

MALNUTRITION AND AGEING: A ULTRAELECTRICAL ANALYSIS OF CHANGES IN NEURONAL FEATURES OF HIPPOCAMPAL PYRAMIDAL CELLS.

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The hippocampal formation (HF) has been intensively study, not only by their anatomy (simply relative), but also for the association of cognitive functions. The hippocampus dorsal (HD) is a structure of the HF useful for studding the behavioral and/or anatomical effects, produced by the aging and stressful factors, such as the chronic and pre or postnatal malnutrition (1,2,3). In rats, it is well known that the hippocampus development finished after the moment at the birth, and by this reason, the pre and postnatal malnutrition can produces delay in the development of the projection cells of the HD, specially in those located in CA1 field, which is the output of the information (hippocampal theta rhythm). This rhythm is associated with learning process (4). In order to understand, the relation with the learning process and the changes in the neuronal features of the hippocampal pyramidal cells in malnourished ageing rats, we design the present study in which were used senile 24 months animals (with and without malnutrition) on hippocampal pyramidal CA1. The malnutrition method consisted in the administration of an isocaloric and hypoprotein diet from 5 weeks prior to mating, during pregnancy, lactation, adult and senile life, which contains only 6% of casein (4). Animals were anesthetized with pentobarbital and perfused transcárdially with 4% paraformaldehyde and 2% glutaraldehyde in 0.15M sodium cacodylated buffer, pH 7.3 (5). The right HD was isolated and a section of 400 microns and post fixed in 1% OsO₄ in the same buffer, dehydrated in ethanol and embedded in epoxy resin. Semi-thin sections were cut an ultramicrotome MTX of RMC to identify the area CA1 of the HD. The thin sections were cut with a diamond knife, stained with uranyl acetate and lead citrate and examined with a JEOL-1010 transmission electron microscope operating at 80 kV (6,7). The electron microscopy data were colleted by photographing pyramidal cells from CA1 region at primary magnification 5,000x and enlargements of 20,000x. This soma were identified by their possessing apical and basal dendrites and a large nucleus surrounded by cytoplasm indicating that the plane of section was through the central portion of the cell body (8). Each cell was digitized in a Macintosh computer. The following analyses were done for each neuron, features of endoplasmic reticulum, mitochondria, lysosomes (lipofuscin inclusions) and multivesicular bodies, as signs of a aged neurons (9). Our results in malnourished aged animals showed reductions in the lipofuscin granules, mitochondria and endoplasmatic reticulum had a considerable dilated cisternae system. Control aged animals with a normal diet had increases in the lipofuscin granules but their endoplasmatic reticulum is normal. Malnutrition and ageing increase the lysosomal dysfunction and caused changes in the features of neuronal cell bodies of typical pyramidal cells in HD.

References

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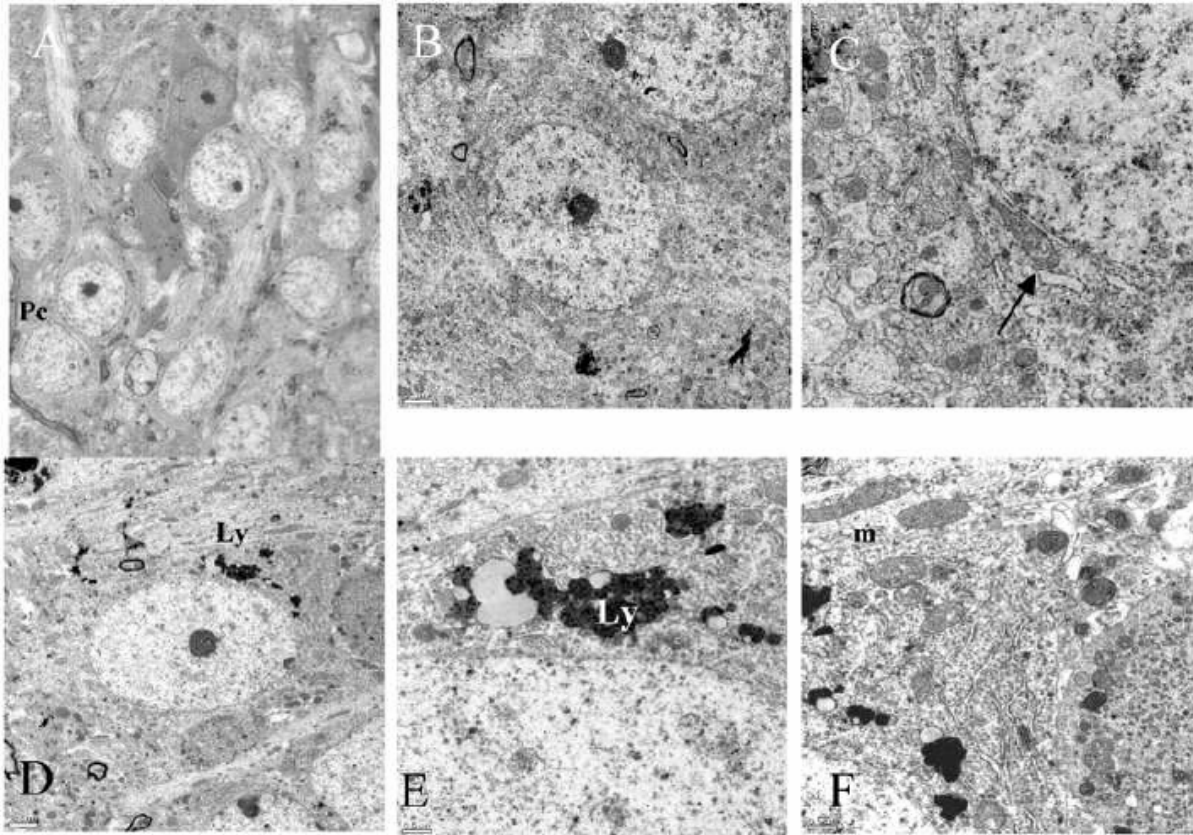


Figure A semi-thin section from HD showing the pyramidal cells (Pc) in CA1. B, Neuron from malnourished and ageing animal at 5,000x. C, enlargement of a 20,000x showing the dilated cistern from endoplasmic reticulum (arrow). D, pyramidal cell from control ageing animal, note the lysosomes (Ly) and lipofuscin inclusion, a well preserved endoplasmic reticulum and mitochondria (m). Bars = 2 and 1 micron.