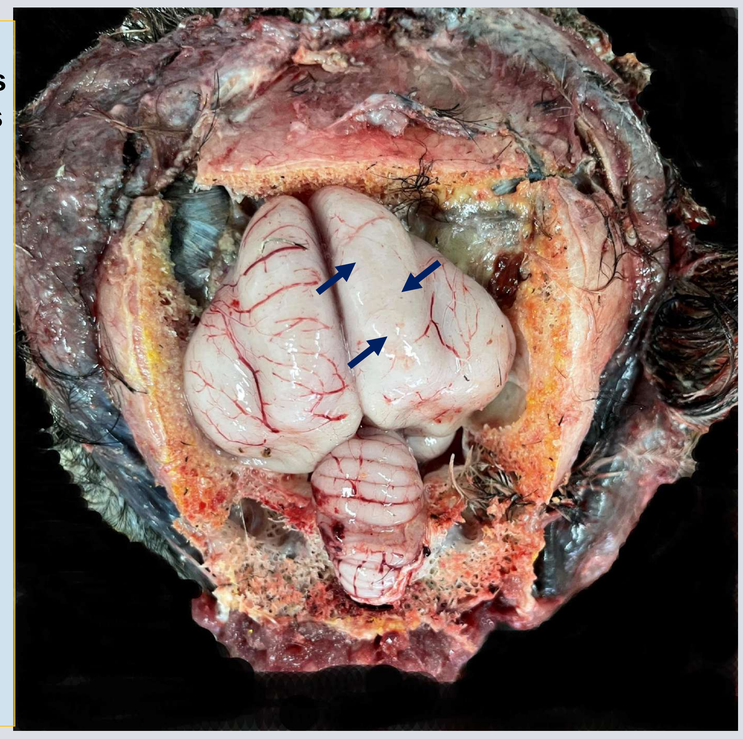
MATERIALS AND METHODS

Complete necropsy was performed and tissues from every organ system, including brain, were processed for histopathology at the Zoo and Wildlife Pathology Service of the Complutense Veterinary Teaching Hospital. Samples from the brain were processed for transmission electron microscopy at the National Center of Electron Microscopy (CNME).

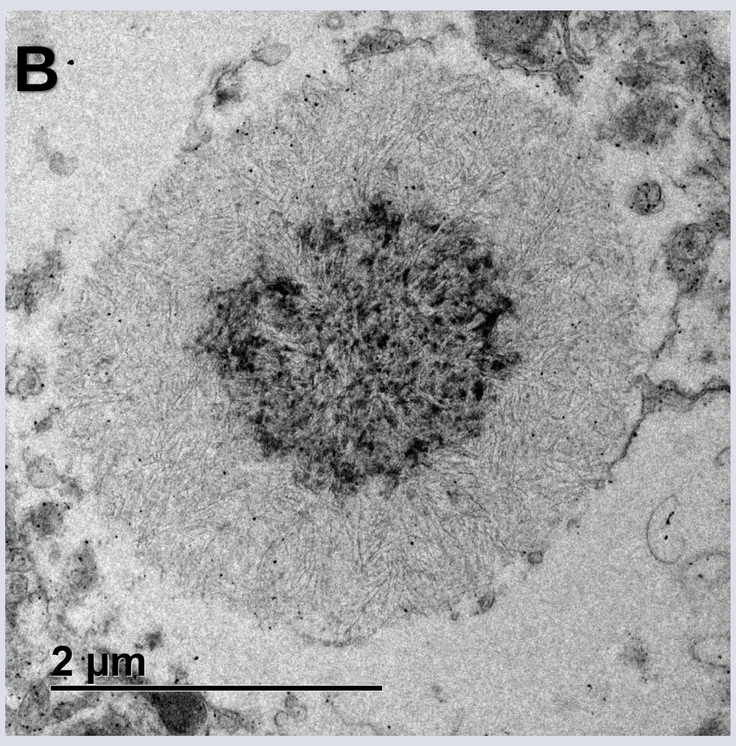
RESULTS AND CONCLUSIONS

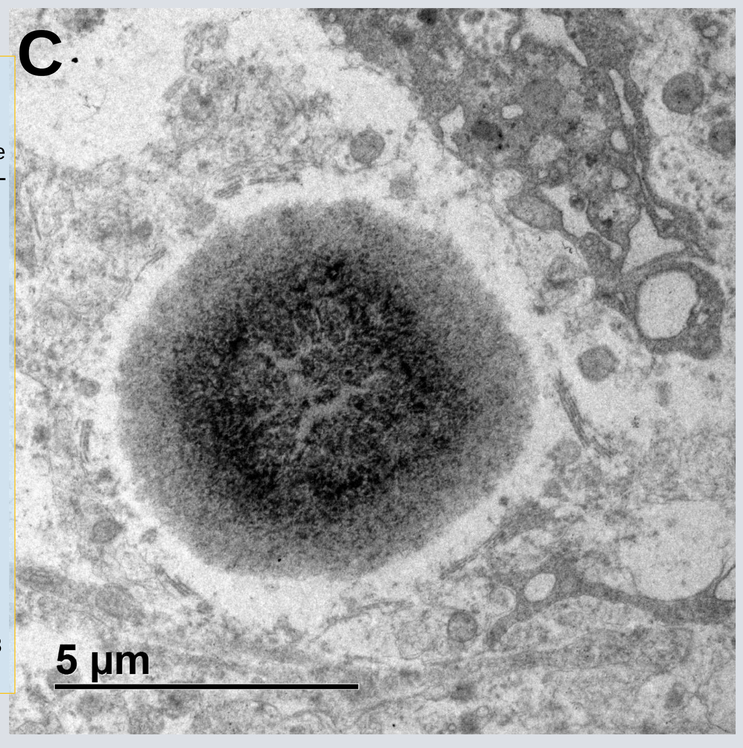


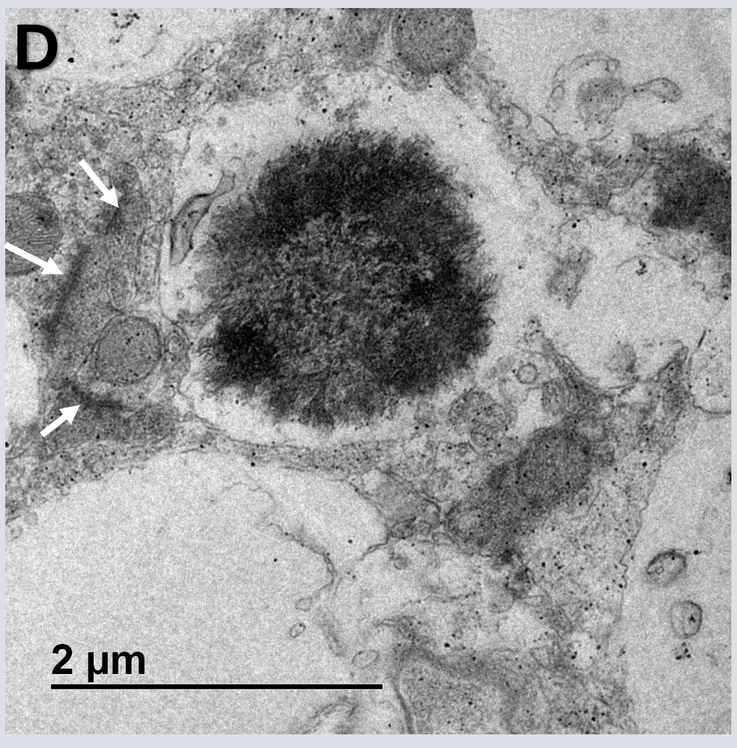
- **Almost 100% of the cerebellar Purkinje cells and brain stem neurons contained 25-75 micron inclusions with pale basophilic to amphophilic central cores rimmed by dark basophilic, radiating spicules, compatible with Lafora bodies.**
- **Electron microscopy revealed glycoprotein cytoplasmic inclusions in the soma and dendrites of neurons, including cerebellar Purkinje cells.**



- **Fig. 1**. Brain stem. H-E. Numerous neuronal bodies and axons contain or are obliterated by Lafora-like bodies. **Inset**: Lafora-like bodies are PAS positive. **Fig. 2**. Cerebellum. H-E. Purkinje cells and molecular neurons with Lafora-like bodies. Inset. PAS positive Lafora bodies. **Fig. 3**. Cerebellum. Detail of Purkinje cells and PAS positivity of Lafora bodies (**inset**).
- **Fig. A**. Gross image of the brain. Multifocal to coalescing, faint yellow-grey areas of malacia (arrows). **Fig. B-D. Electron microscopy**. **Cerebellum**. **Fig. B and C**. Detail of 4-5 micron diameter inclusions of fibrillar, branching polyglucosans within a degenerate cytoskeleton and mitochondria. **Fig. D**. Lafora body-like inclusion within a degenerate dendrite with a mitochondrion and 3 electron dense synapses (arrows).







The similarity of the polyglucosan fibrils with Lafora bodies (LB) and the location of these deposits within the neuronal soma and dendrites reminded of human Lafora disease (LD). However, clinical onset of LD in humans occurs in late childhood-teenage years and in this emu, neurological signs occurred in senility, more similar to the storage disease “adult polyglucosan body disease” (APBD). However in the latter, polyglucosan deposits occur in axons instead of neurons[1]. Further studies are required to determine a similar genetic origin to LD in this case.

Lafora inclusions have also been reported in dogs and cockatoos[2]. Although rare, other lysosomal storage diseases have been described in emu[3], but this is the first description of Lafora like inclusions associated with clinical neurologic disfunction in this species.

1. Mochel F et al. Adult polyglucosan body disease: Natural History and Key Magnetic Resonance Imaging Findings. Ann Neurol. 2012 Sep;72(3):433-41. doi: 10.1002/ana.23598. PMID: 23034915; PMCID: PMC4329926.
2. Flegel T, et al. A retrospective case series of clinical signs in 28 Beagles with Lafora disease. J Vet Intern Med. 2021 Sep;35(5):2359-2365. doi: 10.1111/jvim.16255. Epub 2021 Sep 5. PMID: 34486182; PMCID: PMC8478043.
3. Kim DY, Cho DY, Taylor HW. Lysosomal storage disease in an emu (Dromaius novaehollandiae). Vet Pathol. 1996 May;33(3):365-6. doi: 10.1177/030098589603300320. PMID: 8740717.