After 7 days of incubation the control cultures show involution phenomena in both proximal and distal tubules: presence of vacuolization in an eosinophilic cytoplasm, polymorphism of the nuclei, and reappearance of cell debris in the lumen. In the glomeruli, the cell number decreases and Bowman's capsule is thickened.

In the cultures irradiated with 1000 and 2000 rad a wide spread disintegration of tubules and Bowman's capsules is found. The paucity of fibroblast-like cells is remarkable. The swollen and disrupted remnants of argentophilic fibers are still to be seen.

Discussion. After 6 h of incubation, both irradiated and control cultures show reversible and irreversible cell damage. In irradiated cultures, recuperation is retarded or completely absent, a phenomenon also mentioned by LASNITZKI[7]. We infer from this that irradiation injury is superimposed on injury caused by cultural procedures, increasing the number of irreversibly damaged cellular components.

The interstitial cell compartment changes considerably during culture. These changes are characterized by the appearance of connective tissue around the organized structures and at the periphery of the culture. Most of these interstitial cells originate from traumatized kidney tubules[8]. These cells flatten and migrate through the whole culture and form argentophilic fibers. Interstitial cells also undergo irradiation damage, as is shown by their swelling. The decreased number of flattened cells cannot be explained by inhibition of multiplication, since in these cells mitotic activity is low. This phenomenon can only be explained by inhibition of cell migration, as also stated by GÄRTNER[9] and GOLDFEDER[10] in fibroblast cultures. The absence of isolated cells at the periphery of the culture supports this theory.

It may be concluded from our experiments that in the chick mesonephros organized structures are less radiosensitive than the interstitial cell compartment. This phenomenon is also described by NORRIS and HOOD[11] in cultures of human foetal kidney. The irradiation-induced changes described in our experiments are dose-dependent, as is shown by comparison of the various doses administered.

Zusammenfassung. Es wurden Hühnchen-Embryonen mit Einzeldosen von 500, 1000 und 2000 rad in vitro bestrahlt und die Kulturen nachher inkubiert. Nur bei den nicht bestrahlten Kulturen kam es zur Proliferation des interstiziellen Gewebes und zur Vermehrung der argentophilen Fasern. Schädigungen an Tubuli und Glomeruli bei den bestrahlten Kulturen erwiesen sich als strahlendosisabhängig.

L. DE RIDDER[12], M. MAREEL[12] and L. VAKAET[13]

Instituut voor Radiotherapie en Kerngeneeskunde, Universiteit Gent, Akademisch Ziekenhuis, Gent, and Laboratorium voor Anatomie en Embryologie, Rijksuniversitair Centrum Antwerpen (Belgium), 16 October 1970.

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[13] Laboratorium voor Anatomie en Embryologie, Rijksuniversitair Centrum, Antwerpen (Belgium).

CAJAL Cells of the Rabbit Cerebral Cortex

'Special cells' or horizontal cells located in the first layer (molecular or layer I) in the cortex cerebri of small mammals, were first described by CAJAL[1] as cells possessing no axons, and were later classified as neurons by the same investigator[2]. RETZIUS[3] described the same type cell in the brain of the human fetus and coined the name 'CAJAL cells' for this structure and shortly afterwards, VERATTI[4] confirmed CAJAL's original observation. Both RETZIUS and VERATTI, however, concluded from their work that the CAJAL cells contained axons. This conclusion was also reached by CAJAL[5] from his study on the cortex cerebri of the new-born human. LORENTE DE NÓ[6] discussed the possibility that the CAJAL cells of the mouse cerebral cortex could be of the short axon type. In other animal species, the short axon cells located in the molecular layer, have been described as modified CAJAL cells. Since these publications, CAJAL cells are thought to be neurons with axon, though the literature supporting this view is rather inconclusive.

The present study was conducted in order to establish the morphological features of the CAJAL cells of the rabbit cerebral cortex during early development. Tissue samples from the sensory motor cortex of rabbits ranging in age from 6 to 24 days were prepared histologically by the Golgi method. In all brains studied, tissue sample sectioning was performed both perpendicularly and tangentially to the cortical surface. Suspecting a similarity between CAJAL cells of the rabbit cerebral cortex and the large amacrine cells of the inner plexiform layer of the retina, morphological studies on the retinae from adult rabbit were also performed. The Golgi staining procedure was applied to small pieces of this tissue which was subsequently sectionned perpendicularly to the main surface of the retina. In order to obtain a more complete histological view of the whole retina, it was also subjected to the staining technique of GROS as modified by GALLEGO[7].

In our preparation of the rabbit cortex cerebri, it was possible to demonstrate the occurrence of CAJAL cells and to study their body shape and prolongation in 2 angular sections. These cells, whose soma was located in the middle and lower third portion of molecular layer,

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presented the morphological features described by CAJAL[1], stellate multipolar or bipolar shaped body with an approximate cross section of 10 by 20 μm with prolongations from 400 to 700 μm extending horizontally in a plane parallel to the pial surface. As stated by CAJAL, these prolongations do not extend beyond the molecular layer, but terminate in this layer and cover areas of different dimensions. In the preparations stained by the Golgi method, the protoplasmic extensions were thick, rough, lacking spines, and gave off branches at angles of different degrees. In all preparations studied the close resemblance between all the processes of the same cell made it impossible to differentiate an axon, thus corroborating the early findings of CAJAL[1,2]. No structural difference was observed moreover in CAJAL cells from animals ranging in age from 6 to 24 days, but in 6-day-old rabbits, histological localization of the stellate shaped multipolar cell was only possible in preparations sectionned tangential to the pial surface. The structural resemblance between CAJAL cells and the large amacrine cells of the inner plexiform layer of the adult rabbit retina was surprising (Figure A). This similarity was indeed pronounced when CAJAL cells appearing in tangentially sectionned preparations were compared with the large amacrine cells of the adult rabbit retina processed by the GALLEGO method (Figures B and C). As can be seen, the protoplasmic extensions of both cell types could be followed to their final ramifications. The large amacrine cells could be classified in 2 main groups with reference to the shape of their soma: bipolar or stellate. The close resemblance between CAJAL cells and large amacrine cells was also evident in perpendicular sections of both the cortex cerebri and of the retina when stained by the Golgi method (Figures D and E). In these preparations the large amacrine cells had a body with an approximate cross section of 15 to 20 μm; they were ovoid or piriform in shape and contained polar extensions of great length.

Many workers have pointed out the difficulty in localizing CAJAL cells in the brain of adult animals, and the postulate has been made that CAJAL cells evolved into adult cortical cells of some other type: either short axons cells[6,8] or large pyramidal cells[9]. According to MELLER et al.[10], the cerebral cortex of the albino mouse up to the age of 6 days contains CAJAL cells bipolar in shape. From the 7th day onwards, these cells change their primitive shape becoming multipolar and possessing several dendrites with spines and one axon. In our preparations of the cerebral cortex of rabbits ranging in age from 6 to 24 days, no axons were observed either in the bipolar or stellate multipolar cells. The cellular processes of both cell types were spineless, although

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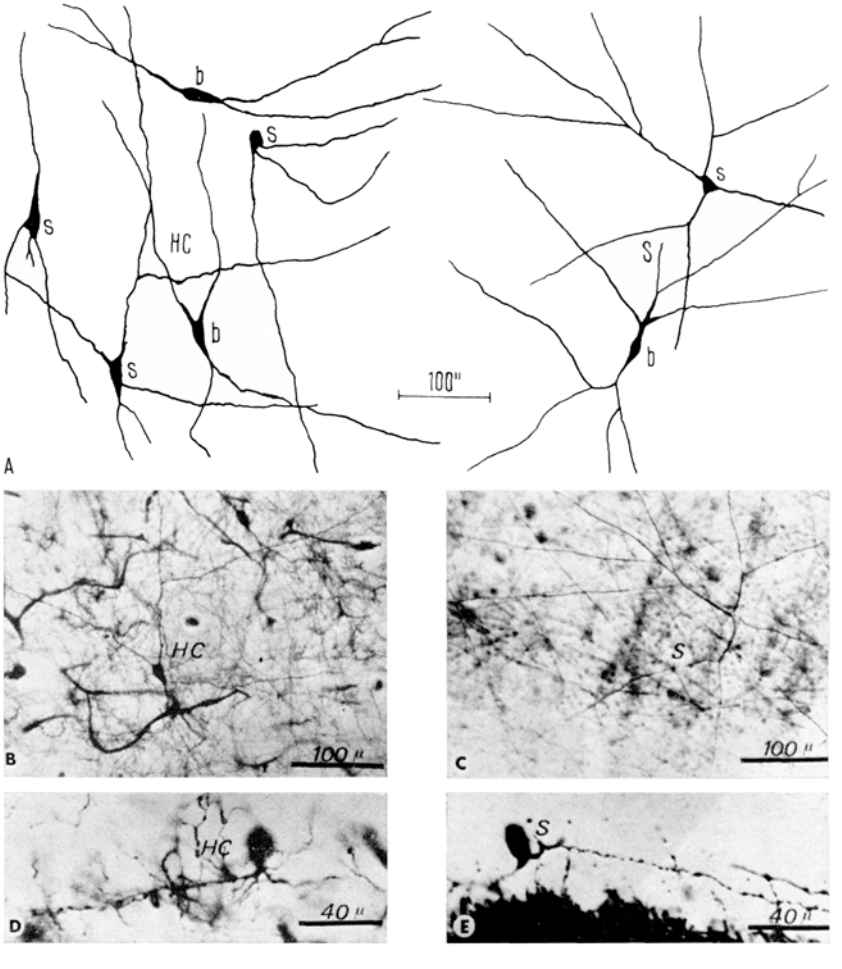

A) Diagramatic illustrations of CAJAL cells or horizontal cells (HC) from layer I of the cortex cerebri of a 12-day-old rabbit, and large amacrine cells (S) of the inner plexiform layer of the retina of an adult rabbit. Stellate multipolar type (s). Bipolar type (b).
B) CAJAL cell (HC) from layer I of cortex cerebri of a 12-day-old rabbit. Golgi method. Tangential section.
C) Large amacrine cell (S) from the inner plexiform layer of the retina of an adult rabbit. GALLEGO method.
D) CAJAL cell (HC) from layer I of the cortex cerebri of a 14-day-old rabbit. Golgi method. Perpendicular section.
E) Large amacrine cell (S) from the inner plexiform layer of the retina of an adult rabbit. Golgi method. Perpendicular section.

varicose-like structures could be seen. Both bipolar and multipolar cells were found throughout the period of development studied (6–24 days). Morphological changes in the CAJAL cells of the rabbit cerebral cortex are therefore minute from the 6th day onwards.

If CAJAL cells serve a distinct function, it is possible that they undergo biochemical changes with age. Such changes could make the staining of the adult cells rather difficult, using techniques which visualize them so readily in the brain of embryonique and inmature animals. Taking proper precautions in the preparation, we have, however, been able to see CAJAL cells by the Golgi staining in the cerebral cortex of adult animals, thus confirming data from investigations on the canine brain by FOX and INMAN[11].

Further work should concentrate an electrophysiological investigation of CAJAL cells, since, lacking an axon, these cells might exhibit a possible function through slow, non-conducted membrane potential variations[12].

Resumen. Las células de CAJAL en los animales estudiados, no poseen axon. Morfológicamente son similares a las grandes amacrinas de la plexiforme interna de la retina.

M. BARÓN and A. GALLEGO

Department of Physiology and Biochemistry, Madrid Medical School, Madrid (Spain),
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The Localization of Tellurium in Tellurium-Induced Hydrocephalus[1]

If tellurium is experimentally fed or injected into adult animals or birds, it can result in the deposition of dark bodies in cerebral neurons, the so-called 'black brain'[2–4]. Electron-microscope studies of the brains of rabbits and Syrian hamsters given tellurium have suggested that the tellurium particles are localized in the lysosomes of neurons and glial cells[5–7]. It has been suggested that the tellurium is present in cerebral tissues as tellurous acid[7–9].

Small amounts of elemental tellurium included in the normal diet of pregnant Wistar and Long-Evans rats can result in hydrocephalus of the fetuses and newborns[9–11]. Radioactive tellurium 127m, as tellurous acid, included with this diet will localize in the fetal brain[9,12], and can be visualized with the light-microscope using autoradiographic techniques[12]. Radioactive tellurium 127m, being a strong γ-emitter (99.2%) and a very weak β-emitter (0.8%), is adequate for light microscopy autoradiography but not for electron-microscopy autoradiography[12,13]. This communication reports observations of small dark particles, presumably telluric, in lysosomes of neurons and glial cells in the tellurium-induced hydrocephalic brains of newborn rats.

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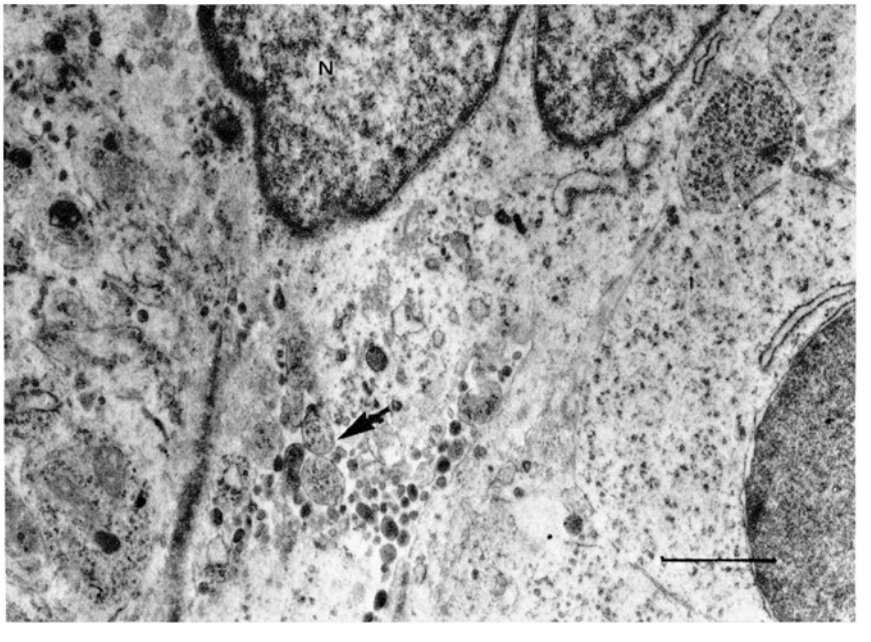

Fig. 1. A Neuroblast from the telencephalon of a rat fetus, whose mother was fed tellurium, showing black particles within membrane-bound bodies in the cytoplasm. The arrow points to the bodies shown in Figure 2. N = nucleus.