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Ependymogenesis of the Lizard Basal Areas

I. Ependymal Zones

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With 6 Figures

Summary

A study of the ependymary covering at (OM and EM) all levels of all ependymal zones of the Basal Areas of the Telencephalon has been carried out [vz(b), vz(e) and vz(f)], during the embryonic, postnatal and adult development of *Gallotia galloti*. The telencephalic vesicle is iniciated at E-30, its ventricular wall is covered by a thick homogenous matrix (dorsal and ventral) that gradually differentiates through embryonic development in the mentioned ependymal zones and in four sulcus (sulcus lateralis, terminalis, ventralis and septomedialis) and the adult will give to the lateral ventricle a regionalized aspect, denominated as mosaic. The proliferation gradient of these zones is rostro-caudal and at the same time overlaps the formation gradient rostro-caudal of the basal nuclei. During the first stages (E-32, E-35), these ependymal zones present homogenous ultrastructural characteristics and numerous intercellular spaces. They have a large cellular proliferation, shown by the presence of numerous mitosis. This model undergoes a gradual change from E-35 to E-38, where its ependymal characteristics appear clearly defined, the intercellular spaces dissapear together with its mitotic capacity. Cubic, prismatic and secretory cells are identified. the ependymal zone (b) is that which presents major morphological variability in the rostral-caudal sense.

Key words: Ependymal Zones – Development – Basal Areas – Telencephalon – Lizard.

Introduction

The lateral ventricles are covered by a layer of ventricular cells during the embryonic development of the telencephalic vesicle, which are in different stages of the mitotic cycle (Boulder Committe 1970) and give origen to the different glial and neuronal cells. In the last stages of development this proliferative region will differentiate in the different ependymal cells that will form part of the distinct regions of the lateral ventricle of vertebrates, but in the adult Reptiles, apart from existing zones with ependyma characteristics there are stil others of matricial characteristics "sulcus" (Fleischhauer 1957 and Kirsche 1967).

There has been much speculation throughout all the literature about the possible functions of ependymal cells (Telencephalon), and there seems to exist general agreement in respect to Reptiles, on the other hand they could intervene in the reabsortion of cerebrospinal fluid, or the transport of substances or secretion (HETZEL 1978a). This diversity of functions is already reflected in the regional morphology of the ependyma (FLEISCHHAUER and PETROVICKY 1968). Among the classic authors the ependymal recovering of the lateral ventricles during Reptile development has been partially studied (OM). We must point out HOLMGREN's studies (1925), he studied some aspects of ependyma development. KÄLLEN (1951) carried out one of the most extensive and detailed works on cellular proliferation. KIRSCHE (1967, 1972), basing himself on cytoarchitectonic differences he divided the telencephalic wall into one ventral part and another dorsal. HETZEL (1974) elaborated one of the basic studies on matrix activity and divided the lateral ventricle into different sections, (a, b, c, d, e, f). In respect to postnatal development SCHULZ (1969), developed an extensive work on the postembryonic matrix. From the ultrastructural point of view, studies are rather scarce and only refer to some aspects of the lateral ventricle FLEISCHHAUER (1972). All together, these studies have not permitted us to give a complete vision in relation to the development and tipology of the lateral ventricle ependyma.

In this work the recovering ependyma of three zones of the lateral ventricle (vz(b), vz(e) and vz(f)), will be systematically approached, from the structural and ultrastructural point of view in *Gallotia galloti* during embryonic, postnatal and adult development. HETZEL (1974) terminology will be followed.

Material and Method

The material object of this study has been the *Gallotia galloti* species (Reptil-Lacertidae) from Tenerife (Canary Islands, Spain). Embryonic, postnatal and adult examples were used. In total 85 embryos, 10 postnatal and 40 adults were used.

The embryos were obtained from pregnant females captured during May–June and earth eggs were collected in the laying zone during July–September (Tenerife). The embryos with a cephalic length of over 2 mm (stage 30 onwards), were beheaded and fixed by immersion, while the samples near to the hatching stage were anaesthetized with Nembutal and perfused.

Embryo classification was carried out according to the development table of *Gallotia galloti* (RAMOS STEFFEN 1980), in which equivalence with the development stages of *Lacerta vivipara* (DUFAURE and HUBERT 1961) is established.

Postnatal classification was made according to size (length head-cloaca), criteria used by ROSE (1957) and PLETICHA (1968). In our study we have used examples of 3.6 and 4.5 cm.

The fixers used for OM were Bouin liquid and Lillie Formaline; the embryos were embedded in paraffin, sections were cut between 7–10 microns and stained with Hematoxylin-Eosine. For EM they were fixed with 2.5% glutaraldehyde in phosphate buffer (0.1 M and *p*H 7.2); postfixed with 2% osmium tetroxide in Millonig buffer (4°C). during 2 h, dehydrated in acetone and embedded in araldite. Semithin sections were stained with 1% toluidine blue.

To carry out telencephalon drawings in lateral and dorsal views of stages E-31, E-32, E-35 and adults we used a clear chamber in a Zeiss microscope.

All development stages of *Gallotia galloti* were studied, and the following significant stages were chosen. E-32, E-35, E-37, E-39 and hatching; as important morphological and histological changes were seen in them.

We have used the following parametres, number of layers, staining, distribution, morphology and orientation of the cellular nucleus, number of mitosis, lipidic droplets and cilia, to study the development of each ependymal zone and sulcus, at each level studied (caudal-rostral).

Results

Telencephalon Morphogenesis. The prosencephalon of *Gallotia galloti*, is divided into telencephalon and diencephalon, in the stage of 17 somitas or stage 24 of *Lacerta vivipara* (DUFAURE and HUBERT 1961). Between E-24 and E-30, the telencephalon is formed by one unique pumped vesicle. As from E-30, the separation diencephalon-telencephalon is seen for the first time (E-30) and iniciates in the lamina terminalis (Fig. 1A, A′). The ventricle is made up of an ample, round shape, which is covered by a thick matrix. In E-31 the piriform aspect of the telencephalon is iniciated, this presents a caudal rostral growth gradient and lateral ventricles (Fig. 1B, B′). The ventricular lumen is very ample above all in its dorsal portion, due to the initiation of a ventral-dorsal growth

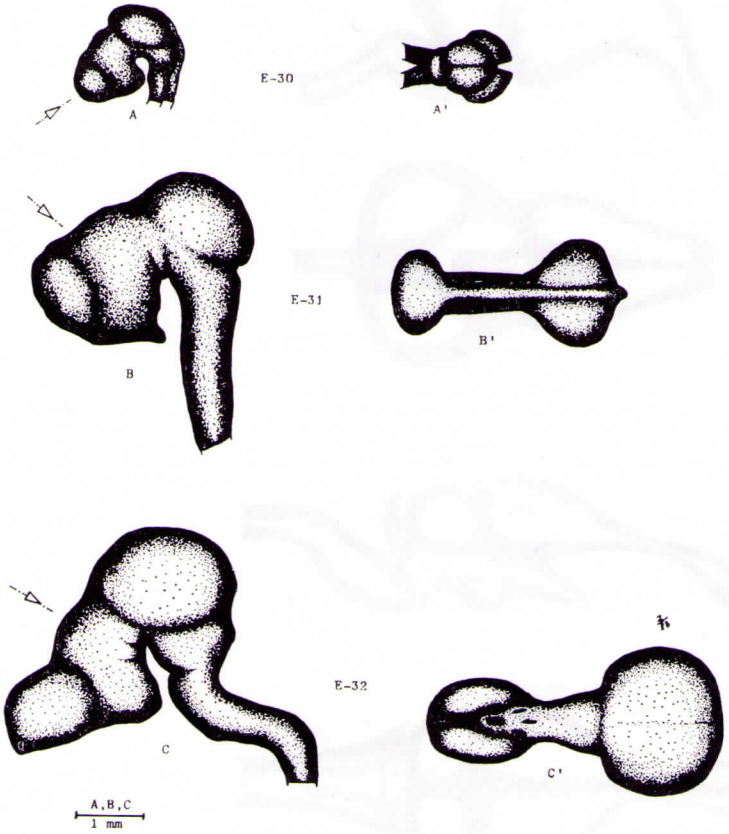

Fig. 1. Morphological telencephalic development of *Gallotia galloti*. In (A-A′) the telencephalic vesicle differentiates for the first time. (B-B′) The telencephalic piriform aspect anlages. (C-C′) The two hemispheres are formed. The arrows indicate the optic axle in which the correspondent dorsal views have been carried out (A′, B′, C′, D′, E′)

in the intermediate zone (Fig. 2). In E-32, the initiation of the telencephalic hemispheres can be observed, the middle wall or septum develops, and the two lateral ventricles are defined (Fig. 1C, C′). In E-35, the piriform aspect of the telencephalon is defined (Fig. 1.1D, D′) and a narrowing of the ventricular ventral lumen takes place (Fig. 2). As from E-37 and at the same time as the growth of the entire telencephalic vesicle the ventricular lumen (Fig. 2) also narrows gradually until taking on the shape of the "horseshoe" in the hatching stage, as defined in the adult (Fig. 2.1).

Ventricular Zone Evolution. The ventricular zone in initial stages (E-30, E-31) of encephalic development, is found almost fully developed in all telencephalic vesicle levels (Fig. 3a) and is constituted by a pseudostratificated epithelium of 9–11 layers of nuclei;

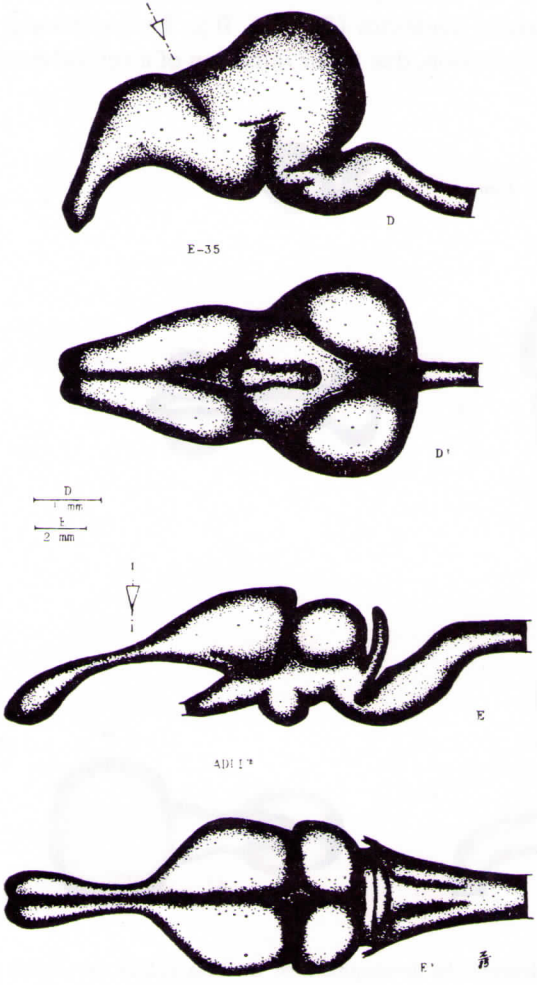

Fig. 1.1. Telencephalic morphological development of *Gallotia galloti*. (D-D′) The morphological aspect of the adult in E-35 appears defined. (E-E′) The adult telencephalon is represented

the majority of these nuclei show an oval and round shape with a clear nucleolus. The number of mitotic figures is very high and situated periventricularly (Fig. 3b).

Three ventricular zones are differentiated as from E-32, ventricular zone (b) [vz(b)], ventricular zone (e) [vz(e)] and ventricular zone (f) [vz(f)] and four sulcus (lateralis, terminalis ventralis and septomedialis), which will be dealt with in the second part of the study.

Ventricular Zone (*b*). vz(b), begins its initiation between E-31 and E-32 and is found situated between the sulcus lateralis (SL) and terminalis (ST) primordial (Fig. 3c). The limits with both structures are defined gradually from E-33 and E-35 (Fig. 3d).

In E-32, at the middle and anterior levels 4–5 nuclear levels are seen, 7–8 in the rostral and 9–10 in the caudals. In E-35, in the middle levels 4 layers are presented and 6–7 in the caudals and anteriors. From E-37 up to hatching stage, a gradual reduction takes place in the number of layers, all appear monostratificated, in the hatching stage (Fig. 4a, b). The cellular population is made up of cells whose nuclei are oval and round (E-32, E-35).

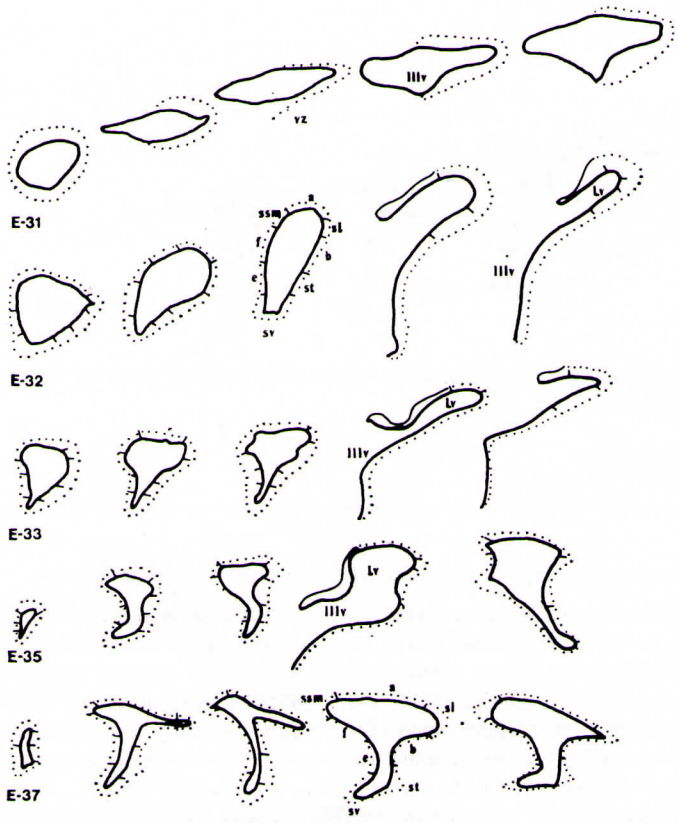

Fig. 2. Lateral ventricle evolution. The gradual reduction of lumen is seen from E-31 until adulthood. In E-37, the lateral ventricle takes on the morphological aspect of the adult

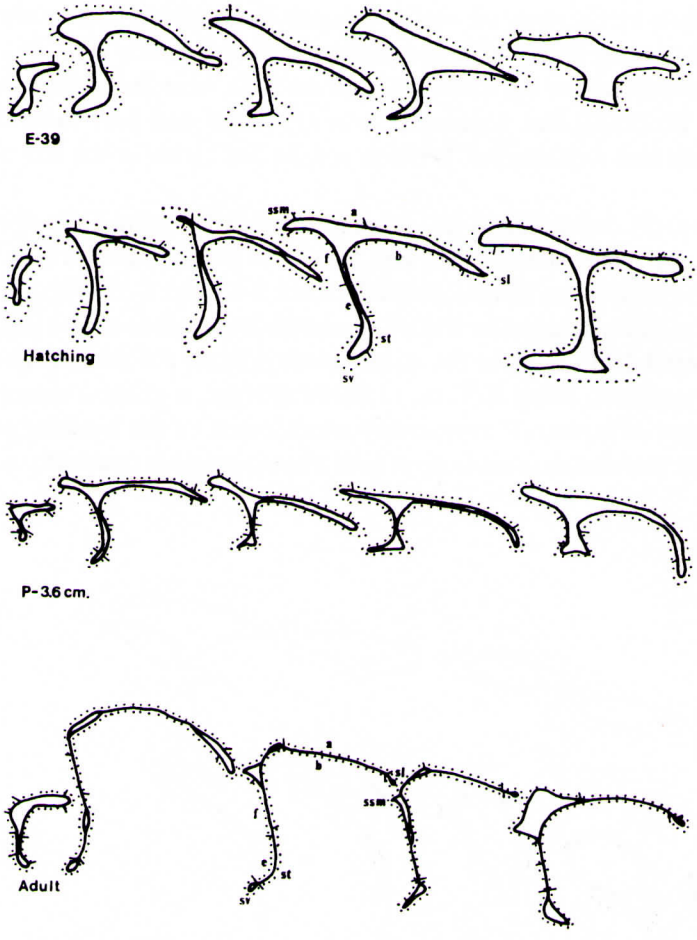

Fig. 2.1. Lateral ventricle evolution. At postnatal stage the early zones of ventricular coartion are appreciated

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Fig. 3. Cytological topography and characteristics in vz(b) from E-30 to E-35

a) Transverse section of the telencephalic vesicle anterior level in E-30. ×160. The marked area is shown in b); b) Semithin section of vz(b), observe the pseudostratificated disposition of vz and the presence of mitotic figures (arrow) and a narrow marginal zone (MZ). ×640; c) transverse section of an anterior level in E-32. ×47; d) transverse section of an E-35 anterior level. ×120; e) ultrastructural aspect of the ventricular cells apical portion of vz(b), the presence of mitotic figures is shown, in the internal cell processes tight and adherent junctions appear (thin arrow) and a basal body (arrow tip). ×15000. Abreviations: Anterior Dorsal Ventricular Ridge (ADVR), Ventral Striatum (VS), N. Septi Lateralis Pars Superior (SELE), N. Septi Lateralis Pars Inferior (SELI), Medial Septalis (SEPT), Ventral Striatum Dorso Lateralis (SV_3)

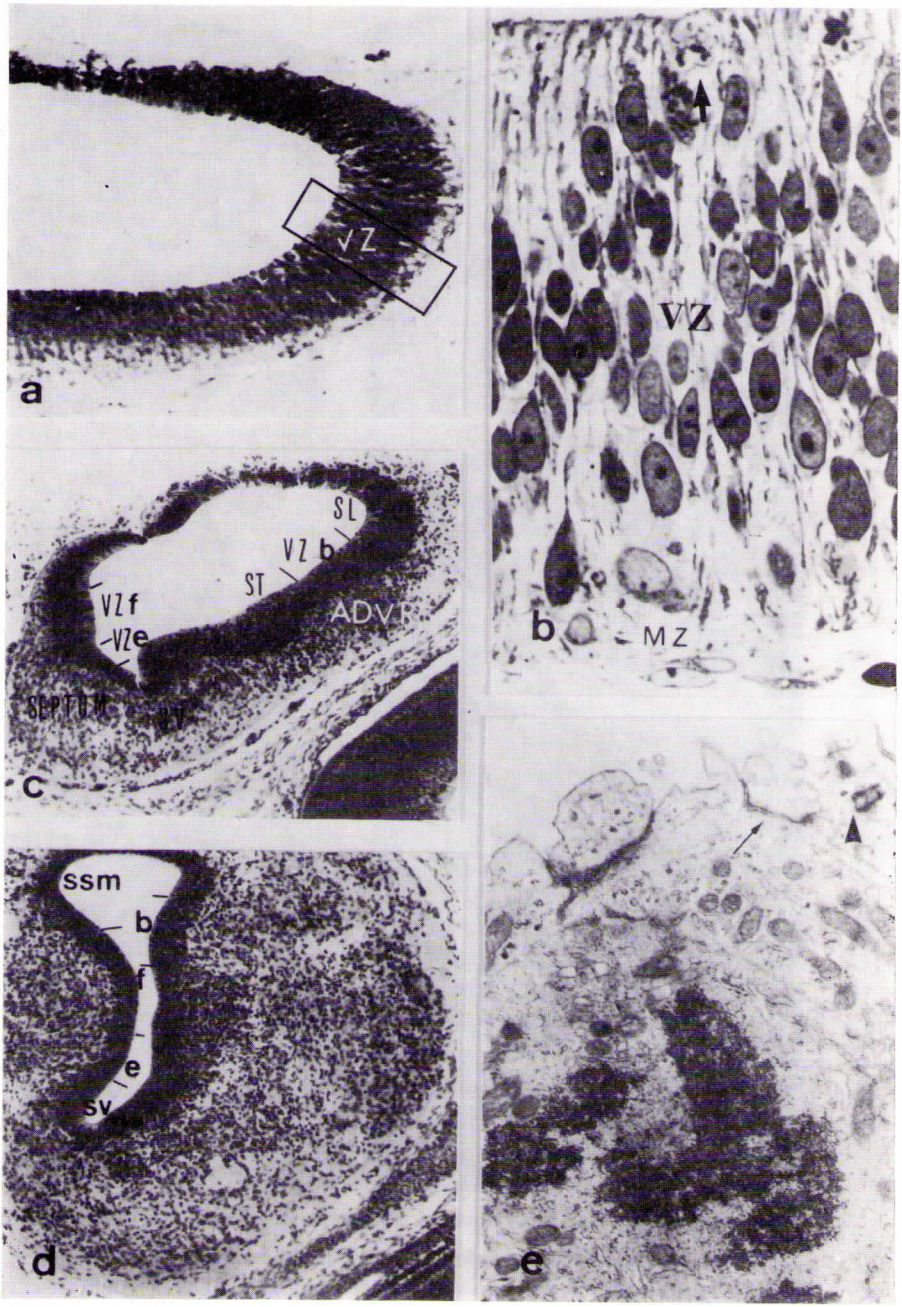

Fig. 3

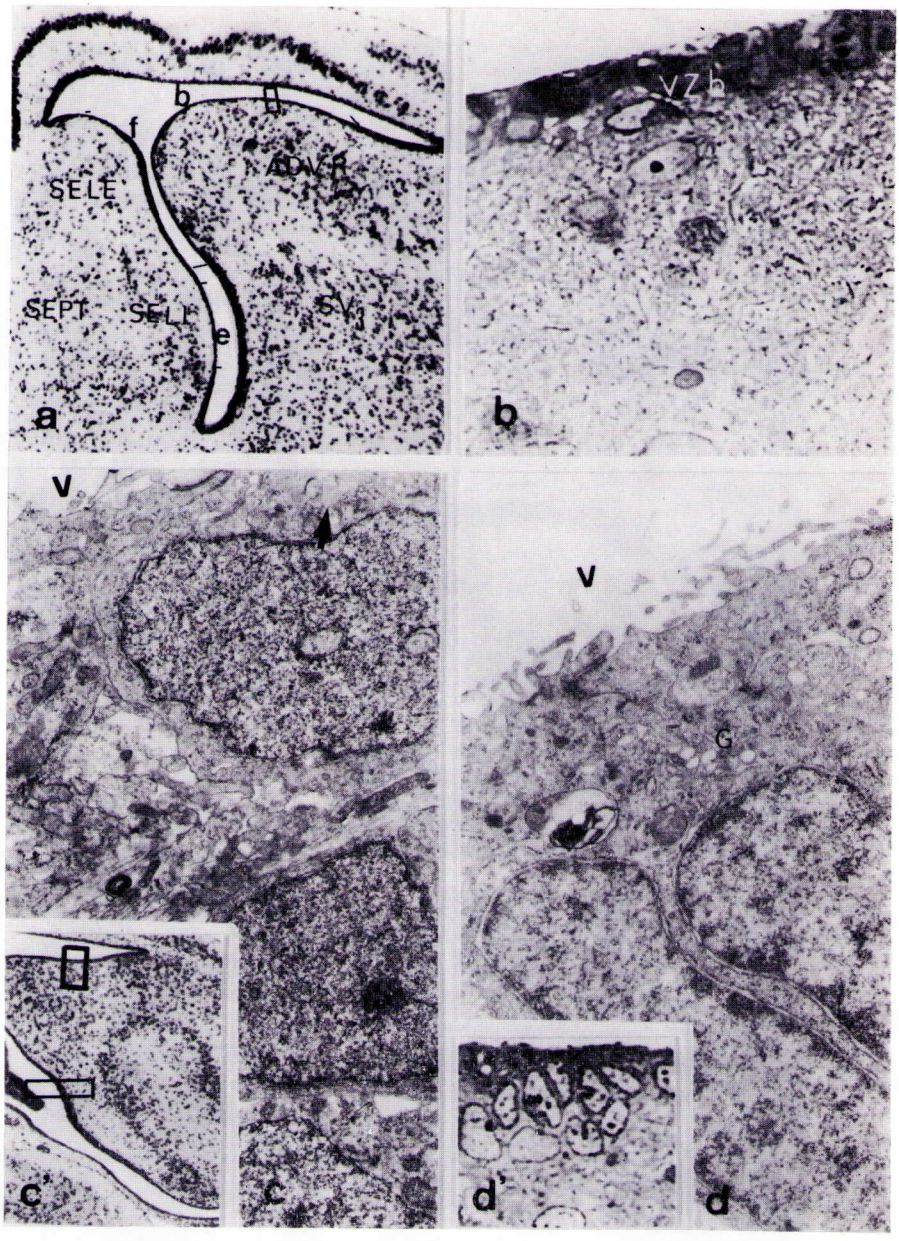

Fig. 4. Topography and ultrastructural characteristics of vz(b) in E-40 and hatching stage

a) Transverse section of an anterior level in E-40. The marked area is shown in b). ×93; b) ependymary aspect in E-40 in a semithin section. ×1440; c) observe the presence of cubic ependymary cells at hatching stage, numerous lipidic droplets appear in the cytoplasm (arrow). ×7500; c′) transverse section at a caudal level in the hatching stage, the marked zone with a thin line is shown in c) and d) and that marked with a thick line in Fig. 5 (a, b, c). ×66; d) prismatic cells at hatching stage, notice the presence of a very developed Golgi apparatus (G) ×15000; d′) semithin section of the lateral region at caudal level. ×1920. Ventricular lumen (V)

In the hatching stage they begin to flatten and in postnatal stage all levels appear flat analogically to that observed in the adult, above all at anterior and medial levels (Fig. 5d, e).

Another proliferative characteristic is the abundance of mitotic figures seen, above all in E-32 and E-35 (Fig. 3b, e), these are drastically reduced as from E-37 and have not been observed in hatching.

In the rostro-caudal sense scarce presence of cilia have been seen between E-32 and E-37, while between E-39 and hatching they have increased, more so at caudal levels. The presence of lipidic droplets begin to show up as from E-35, although of variable density from this stage to hatching, and are usually more frequent at caudal levels than at medial ones (Fig. 8, see II. Sulcus).

At ultrastructural level from E-32 to E-35, this zone is formed by ventricular cells, an oval morphology nucleus with slight dents, difuse chromatine and a cytoplasm, with abundant free ribosomes in group disposition, RER cisterns scarce and isolated, a developed Golgi apparatus and disperse mitochondrias. The greatest part of the cellular bodies are found far from the ventricle and in the internal cellular processes that reach the ventricular lumen where various long mitochondrias, free ribosomes and RER cisternae are concentrated (Fig. 6a).

Where the apical surface makes contact with the ventricular lumen, microville and cilia are observed, but they are very scarce. The cells are found fixed to their lateral apical borders by tight and adherent type junctions (Fig. 3e).

One of the characteristics that must be mentioned during this period is the presence of clear and ample intercellular spaces that give a spongy aspect to these ventricular zones (Fig. 2a, see II. Sulcus)

Between E-35 and E-38, the cells have narrowed and the cytoplasmatic content has suffered practically no variation in respect to the anterior stages; however, the golgian cisternae have increased in number and development, endocytic vesicles appear in cytoplasmatic processes, the intercellular spaces are reduced.

As from E-38, modifications take place, not only in the rostro caudal sense but also, at the same level, in which variations can exist derived from the two considered regions; one that borders with the SL or "lateral" and the other "medial". These differences occur in the presence of cubis-like cells situated at anterior levels; cubic or prismatic-like cells in the lateral region, and secretory cells in the medial region, both at posterior levels (Fig. 4c).

Cubic cells. This type of cell is present in both mentioned regions of the vz(b) in E-38, while as from E-40 at caudal levels, these cells appear together with prismatic cells, in the lateral region (Fig. 4c, c′).

The nucleus of these cells is polymorphic with scarce groups of heterochromatine joined to the nuclear membrane, excentric nucleolus and the cytoplasm presents a rich organule content in which the RER cisternae have increased in respect to the anterior period and lipidic droplets also appear in the apical cytoplasm (Fig. 4c).

Prismatic cells. These are first observed at stages near to hatching, in the lateral region of caudal levels or posterior to this zone (b) (Fig. 4c′). Their characteristics are similar

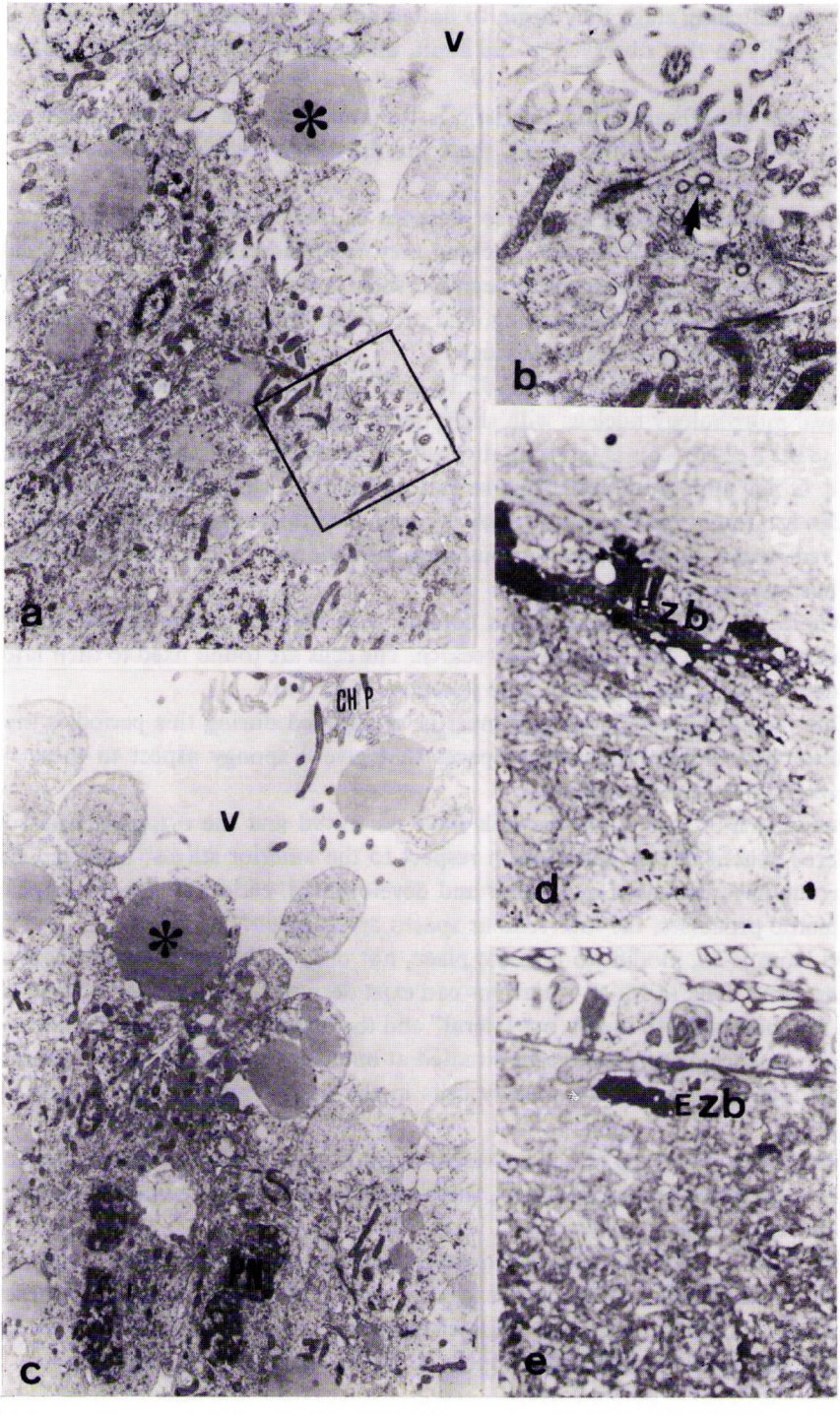

Fig. 5

to those of the higher cells at the initial period of development, though with a grade of differentiation, that is, cells with a long nucleus, with clots of chromatin associated to the nuclear membrane and an electrodense cytoplasm with disperse cisternae of RER, showing up clearly a notable development of the Golgi apparatus, with clear dilated vesicles. These cells present some apical differentiations towards the ventricular lumen and remain united throughout different junction complexes (Fig. 4d, d').

Secretory Cells. These cells are localized in the medial regions at caudal levels of this zone (b) (Fig. 4c').

The aspect of these secretory cells, is prismatic in type, with an oval nucleus near the ventricular lumen and with a cytoplasm rich in organules, above all mitochondrias and large lipidic droplets situated in the apical portion (Fig. 5a). These droplets unite and form large lipidic vacuoles that are expelled with part of the cytoplasm towards the ventricular lumen by an apocrine secretion process (Fig. 5a, c). Secretion of similar characteristics is produced by the choroid plexus cells, next to this region of zone (b) and is poured simultaneously, together with that of the last, in the ventricular lumen (Fig. 5c). It is also frequent to find in the apical cytoplasmic portions, cilia and coated vesicles (Fig. 5b).

One fact which stand out is the presence of cells with a picnotic nucleus among the secretory cells, while the cytoplasm present characteristics analogous to the adjacent ependymary cells (Fig. 5c).

In the adult the ependymal zone (b) is found covering the ventricular region situated between the SL and ST.

The aspect of this zone is that of an ependyma formed by flat epithelium, above all in the coartion zones (clear and dark cells) of the ventricle while the rest of it is made up of cubic, prismatic and secretory cells (Fig. 5e).

Cilia are scarcely seen just as in the case of the lipidic droplets; however, these droplets are usually large and numerous, at caudal levels of this zone, specially in the proximity of the choroideus plexus.

Ventricular Zone (*e*). This is initiated in E-32 between the SV and vz(f), with very difuse limits (Fig. 3c), these are defined in E-37 (Fig. 4a), analogue to that seen in the adult.

In E-32, this zone is made up of cells that present an oval nucleus (Fig. 6a'). In the anterior levels 4–5 layers of nuclei have been observed and 12 at rostral levels.

Fig. 5. Ultrastructural aspect of the secretory cells and cytological characteristics at adult and postnatal stages of vz(b)

a) Secretory cells with large lipidic droplets in E-38 (asterix). ×4500; b) corresponding to marked area in a), a better view of coated vesicles are shown (arrow) in the apical portions. ×12000; c) note the presence of cells pouring their apocrine content (asterix) into the region next to the choroid plexus (CHP) and to picnotic nuclei (PN). ×4500; d) and e) semithin sections of ependymal cells at anterior levels of postnatal and adults. Ependymal Zone (b) (EZb). d) ×1600; e) ×960

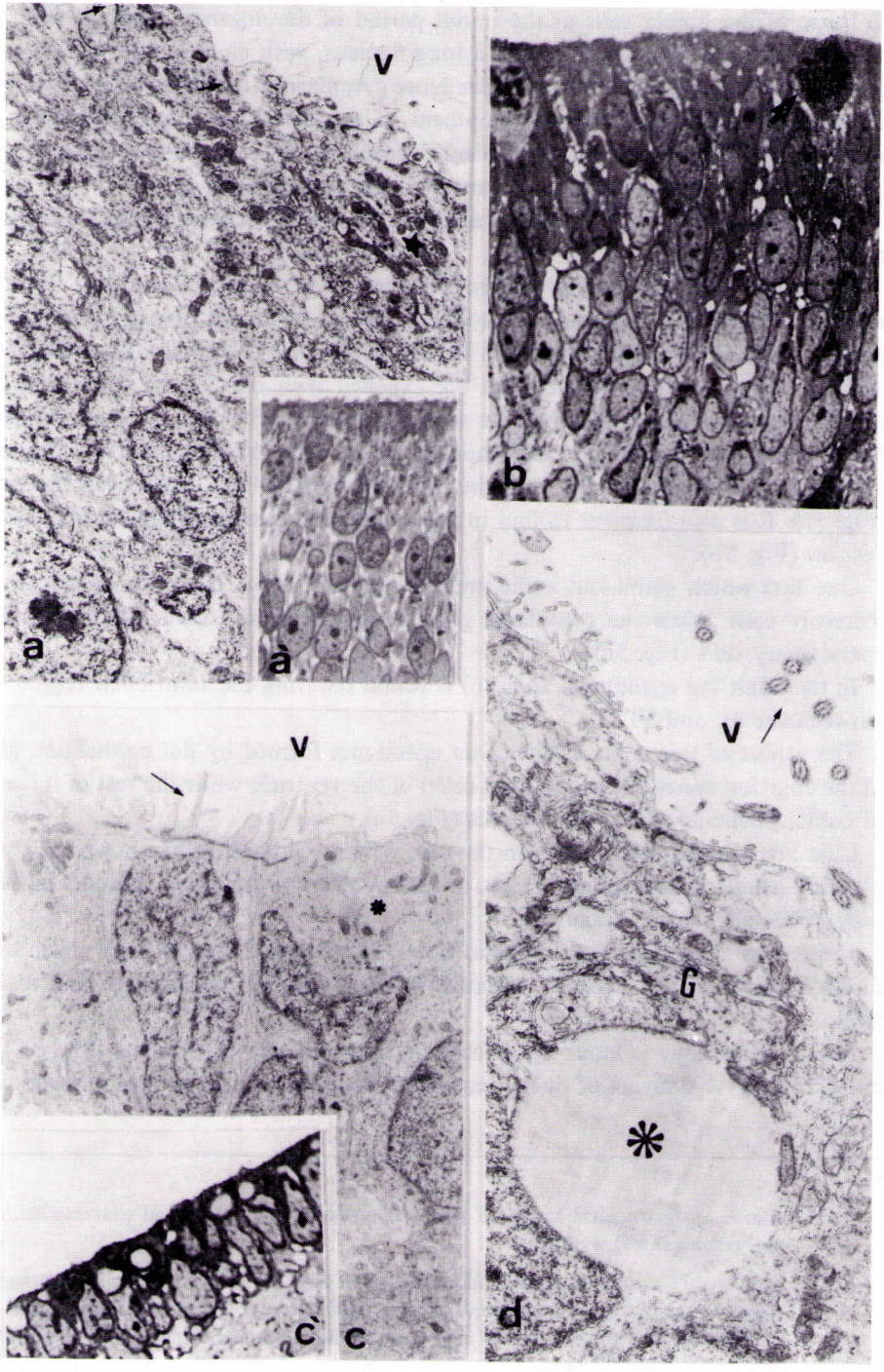

Fig. 6

In E-35, anterior and medial levels present 3 layers. In E-37, caudal levels appear monostratificated and the cells have begun to aquire a slightly flat aspect. The anterior and medial levels have 2 layers. The ventricular cells continue with an oval nuclei. At hatching stage, the medial levels appear monostratificated, which in the postnatal extends to all levels, with the exception of the rostral ones, the presence of cells with dark nucleus are also seen for the first time.

The mitotic figures observed in this zone are scarce from the first stage until E-39, as from this stage some isolated forms have been found. The presence of cilia in E-32 to hatching stage. In the postnatal, they have not been observed in obliterated portions of the ventricle. The lipidic inclusions are very abundant between E-37 and hatching stage (Fig. 8, see II. Sulcus).

In the adult they are found covering the entire septal ventricular region, situated between the SV and vz(f).

This zone is formed by a monostratificated flat epithelium at all levels. Another constant is the presence of clear and dark nuclei.

Ventricular Zone (*f*). This is iniciated at E-32, between vz(e) and the SSM, with difuse limits (Fig. 3c), these are gradually defined until E-39 (Fig. 4a).

During the first stages this zone (E-32, E-35), is made up of cells with an oval and round nuclei, disposed in 4–5 layers at anterior levels and 8 at rostral levels (Fig. 6b). In E-35, the medial levels present 3 and the anterior ones 4. In E-37, monostratification is initiated in a rostro-caudal sense.

At anterior and rostral levels, some fusiform nuclei are observed. In postnatal, the cells have oval nuclei orientated perpendicularly to the ventricular surface.

The frequency of mitotic figures is similar to that described for zv(e) (Fig. 6b).

Cilia are numerous between E-35 and E-37, they decrease slightly between E-37 and hatching stage. The lipidic droplets are scarce between E-32 and E-35. As from E-37 they increase until the hatching stage (Fig. 8, see II. Sulcus).

In the adult, this zone is situated between the SSM and vz(e) and covers the ventricular region that delimits laterally the nucleus septo lateralis pars superior sele.

It is monostratificated at all levels with the exeption of the rostral one. The morphology of the cellular nucleus is oval and in isolated cases some have been observed dented.

Cilia presence is constant throughout all its extension. Lipidic droplets are scarce and present an isolated disposition in the apical portion of the cells.

Fig. 6. Ultrastructural aspests of the ventricular zones (e) and (f)

a) Note in the ventricular cells E-33 of vz(e), the presence of numerous mitochondrias in the internal cell processes (star) and of tight and adherent junctions (small arrow). ×5700; a′) semithin section of vz(e) in E-33. ×640; b) semifine section of vz(f) in E-35, showing the presence of mitotic figures (arrows). ×960; c) ependymal characteristics of vz(f) in E-38, observe the presence of the lipidic droplets (asterix) and of numerous and large microville (small arrows) ×8000; c′) semithin section of vz(f) in E-38. ×960; d) the high grade of ependymal cell differentiation is shown, prismatic in vz(e), large lipidic droplets (asterix) and numerous cilia (small arrow). ×8850

The ultrastructural features of the ventricular cells of these septal zone [vz(e) and vz(f)], at initial stages (E-32, E-35), are similar to those described for vz(b) (Fig. 6a). At E-35 they have a cubic form and their cytoplasmatic content is also similar to that of cells vz(b).

In E-38, the cell aspect is of an ependymary type. In these cells the nucleus has a polimorphic aspect and the cytoplasm is rich in organulles; furthermore, the presence of lipidic droplets (Fig. 6c) and long mitochondria concentrated in the apical portion stands out clearly (Fig. 6c). These cells present numerous and large microville, and cilia towards the ventricular lumen (Fig. 6c).

At hatching stage prismatic cells appear for the first time with a larger grade of differentiation, their characteristics are similar to those described for zv(b). These cells not only present microville but also contain numerous cilia towards the ventricular lumen (Fig. 6d).

Discussion

The evolution of the matrix from the first stages until taking on ependymary features takes place in a different place and time in the caudo-rostral and ventro-dorsal of the telencephalic vesicle.

In *Gallotia galloti* the initiation of the different zones and sulcus of the lateral ventricle, begins in the first stages from the dorsal and ventral matrix, characterized by a greater cellular homogeneity, and as development advances each one gradually adquires topographic and cytologic characteristics of its own that will give to the lateral ventricle of the adult a regionalized structure. Authors such as KÄLLEN (1951), BERQUIST (1952), FLEISCHHAUER (1961) and KRAUTGARMER et al. (1984), in different Reptiles, also indicated that the lateral ventricle showed a certain regionalization.

Topographically the dorsal column (d), (bm) and (e) of KALLEN (1951c) correspond respectivally to the vz(b), vz(e) and vz(f) of this study.

From the analysis of the obtained data the proliferation gradient of these zones is deduced as caudo-rostral. This gradient was also cited by KIRSCHE (1967), in *Testudo hermani*, SCHULZ (1969), in *Lacerta agilis* and HETZEL (1974), in *Lacerta sicula*. Together with this proliferation gradient an overlapping is also produced with cellular migrations during telencephalic vesicle development. The intense proliferations originated at the initial stages (E-30, E-31) coincide with slow migrations (the intermediate zone begin to form). From E-32 to E-35, an overhanging of both processes is produced and as a result the basal nuclei are initiated (unpublished data). As from stages E-37 and E-38, proliferative activity is almost null, and according to KHALE (1951) it corresponds to a matrix waste at embryonic level. This proliferation reduction could also be related to the caudo-rostral formation gradient of the basal nucleus, a similar fact occurs in the bird telencephalon (HUEI-MET TSAI et al. 1981).

Other factors that support this decrease in proliferative (matrix waste), would be the variation of mitotic activity, although we have not carried out any kind of mitotic index, it has been observed that the intense mitotic activity at first stages of these ventricular

zones is similar to that described by HETZEL (1974), in *Lacerta sicula* and KORR (1980), in mice. The decrease found in the half stages, coincide with that pointed out by KÄLLEN (1962), in the chick, COWAN (1978), in the rat and SCHAMALH (1983), in mice.

The cellular flattening observed above all in some cells at anterior levels of perinatal stages and in zones where a joining of the cortical wall with that which limits the anterior dorsal ventricular ridge (ADVR), vz(b) is produced posterior. According to STUDNICKA (1900), it could be due to the great growth of the ADVR during this phase of development. For FLEISCHHAUER (1957), CAMPOS ORTEGA (1965) and SCHULZ (1969), it represents an ependyma on the way to degeneration, and for the second author, this flattering constitutes a loss of matricial funtioning. SCHULZ (1969) in *Lacerta agilis* and HETZEL (1974) in *Lacerta sicula* point out that this type of flattening in the ependymal cells that limit periventricularly ADVR coincide with an increase of irrigation (E-38, E-40), an increase of the glial population, above all in the postnatal, is produced. All these facts induce us to postulate that these zones where coartion of the ventricle has taken place (disappearance of the ventricular lumen), in ependymal zone (b) could represent in a certain way an ependyma in degeneration, as together with these cells others have been observed that are GFA positives (unpublished data), and at ultrastructural level cells appear that are typical of a cubic ependyma (in the ventricule with no coartions).

At ultrastructural level the cytological characteristics of the ventricular cells of the studied proliferative zones (E-32, E-35), are similar to those described by TENNYSON and PAPPAS (1962) in the human vesicle; ALLENSPACH and ROTH (1967) in the chick medulla; STENSAAS and STENSAAS (1968), in the rabbit and MARRERO (1986) in the lizard cerebellar cortex.

The presence of intercellular spaces, is a feature of immature cells according to HINDS and RUFFET (1971) description, in the rat cortex. The abundance of these intercellular spaces could play a nutritional part, if we take into account that in these primitive stages, blood invasion has not yet taken place and the liquid encephalic barrier does not exist, that as pointed out by HETZEL (1977), in Reptiles, this nutritional role is attributed to the ventricular zone. Another fact that supports this nutritional role even more would be, the observation in the ventricular zone which is positive for the vimemtin (unpublished data) and in agreement with PIXLEY and DEVILLIS (1984), a close ralation exists between the positivity of the matricial cells and intercellular spaces, and furthermore, they show that the transport of liquid takes place through the intermediate filaments of the cellular cytoplasm.

As from the half stages (E-38), the mentioned zones begin to take on the ependymary structure and we coincide with the proposal of DAS (1979), who determines that the beginning of ependymogenesis starts at half stages of development. The different cytological characteristics described in these lateral ventricle zones are similar to those described by KRAUTGARMER et al. (1984), in *Tinca tinca*, and they confirm once more the resionalization grade of the ependyma of *Gallotia galloti*. The existence of prismatic, cubic and secretory cells has also been observed by HETZEL (1977a).

The increase in lipidic droplets observed in apical portions of ventricular cells (half stages), in semithin sections, could be due to, according to RAKIC (1982), the start of differentiation of the glia radial, in astrocytes, our observations in these zones marked with GFA and glutamine synthetase seem to confirm this fact (unpublished data). On the other hand FERRER and SARMIENTO (1981), describe the presence of lipidic vesicles (EM) during rat development. In our observations of EM we have also proved the presence of lipidic droplets in the ependymal cell.

The apical differentiation such as the microville that are presented by internal processes in the first stages, is a constant pointed out by SHOUKIMAS and HINDS (1978). Once these zones present the ependymary structure, the abundance of these microville varied in the different zones and at their different levels, a fact also pointed out by KRAUTGARMER et al. (1984).

FLEISCHHAUER (1972) describes an increase of ciliar processes during embryonic development of the mouse from the first development phases to perinatal ones. In *Gallotia galloti*, we have also observed that its increase is similar to that of mammals. At ultrastructural level, above all, in vz(b), the appearance of centriole images which are the first step in the formation of a cilium (SOTELO and TRUJILLO GENOZ 1958). This fact that seems to come later in cilum than in microville has also been pointed out in rat embryos by STENSAAS and STENSAAS (1968). As fron half stages it is observed that ciliar frequency is proper to each zone and responds to the basic model described by BRIHTMA and PALAY (1967).

All these differences indicate that each lateral ventricle zone will have a different functional differentiation that can be reflected in the mentioned structure in a lateral ventricle mosaic.

The presence of ventricular protusions that contain lipidic material and that evacuate to the ventricular lumen through an apocrine process has been observed by FERRAZ DE CARVAHO and COSTACURTA (1976). HETZEL (1977b, 1978). HETZEL (1978) also points out that these secretory processes could be related to a degeneration ependymary mecanism. In our examples, the fact that it presents itself only in portions of vz(b) that make contact with the choroid plexus is significant. Material eleborated for these have the same ultrastructural features as the content of the ventricular protusions; however, it is significant that together with this material, the cells seem to free part of the cytoplasm too. In the bibliography we have not found any alusion to this process; during cellular ontogeny it is therefore possible that this ventricular region contributes in some way to the eleboration of the cerebrospinal fluid. On the other hand, it could indicate that this region, is more active during development, and that the renovation of ependymary cells can take place very quickly and in the half region of the vz(b).

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