The histochemical results demonstrated: a) that the interstitial cells are very active cells of the mammalian ovary during the foetal life and some phases of the menstrual cycle (human) and during the oestrus cycle and pregnancy (rat and guinea-pig); b) that they have the same steroid converting enzyme present in corpora lutea and theca interna but with a pattern of intensity comparable only to that present in lutein cells.

Recent biochemical data[7] have demonstrated that in the rabbit the interstitial tissue appears to be the site of synthesis of the steroid hormone in ovaries without corpora lutea.

In previous research, MOSSMAN et al.[8] have found that 'interstitial gland cells' are present and profuse in the human ovary from birth to old age. These observations prove that the interstitial tissue may be the most important gland of the human ovary[8].

These results may be very suggestive and interesting if compared with the electron micrographs of the same cells.

In fact in the present study no essential difference in submicroscopic organization of these tissues was observed. In these cells only a different step of differentiation or quantity of steroidogenic organells (mitochondria with villiform cristae, abundant and complicated membranes of smooth endoplasmic reticulum and lipid droplets) are demonstrable. Concluding from the present and some previous studies[4,5], there is strong suggestive evidence that these different ovarian cells may have an equivalent role in mammals in secreting steroid hormones with only a difference of intensity and fluctuation of activity in relation with cyclic changes and steps of differentiation. In fact all these steroidogenic cells (theca interna, luteal cells and interstitial cells) are developed from one ovarian cellular type only and when they are mature secreting cells, may well represent, all together, a large profuse 'interstitium' working with a coordination of cellular activity strictly correlated with the sexual cycle and the eveniences of the pregnancy.

Riassunto. Le cellule interstiziali dell'ovaio presentano spiccata attività enzimatica (3β-OHD) ed organizzazione submicroscopica tipicamente stereidogenica nella donna nel periodo fetale e nel ciclo mestruale; nel ratto e nella cavia nel ciclo estrale e nella gravidanza. Negli stessi mammiferi tale attività è equivalente e coordinata a quella della teca interna e del corpo luteo.

P. MOTTA[9], Z. TAKEVA and V. BOURNEVA

Institute of Morphology, Academy of Sciences, Sofia (Bulgaria), and Institute of Anatomy, University of Rome, Viale Regina Elena 289, Roma (Italy), 7 April 1970.

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Ultrastructure of the 'Onion Bodies' of the Sensory Pore X-Organ of *Paratya tasmaniensis* Reik (Crustacea, Decapoda)

Within the sensory pore X-organ (SPX-organ) or the organ of Bellonci of some of the Decapoda and Stomatopoda there occur stratified concretions referred to as 'onion bodies'[1]. Until now the exact nature of the 'onion bodies' has been in doubt. CARLISLE[2-4] and CARLISLE and KNOWLES[5] considered the 'onion bodies' in *Lysmata seticaudata* and *Pandalus borealis* to be swollen axonic terminations. This interpretation was not acceptable to GABE[1] who, like HANSTRÖM[6], regarded the 'onion bodies' as involved in the elaboration of secretory material. It appears that the nature of the 'onion bodies' may better be revealed by the electron microscope. The following is a preliminary report on the ultrastructure of the 'onion bodies' in the SPX-organ of the freshwater shrimp *Paratya tasmaniensis* Reik.

Material and methods. Specimens of *Paratya tasmaniensis* were collected from the Coal River, near Richmond (Tasmania). Animals were anaesthetized in carbonated water and their eyestalks dissected into chilled 2% OsO_4, made up in phosphate buffer adjusted to pH 7.3 (with or without 5% sucrose). After 1 h in the fixative at 4 °C the distal $^2/_3$ of the eyes were cut off (this was found to be necessary for satisfactory embedding) and the specimens were left in the fixative for 1 further h at room temperature. The specimens were then dehydrated through a graded series of ethanol, cleared in propylene oxide and embedded in Epon 812. Sections of between 1 and 2 μm were cut with glass knives and stained with toluidine blue for the purposes of location and orientation of the 'onion bodies'. Silver to pale gold sections were cut with a diamond knife on an LKB ultratome. Some of the sections were stained with alkaline lead citrate before examination with an AEI EM6 electron microscope operating at 60 kV.

Observations. Under the light microscope the 'onion bodies' appear as stratified concretions and this is in agreement with previous light microscope observations. The electron microscope reveal that the 'onion body' consists of a concentric concretion of either tubular elements (Figure 1) or cisternae (Figure 2); this difference in configuration is possibly due to the different physiological states of the animals[7]. Sparsely scattered amongst the tubular elements or cisternae are lysosome-like bodies.

The tubular elements range in size from 100 to 400 nm in cross-sectional diameter and are arranged in 2 main

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[7] The difference in structure could possibly be due to extreme osmotic sensitivity of the tissue but we are of the opinion that this difference is not due entirely to an osmotic artifact.

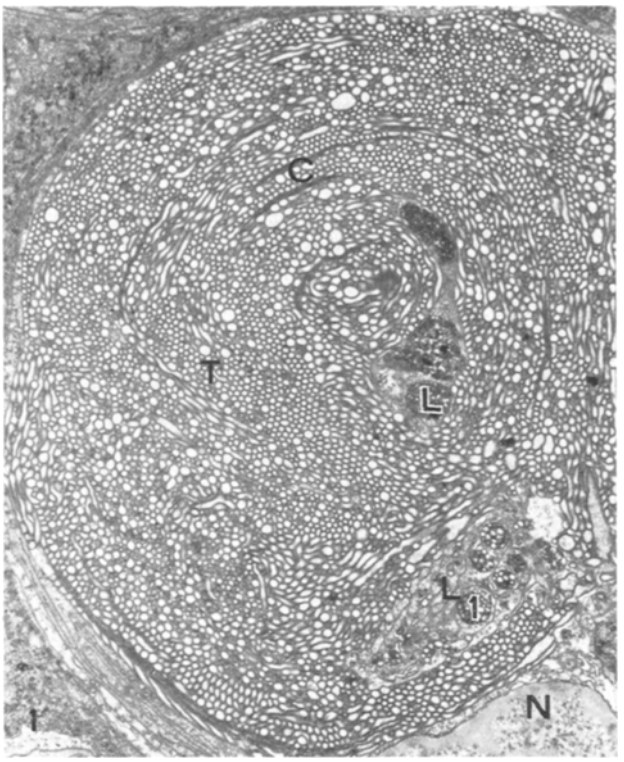

Fig. 1. Electronmicrograph of a section through an 'onion body' showing a concretion of mainly tubular elements (T) interspersed with cisternae (C) and lysosome-like bodies (L). L_1, multivesiculate lysossome-like bodies; N, nucleus. Fixative without sucrose, lead stained. × 4900.

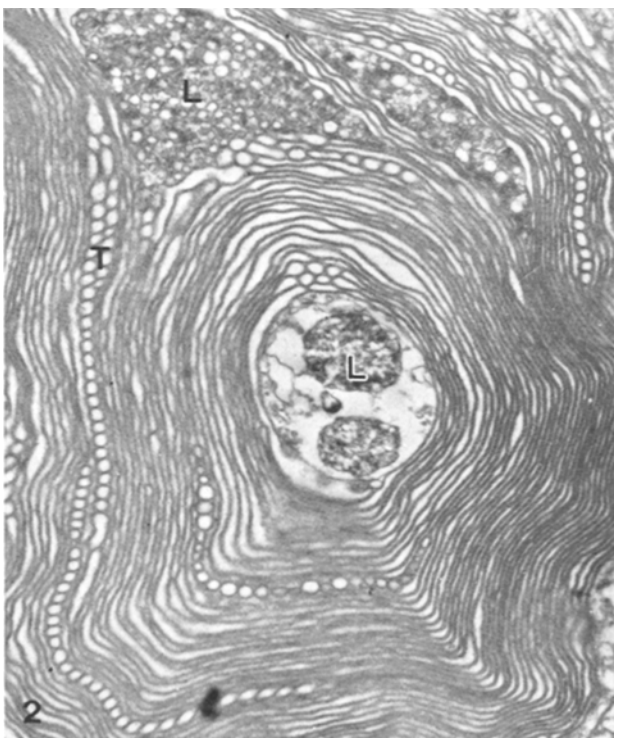

Fig. 2. Electronmicrograph of a section through an 'onion body' showing a concretion of mainly cisternae interspersed with tubular elements (T) and lysosome-like bodies (L). Fixative with 5% sucrose, 'unstained'. × 6700.

directions; perpendicular to each other. The lysosome-like bodies appear as electron dense structures and appear to be at various stages of development. Some of the lysosome-like bodies have the appearence of multivesiculate bodies (Figure 1, L_1) and this is a suggestion that the lysosome-like bodies may have been derived from moribund tubular elements.

Morphologically, the structures revealed by the electron microscope may be correlated to those seen under the light microscope. The almost concentric arrangement of tubular elements and cisternae would seem certainly to correspond to the 'fine spirally coiled or concentrically arranged threads', seen by HANSTRÖM[6] or the irregular layers of the 'onion bodies' seen by CARLISLE[2]. The lysosome-like bodies would correspond to the small homogeneous particles of GABE[1] or to the osmiophilic droplets of CARLISLE[2]. HANSTRÖM[6] and GABE[1] have noted that the small particles within the 'onion bodies' appear to form in a cyclical manner. This is probably the developmental cycle of the lysosome-like bodies.

The tubular elements show a superficial resemblance to photoreceptors[8,9] but they appear more likely to be a specialized form of agranular endoplasmic reticulum. The tubular elements closely resemble the agranular endoplasmic reticulum of the lutein cells of mammalian ovaries[10] as well as showing a negative reaction for acid mucopolysaccharides with alcian blue staining. Work is underway, using lanthanium hydroxide, to determine if the tubular elements are intracytoplasmic.

Structures similar to the tubular elements are also seen as agranular endoplasmic reticulum in the interstitial cells of the testes[11] and the cells of the adrenal cortices[12] of vertebrates as well as in the prothoracic glands of insects[13]. These tissues are known to be sites of steroid synthesis and the agranular endoplasmic reticulum has been linked with this synthesis[14]. Thus it may be possible that the SPX-organ, in *Paratya* at least, is the site of steroid synthesis. Further histochemical and ultrastructural studies are being carried out to elucidate this possibility and we expect to publish a more comprehensive report of the SPX-organ shortly[15,16].

Résumé. Nous avons étudié l'ultrastructure des «corps en bulbe d'oignon» dans l'organe-X du pore sensoriel ou l'organe de Bellonci de la crevette *Paratya tasmaniensis*. L'ultrastructure des «corps en bulbe d'oignon» consistent en éléments tubulaires, que nous supposons être du réticulum endoplasmique agranulaire, orienté dans deux directions. Dans les éléments tubulaires se trouvent des structures semblables aux lysosomes.

P. S. LAKE and J. E. ONG

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[16] This project was supported by a University of Tasmania Research grant and one of us (J.E.O.) holds a University of Tasmania Research Scholarship.