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THE SUBCOMMISSURAL ORGAN OF THE LIZARD (LACERTA S. SICULA RAF.) DURING THE SEXUAL CYCLE IN NORMAL AND EXPERIMENTAL CONDITIONS

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Received 23 February 1977

I. INTRODUCTION

The subcommissural organ (SCO) is a specialization of the diencephalic ependyma at the level of the posterior commisure. It has been described in all classes of Vertebrates: cyclostomes (Dendy, 1902; Sterzi, 1907), selachia (Ghiani & Uva, 1963), teleosts (Mazzi, 1952; Stanka, 1967), amphibians (Mazzi, 1952; Oksche, 1961, 1969; Rodriguez, 1970a, 1970b; Diederen, 1970), reptiles (D'Uva et al., 1976), birds (Ghiani et al., 1966), mammals (Krabbe, 1925; Stanka et al., 1964; Vigh et al., 1967; Herrlinger, 1970).

The SCO is composed of secretory cells, the functional significance of which is still under discussion, from which the secretion of mucopolysaccharides and mucoproteins (TEICHMANN, 1967) and sialoglycoproteins (HÄDGE & STERBA, 1973a, 1973b) has been reported.

In some vertebrates the secretory activity of the SCO seems to show annual variations (LEGAIT, 1946, in *Rana temporaria* L. and *Rana esculenta* L.; D'UVA & CIARCIA, 1976 and D'UVA et al., 1976, in *Lacerta s. sicula* Raf.). Many other species present variations which can be related to diverse experimental stimuli (LEATHERLAND & DODD, 1968, in *Anguilla anguilla* L.; DIEDEREN, 1972, in *Rana temporaria* L.).

Various hypotheses have been suggested to explain the functional significance of this organ. According to DIEDEREN (1975) the secretions of the SCO regulate the composition of the cephalo-rachidian liquid. GILBERT (1956, 1958), FARREL (1958, 1959) and PALKOVITS (1961) suggest that the SCO is involved in the regulation of water-salt balance. There may also be a functional correlation between SCO and adrenal gland activity (ATTILA & TALANTI, 1973).

Recent research using immunological techniques (PELLETTIER et al., 1975) has shown that a hormone (somatostatin) which inhibits growth hormone (GH) release is localized in the SCO of rat. For a review of ependymal specializations see the work of RODRIGUEZ (1976).

In *Lacerta s sicula* the SCO is composed of a single layer of ependymal cells, whose secretory activity varies during the course of the year (D'UVA et al., 1976). Four distinct stages in the secretory cycle can be recognized by the type and distribution of the secretory material in the cells (D'UVA et al., 1976).

The *first stage*, found in December, is characterized by a reduced secretory activity. The cells contain only a few small chrome-haematoxylin positive granules localized in the apical region. The basal zone of the cell is almost lacking in granulation. The *second stage*, found from January to March and from middle September to November, is characterized by cells which are similar to those of the first stage. However, large masses of secretory material appear in the basal region of the cells. The *third stage*, found from March to the end of May and from July to the middle of September, is characterized by an increase in the small chrome-haematoxylin positive granules and by the presence of large masses of secretory material in the supranuclear region of the cells. In the *fourth stage* (June), the basal, supranuclear and apical regions are completely filled with secretory material in the form of large and small masses without a distinct preferential location (Fig. 1).

A correlation between the electron and light microscope morphologies of the secretion of the SCO has been attemped by D'UVA et al. (1976).

The Gomori and PAS positive material localized in the basal region of the cells may be identified with the material of low electron density (type C) stored in the cisternae of the rough endoplasmic reticulum (RER); that of the distal region with the type A and B granules.

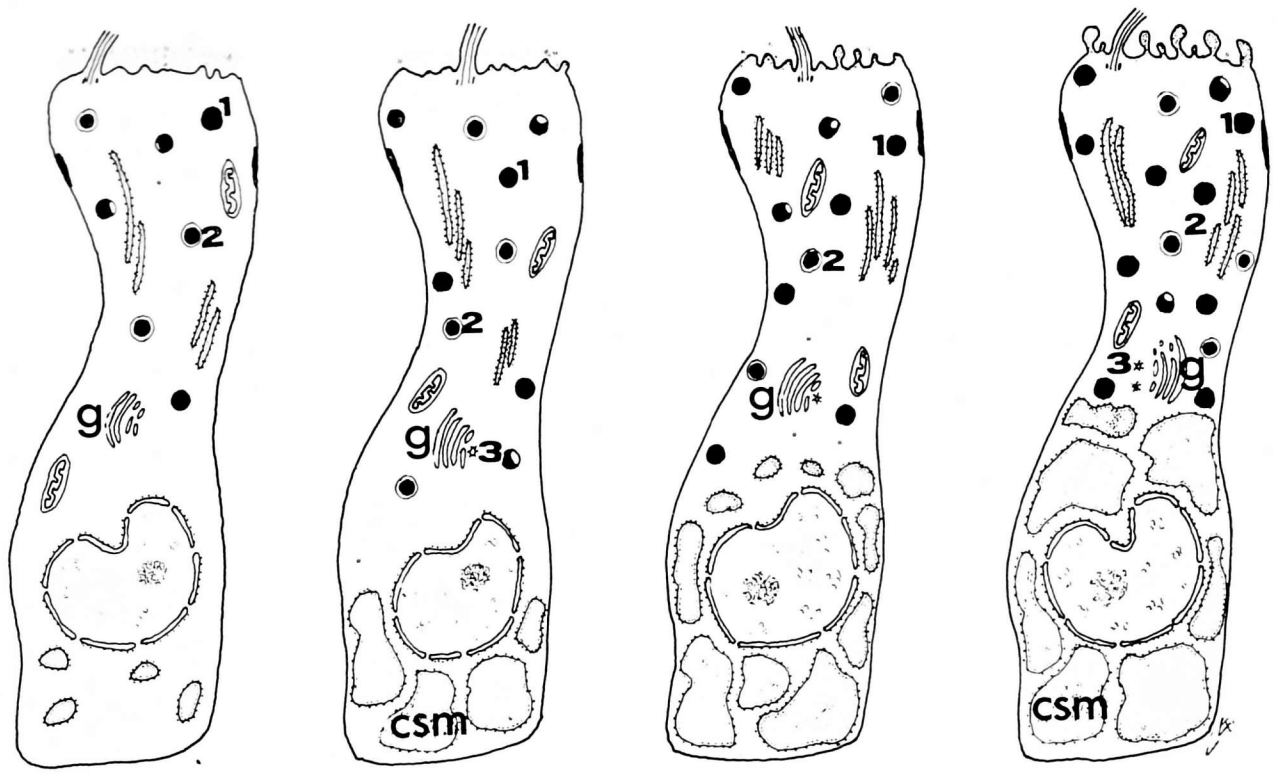

Fig. 1. — Typical cellular stages of SCO during annual secretory cycle; *csm*, type C secretory material; *g*, Golgi apparatus; *1*, type A secretory granules; *2*, type B secretory granules; *3*, coated vesicles.

According to our data, the secretory cycle of the SCO in *Lacerta s. sicula* has almost the same pattern as the cycle of the cells of Leydig and of the secondary sexual characteristics (SSC) described by VARANO et al. (1973). In fact, the maximum secretory activity (stage 4) of the SCO coincides with the period of maximum development of the cells of Leydig and of the SSC. A decrease in the secretory activity of the SCO is found during the period corresponding to a decrease in the activity of the cells of Leydig and to the involution of the SSC. When the cells of the SCO are in stage 1 (Fig. 2), the cells of Leydig are quiescent. These correlations may suggest new approaches to the problem of the secretory activity of the SCO.

An initial hypothesis is that the secretory activity of the SCO, together with other factors, influences some aspects of the sexual cycle;

on the other hand, the SCO itself may be regulated by the same factors which influence the sexual cycle. The substances cointained in the secretion may intervene as regulators of more general functional activities (water-salt balance, growth regulation, metabolism or others).

Before discussing the experimental design of this work, it is opportune to briefly describe the principal phases of the ♂ sexual cycle of *Lacerta s. sicula.*

In *Lacerta s. sicula* (GALGANO & D'AMORE, 1953; ANGELINI et al., 1976) the sexual cycle shows two periods of activity. The first one occurs from April to July, with an apex in June. At this time the SSC are well developed and spermatogenesis is active. A period of regression follows in August. At the end of this period the SSC are completely inhibited and only spermatogonia and Sertoli cells are observed in the seminiferous tubules. In September the SSC remain inhibited, but spermatogenesis resumes and a discrete quantity of sperm is formed in November. From December to the end of February the structure of the SSC is not modified and spermatogenesis remains as found in November. In March both the SSC and the seminiferous tubules begin to be active again.

We are indebted to Prof. GIANFRANCO GHIARA for critical reading of the manuscript.

II. EXPERIMENTAL PLAN

In order to demonstrate that the SCO is regulated by some factors which control the sexual cycle, or that the secretions of the SCO have a functional role in the regulation of some of the activities in the reproductive cycle, experimental manipulation of some of the most significant moments of the sexual cycle was undertaken. The SSC and spermatogenesis were either stimulated or repressed and the effects at the level of the SCO were investigated.

Experimental variation of the sexual cycle was obtained by thermal treatment, by the administration of gonadotropic, androgenic or anti-androgenic hormones or by castration. These treatments were effected in the following periods of the year:

May-June, when spermatogenic activity is at its height and the epididymis and the SSC are well developed.

July, when spermatogenic activity is decreasing, but the cells of Leydig and the SSC are well developed.

October-November, when spermatogenic activity is limited and the SSC are completely inhibited. Some experiments with FSH, LH, testo-

sterone and temperature variation were carried out with the natural photoperiod and in a particular moment of the cycle (October) when both the SSC and the secretory activity of the SCO were relatively inhibited. Autumn was chosen instead of winter because it is possible during this period to stimulate the SSC without stimulating spermatogenesis at the same time (ANGELINI et al., 1976). In winter the same treatment would also have stimulated spermatogenesis, introducing another variable in the evaluation of the data.

The castration experiments were carried out in different periods of the year:

July, when both SSC and SCO have elevated secretory activity.

November, when there is a decrease in the SCO activity and a strong inhibition of the SSC. This period was also chosen to castrate animals for observation in the following spring. We wished to know if there was a normal development of the secretory activity of the SCO in the spring, when in normal animals both spermatogenesis and the SSC develop after a static winter period.

The inhibitory treatment with cyproteron was carried out in the months of May and June, when the SSC and spermatogenesis are at the apex of their development and the secretory activity of the SCO is maximum (stage 4).

III. MATERIALS AND METHODS

A total of 510 adult male *Lacerta s sicula* Raf. were used in these experiments. These animals weighed approximately 14 g each and were captured in Naples area (Arzano). The animals undergoing experimental treatments were maintained in special rooms, where temperature and humidity were controlled and fed on larvae of *Tenebrio molitor* L. and fresh fruit *ad libitum* The hormones were administered in 0 1 cc parenteral injections: FSH and LH in 0.7% NaCl; testosterone and cyproteron in almond oil (Carlo Erba)(1). All the experiments were carried out with the natural photoperiod. Two experimental groups were formed:

Group A (Experiments I - II - III) with stimulating factors;

Group B (Experiments I - II) with inhibiting factors or castration.

The experimental and sampling procedures are summarized in Tables 1 and 2.

In experiment I of group A two different doses of FSH were used. The higher dose of gonadotropin (750 μg per injection every 3 days) was administered to obtain a sure response at the level of the gonads of *Lacerta s sicula* in autumn

(1) The gonadotropins used were from the Calbiochem: Pig FSH with an activity of 1 Armour unit/mg equal to 0.37 NIH-FSHS$_1$ units/mg (REICHERT & WILHELMI, 1973); Horse LH with an activity of 1 Armour unit/mg equal to 1 NIH-LHS$_1$ units/mg.

Conversion to U.I. are for FSH: 1NIH-FSHS$_1$ = 26.6 U.I. for LH: 1 NIH-LHS$_1$ = 1538 U.I. (DONINI et al., 1966).

Table 1.

Group A stimulation experiments

Experiments I: hormones at room temperature

Lot	No. Anim.	Period	Dose/Injection	One injection every 3 days	Sacrificed after days
A	45	Oct.-Nov.	FSH (100 µg)	»	3-6-9-12-15-20-23-28-32-40-43
B	45	»	FSH (750 µg)	»	3-6-9-12-15-20-23-28-32-40-43
C	45	»	LH (50 µg)	»	3-6-9-12-15-20-23-28-32-40-43
D	20	»	LH (500 µg)	»	15-23-43-48-55
E	20	»	Testost (200 µg)	»	15-23-43-48-55
F	40	»	Controls	»	Sacrificed on the same date as lot A, B, C, D, E

Experiments II: hormones at 28°C

Lot	No. Anim.	Period	Dose/Injection	One injection every 3 days	Sacrificed after days
A	45	Oct.-Nov.	FSH (100 µg)	»	3-6-9-12-15-20-23-28-32-40-43
B	45	»	LH (50 µg)	»	3-6-9-12-15-20-23-28-32-40-43
C	20	»	Controls	—	Sacrificed on the same date as lot A, B

Experiments III : 28°C

Lot	No. Anim.	Period	Photoperiod	Sacrificed after days
B	45	Oct.-Nov.	Natural	3-6-9-12-15-20-23-28-32-40-43
A	20	»	Controls	Sacrificed on the same date as lot A

at ambient temperature. In fact, during this period of the year at temperatures between 18-20°C, low values of FSH do not induce either sperm production or significant development of SSC in *Lacerta s sicula* (ANGELINI et al., 1976).

Anolis carolinensis Voigt behaves differently under these conditions (LICHT & PEARSON, 1969). However, since a slight response at the level of the interstitial tissue was obtained with doses of 100 µg FSH per injection, the effect of this dosage on the SCO was also studied.

At a higher temperature, 28°C, 100 µg of FSH were sufficient to stimulate the SSC.

Fifty and 500 µg/injection of LH were administered at room temperature. In the case of *Lacerta s sicula* lower doses do not cause a massive stimulation of the SSC. No deaths were observed using high dosages of LH.

During the experiment carried out at 28°C, we have used doses of 50 µg/injection, which are able to stimulate SSC.

Table 2.

Group B inhibitory experiments

Experiment I: castration

Lot	No. Anim.	Period	Sacrificed after days
A	20	Nov.	160
B	20	July	13
C	20	Controls, Nov. July	Sacrificed on the same date as lot A, B

Experiment II: cyproteron

Lot	No. Anim.	Period	Dose/Injection	One injection every 3 days	Days treatment	Sacrificed after days
A	20	May-June	5 mg/ml	»	45	48-51-54-57-60
B	20	»	5 mg/ml	»	45	65-68-71-74-77
C	20	»	Only oil	»	45	On the same date as lot A, B

Control groups were kept for each experimental group.

The brains were fixed in Stieve and included in paraffincelloidin according to Peterfi; 6 μ sections were stained with chrome-haematoxylin phloxin according to Gomori and Bargmann. The testes and epididymis were fixed and included as described above and stained with trichrome of Galgano

IV. OBSERVATIONS

Group A: experiments with stimulating factors

Experiment I: hormones at ambient temperature.

Lot A and B: *FSH*
Lot F: *Controls*

Secretory granules appeared in the supranuclear area of the SCO (stage 3) after 9 days of treatment with FSH. At this time three 100 μg injections had been given. The same response was observed in animals sacrificed at 15 and 20 days. In the controls the cells of the SCO were in stage 2.

At 23 days, or eight hormone injections, the cells are completely filled with secretory material (stage 4). The same response was observed after 28 and 32 days of treatment (11 injections). Secretory granules were found only in the basal region of the cells (stage 2) in samples taken after 40 days of treatment (Fig. 6B).

The same effects are observed with higher doses of FSH (750 µg/injection).

Using 100 µg of FSH/injection is produced an effect in the testes only after 32 days of treatment. At this time stimulation of the cells of Leydig is clearly apparent in the light microscope. With higher doses of hormone (750 µg) the interstitial tissue is clearly stimulated in samples taken after 15 days of treatment.

In samples taken prior to this time it is not possible to observe signs of stimulation in the cells of Leydig under the light microscope.

Stimulation of spermatogenesis is limited to the first phases (multiplication of spermatogonia and increase in primary spermatocytes). This is more evident in animals treated with 750 µg/injection.

The epididymis is not significatively stimulated at any time during treatment with 100 µg/injection. After 23 days of treatment with doses of 750 µg the epididymis is hypertrophied and tall binucleate cells containing large quantities of secretory material are observed. The organ remains in this state during the rest of the experimental period. The lumen of the epididymis contains abundant secretory material, but sperms are usually absent. A detailed description of the phenomena observed in the reproductive system is found in ANGELINI et al. (1976).

Lot C and D: *LH*
Lot F: *Controls*

With LH at doses of 50 µg for injection, after 12 days the SCO cells are at stage 3, after 20 days the cells are full of secretory material (stage 4); this condition remains also after 28 days; after 43 days the cells return to stage 2.

We do not have samples for short periods of treatment in this experimental series. After 15 days (five injections) the cells of the SCO are at stage 3: the controls are at stage 2 (Fig. 6C).

After 23 days large secretory granules appear in the apical region of the cells (stage 4) (Fig. 3). After 43 days, or 14 injections, the cells of the SCO return to stage 2.

LH at high doses stimulates the interstitial cells of the testes and epididymis beginning from the 23rd day of treatment.

Little stimulation of spermatogenesis was observed.

Lot E: *Testosterone*
Lot F: *Controls*

In samples taken after 15 days of treatment the cells of the SCO are at stage 3; in the controls they are at stage 2. In samples taken after 23 days of treatment cells at stage 4 are observed. After 43 days of treatment the cells are at stage 2 (Fig. 6D).

The doses of testosterone used in these experiments cause only slight stimulation of the epididymis; no response was observed in the interstitial tissue of the gonads.

Experiment II: hormones at 28°C.

Lot A: *FSH*
Lot C: *Controls*

The ependymal cells of the SCO after 3 days of treatment, that is after one injection, have almost reached stage 3; the controls are at stage 2. After 9 days of treatment the cells are filled with secretory granules (stage 4). This situation is observed after 15-20 days and continues up to 23 days. After 28 days (nine injections), most of the cells are at stage 3. In samples taken after 32 days, only a few secretory granules are present in the basal regions of the cells of the SCO (stage 2), as in the controls (Fig. 6E).

Stimulation of the epididymis and of the cells of Leydig is apparent under the light microscope after 15 days of treatment. In the testis, after a brief stimulation of spermatogenesis, there is a clear depression of spermatogenesis with degeneration of spermatids and secondary spermatocytes.

Lot B: *LH*
Lot C: *Controls*

The LH, when injected in 50 µg doses at 28°C, readily stimulates the SCO cells, which after 3 days of treatment are already at stage 3.

After 9 days, there is a strong stimulation (stage 4) followed by a decrease in activity, and starting from the 15th day the secretory granules are present only at the cellular base (stage 2), as in the control specimens.

LH at high temperature strongly stimulates spermatogenesis, interstitial cells, epididymis and other SSC after 10 days.

Experiment III: heat.

Lot A: *28°C*
Lot B: *Controls*

After 6 days of treatment most of the cells of the SCO are at stage 3. This situation is maintained after 15 and 20 days of treatment. The controls are at stage 2. After 23 days of treatment the cells are filled with secretory material (stage 4). This situation is maintained at 28 and 32 days and lasts until 40 days. The cells in samples taken after 40 days of treatment are at stage 2 (Fig. 6F).

The effects of heat on spermatogenesis are similar to those obtained with FSH at 28°C. The interstitial cells and the epididymis are initially slightly stimulated, followed by a depression.

Group B· experiments with inhibitory factors and inhibiting operations

Experiment I: castration.

Two groups of animals were castrated. The first (Lot A) was castrated in November, when spermatogenesis is relatively active (a discrete number of sperms are present) and the SSC are completely inhibited. The SCO is at stage 2. In samples taken in the following spring (160 days after castration) the cells of the SCO contain very small secretory granules in the apical region (stage 1) and the SSC are completely inhibited. In the controls, in the month of April, the SCO is at stage 3 and spermatogenesis and SSC are undergoing a development (Fig. 6G).

The second group of animals (Lot B) were castrated in July (spermatogenesis in regression, the SSC still well developed, the SCO at stage 3) and sacrificed 13 days later. In these animals the cells of the SCO are at stage 2 and the SSC are in regression (Fig. 6H).

Experiment II: cyproteron.

Treatment with cyproteron carried out in May and June gives results similar to castration. It induces both regression of the SSC and depression of the SCO. The experiments with antiandrogens were initiated early in May and after 45 days, or 15 injections, the treatment was suspended. In Lot A the first sample was taken after 3 days. The interstitial cells were normal; the SSC were completely inhibited by cyproteron, but the SCO was still active (stage 4) (Fig. 4).

Since residual oil containing cyproteron was still present in the abdomen of the animals of Lot A, a second group (Lot B) was held in captivity for another 20 days. In these animals, sacrificed 65, 68, 71, 74

Fig. 2 — Transverse section of the SCO during minimum activity (December) of a normal cycle. No large masses of secretory substance are observed in the basal region. Gomori stain. Ventricular cavity (*vc*).

Fig. 3. — Transverse section of the SCO treated in October-November with LH. Note the large masses of secretory material that completely fill the basal region of the organ. Gomori stain.

Fig. 4. — Transverse section of SCO during intense secretory activity (June) of a normal annual cycle. Gomori stain.

Fig. 5. — Transverse section of SCO during intense secretory activity (July) in animals treated with cyproteron. Note disappearance of large masses of secretory material in the basal region of cells. Gomori stain.


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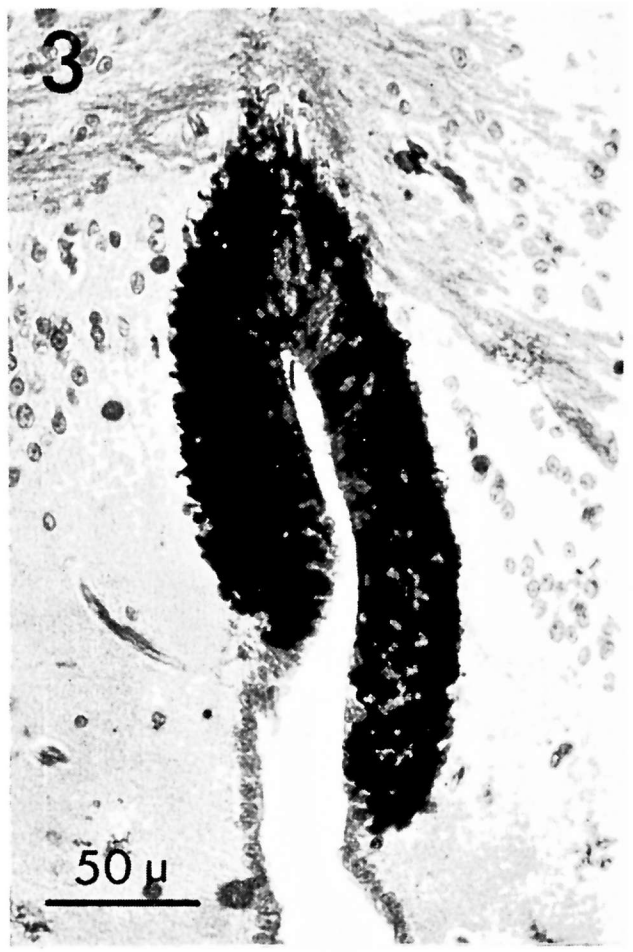
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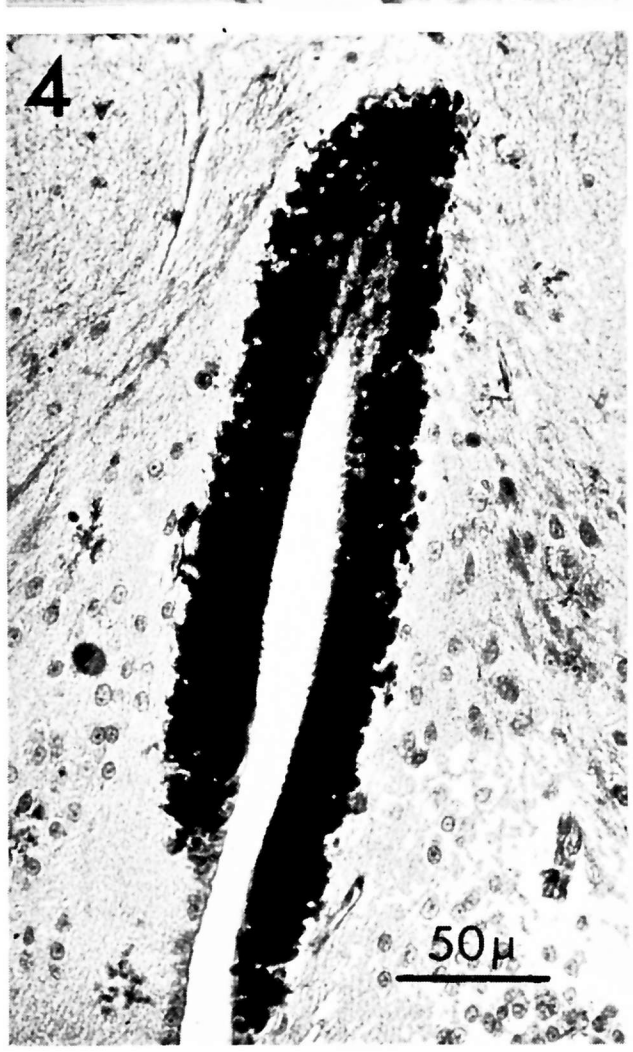
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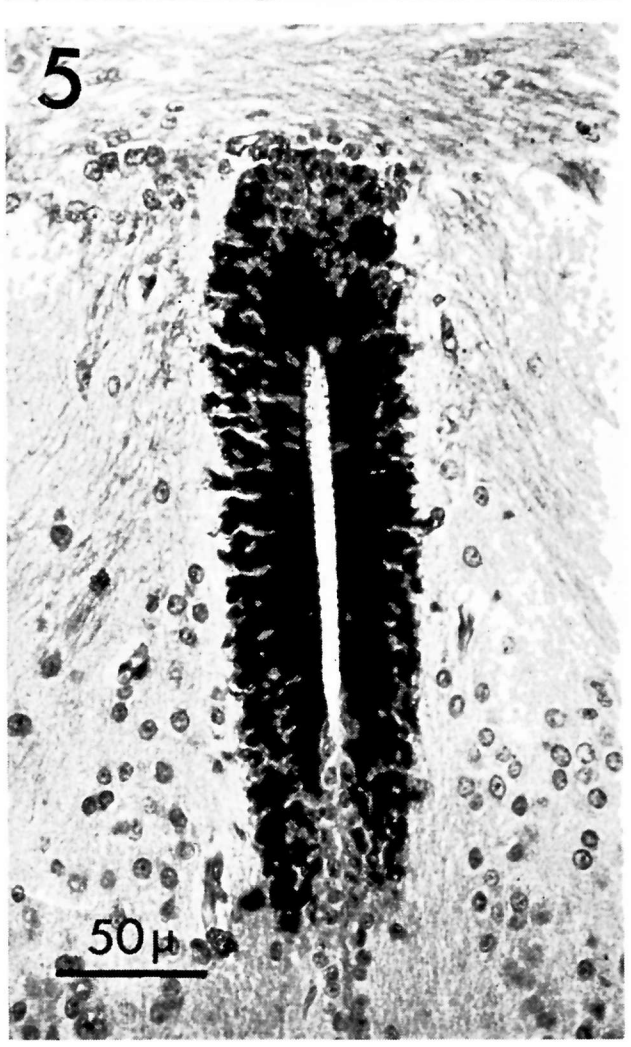
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and 77 days after the beginning of the treatment, both the SSC and the activity of the SCO (stage 2) are reduced (Fig. 5). In the controls (Lot C), which were treated with almond oil, spermatogenesis was in the early regressive phase, the SSC well developed and the SCO in stage 4. Similar development was also observed in the controls in nature (Fig. 6I).

V. DISCUSSION

The secretory cycle of the SCO of *Lacerta s. sicula* Raf. described by D'Uva & Ciarcia (1976) and D'Uva et al. (1976) has the same pattern as the Leydig cells cycle, and with small differences, of the SSC cycle (1). Correlation with spermatogenesis is more limited and seems to occur only in the spring spermatogenic wave. However, complete agreement is not found between the SCO cycle and the SSC. Although there is a correlation between the maximum development of the SSC and the quantity of large chrome-haematoxylin positive secretory granules in the SCO, no variation is observed in the morphological characteristics of the cells of the SCO at the time when the SSC undergo a rapid collapse in August.

A coincidence does seem to exist in the cycle of the cells of Leydig (Varano et al., 1973) and the secretory cycle of the SCO in the course of the whole year. Maximum development of the chrome-haematoxylin positive granules of the SCO occurs when the cells of Leydig are most numerous, largest and have the maximum smooth endoplasmic reticulum (SER) content. The progressive disappearance of these granules takes place when the cells of Leydig become quiescent and are no longer easily distinguished from normal fibroblasts of the intertubular connective tissue.

Our experiments show that the secretory activity of the SCO is influenced by all the experimental procedures which affect the cells of Leydig and the SSC. In concomitance with experimental stimulation of the cells of Leydig and of the SSC there is a strong activation of the cells of the SSC. This usually appears some time before changes in the SSC are evident. The cells of the SCO seem to be more sensitive. The experimental manipulations, which stimulate the cells of Leydig but do not completely activate the SSC, induce a strong activation of the cells of the SCO (see experiment with FSH at ambient temperature 100 µg doses, LH at room temperature 50 µg). The fact that the cells of Leydig at the light microscope level show clear signs of stimulation after the appearance of the first effects on the SCO does not necessarily exclude the possibility

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(1) As a model of SSC, epididymis has been observed; from time to time, in confirmation, femoral pore has also been considered, and there has always been a coincidence between the two organs.

of an increase in their activity before it is morphologically evident at the light microscope level. It has been demonstrated that 12 days after a single dose of 0.7 µg of purificated FHS, an increase in plasmatic testosterone is biochemically demonstrable in *Anolis* (LICHT & WO TSUI, 1975).

The time necessary for the complete stimulation of the cells of the SCO is usually 23 days in experiments carried out with hormones at ambient temperature or when the temperature is increased (Fig. 6). Maximum stimulation is observed after 9 days if hormones are administered at higher temperatures.

The response of the SCO to treatment with hormones blocking the action of testosterone at the peripheral level seems to validate the hypothesis that the secretory activity of the SCO is similar to a SSC. This is also confirmed by the effects of castration.

The difference in the number of days necessary for maximum stimulation of SCO, according to whether the hormones are administered at ambient temperature or at higher temperatures, is in agreement with the observation that response to gonadotropins is temperature dependent in reptiles and that at low temperature (20°C) spermatogenesis is not stimulated by the administration of exogenous gonadotropin. Androgen dependent structures are clearly stimulated under these conditions (LICHT, 1975).

Experimentally stimulated SCO is active for about 3 weeks, after which a rapid process of regression takes place even if the experimental treatment is continued. This is not accompanied by an analogous depression of the SSC, which remain active, probably sustained by the administration of exogenous hormone.

The SCO seems to behave as a SSC with a testosterone sensitivity higher than the other target organs. This may be a significant characteristic of the secretory cycle of the SCO. However, it is also possible that the secretory cycle of the SCO, once it is initiated, has more autonomy from humoral factors than the SSC.

This would indicate the absence of direct correlation between the SCO and the other humoral factors conditioning the SSC. The SCO would in this case be stimulated or inhibited secondarily in relation to the general conditions of metabolic equilibrium induced by different experimental treatments. The necessity for an exchange of the rachidian cephalic liquid following hormone treatment could be among such conditions. In this case, however, the interpretation of the long and short term effects induced by castration and those induced by antiandrogens is difficult.

Experimental modification of the cells of the SCO in other animals has been reported in the literature. In *Rana esculenta* (DIEDEREN, 1975) the growth of Reissner's fibres was more rapid at 24°C. In teleosts (SZABO,

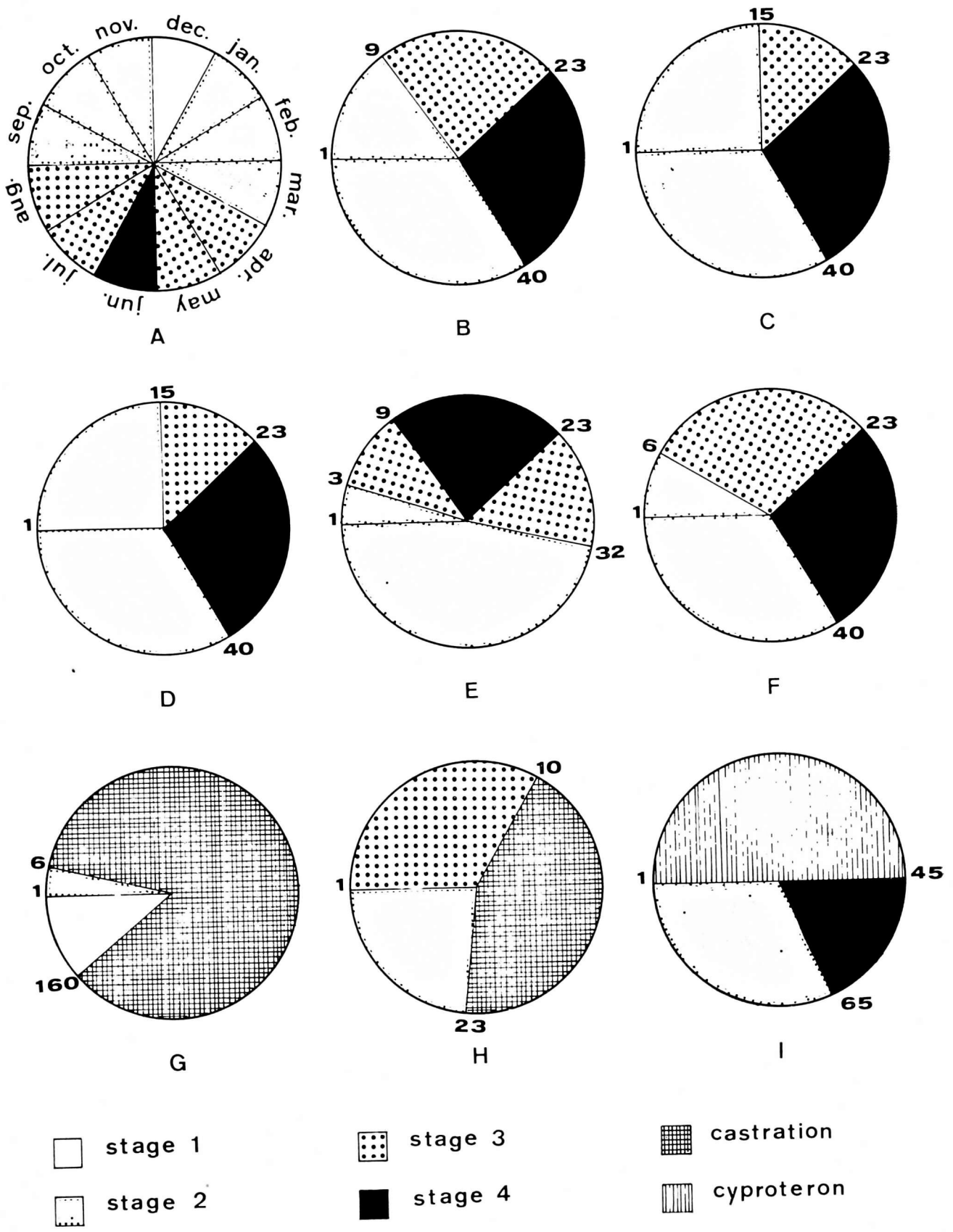

Fig. 6. — Cellular stages of SCO in natural and experimental conditions. A, annual cycle of SCO in nature. B-F, results of different experimental treatments carried out in the period of October-November; the numbers indicate the days of treatment. B, treatment with FSH at room temperature. C, treatment with LH at room temperature. D, testosterone at room temperature. E, treatment with FSH at 28°C. F, animals at high temperature. G, animals castrated in the month of November. H, animals castrated in the month of July. I, treatment with cyproteron in the period of May-July.

1969) a slight stimulation of the SCO was observed after the administration of aldoctone or in conditions of hypoxia. This suggests that the SCO acts as a chemoreceptor.

Our data do not exclude the possibility of a relationship between the SCO and the adrenal glands. In fact, the SCO of *Lacerta s. sicula* captured in the Naples area is most active during the dry period of the year. The adrenal glands are also most active at this time in this locality. This suggests that the SCO may influence the regulation of salt-water metabolism. In rat (ATTILA & TALANTI, 1973) extirpation of the adrenal glands induces a decrease in SCO activity and the administration of hydrocortisone stimulates it.

Experiments are under way in our laboratory on the effect of extirpation of the adrenal glands and of ACTH treatment in *Lacerta s. sicula*, but the results are not yet available.

PELLETIER et al. (1975) have established a connection between the SCO and the hypothalamic hypophysis axis in rat, the SCO releasing a substance (somatostatin) which inhibits release of growth hormone but this substance has never been observed in the epithelium of SCO of the rat by BAKER & YA-YEN YU (1976).

Our data suggest a relationship between SCO and the factors regulating the androgen dependent structures of the sexual cycle.

SUMMARY

The annual cycle of the subcommissural organ (SCO) of *Lacerta s. sicula* Raf. was found to coincide with that of the Leydig cells. During typical stages of the SCO cell cycle the effects on the SCO of treatments designed to stimulate or to inhibit the secondary sexual characteristics (SSC) were studied. All the treatments used to stimulate Leydig cells (LH, FSH, increase in temperature) strongly stimulate the SCO.

Likewise, the inhibition of testosterone (treatment with cyproteron) or castration induce inhibition of the SCO.

RIASSUNTO

Gli Autori hanno studiato il ciclo annuale dell'organo subcommissurale (OSC) di *Lacerta s. sicula* Raf. in natura ed hanno evidenziato una coincidenza con il ciclo delle cellule di Leydig.

In momenti significativi del ciclo delle cellule dell'OSC sono stati inoltre eseguiti trattamenti di stimolazione o di inibizione dei caratteri sessuali secondari (CSS) per studiarne gli effetti a livello dell'OSC.

Tutti i trattamenti effettuati per stimolare le cellule di Leydig (LH, FSH, aumento della temperatura) inducono una forte stimolazione dell'OSC; il trattamento con ciproterone o la castrazione invece (oltre ai CSS) inibisce anche la secrezione delle cellule di questo organo ependimale.

REFERENCES

Angelini, F., O. Picariello & V. Botte 1976. Influence of photoperiod and temperature on the testicular activity of the lizard Lacerta s. sicula Raf. Boll. Zool. 43: 1-7.

Attila, U. & S. Talanti 1973. Incorporation of ^{35}S-labelled cysteine in the subcommissural organ of the rat after adrenalectomy and after treatment with hydrocortisone. Acta physiol. scand. 87 (3): 422-424.

Baker, B. L. & Ya-Yen Yu 1976. Distribution of growth hormone release-inhibiting hormone (Somatostatin) in the Rat brain as observed with immunocytochemistry. Anat. Rec. 186: 343-356.

Dendy, A. 1902. On a pair of ciliated grooves in the brain of Ammocoete apparently serving to promote the circulation of the fluid in the brain cavity. Proc. R. Soc. 69: 485-494.

Diederen, J. H. 1970. The subcommissural organ of Rana temporaria L. A cytological, cytochemical, cyto-enzymological and electron-microscopical study. Z. Zellforsch. mikrosk. Anat. 111: 379-403.

Diederen, J. H. 1972 Influence of light and darkness on the subcommissural organ of Rana temporaria L. Z. Zellforsch. mikrosk. Anat. 129: 237-255.

Diederen, J. H. 1975. Influence of ambient temperature on growth rate of Reissner's fiber in Rana esculenta. Cell & Tissue Res. 156: 267-271.

Donini, P., D. Pozzuoli, I. D'Alessio, B. Lunenfeld, A. Eshkol & A. F. Palow 1966. Purification and separation of follicle stimulating hormone (FSH) and luteinizing hormone (LH) from human postmenopausal gonadotropin (HMG). Acta Endocr., Copenhagen 52: 169-185.

D'Uva, V. & G. Ciarcia 1976. The subcommissural organ of the lizard Lacerta s. sicula Raf. Ultrastructure during the winter. Experentia 32: 1327-1329.

D'Uva, V., G. Ciarcia & A. Ciarletta 1976. The subcommissural organ of the lizard Lacerta s. sicula Raf. Ultrastrutcure and secretory cycle. J. submicrosc. Cytol. 8 (2-3): 175-191.

Farrel, G. 1958. Regulation of aldosteron secretion. Physiol. Rev. 38: 709-728.

Farrel, G. 1959. The physiological factors which influence the secretion of aldosterone. Rec. Prog. hormone Res. 15: 275-310.

Galgano, M. & C. D'Amore 1953. Il ciclo sessuale annuo nel maschio di Lacerta s. sicula Raf. Nota preliminare. Monitore zool. ital. (Suppl.) 62: 320-325. (Atti Soc. ital. Anat., XV Convegno Sociale, Milano, 1-4 ottobre 1953).

Ghiani, P., B. Accame, N. Muratori & M. L. Brosio 1966. Sostanze steroliche nell'organo subcommissurale. Primi dati istocromatografici. Boll. Mus. Ist. biol. Univ. Genova 34: 329-335.

Ghiani, P. & B. Uva 1963. L'organo subcommissurale nei Selaci. Atti Accad. ligure 20: 1-25.

Gilbert, G. J. 1956. The subcommissural organ. Anat. Rec. 126: 253-265.

Gilbert, G. J. 1958. Subcommissural organ secretion in the dehydrated Rat. Anat. Rec. 132: 563-567.

HÄDGE, D. & G. STERBA 1973a. Analytische Untersuchungen am Liquorfaden vom Rind. I. Die Proteinkomponente. Acta biol. med. germ. 30 (5): 581-585.

HÄDGE, D. & G. STERBA 1973b. Analytische Untersuchungen am Liquorfaden vom Rind 2. Die Kohlenhydratkomponente. Acta biol. med. germ. 30 (5): 587-592.

HERRLINGER, H. 1970. Licht- und elektronenmikroskopische Untersuchungen am Subcommissuralorgan der Maus. Ergebn. Anat. Entw. Gesch. 42 (5): 7-73.

KRABBE, K. H. 1925. L'organe sous-commissural du cerveau chez les Mammifères. Biol. Meddr. 5 (4): 1-83.

LEATHERLAND, J. F. & J. M. DODD 1968. Studies on the structure, ultrastructure and function of the subcommissural organ-Reissner's fiber complex of the European eel Anguilla anguilla L. Z. Zellforsch. mikrosk. Anat. 89: 533-549.

LEGAIT, E. 1946. L'organe sous-commissural chez la Grenouille normale et hypophysoprive. C. r. Séanc. Soc. Biol. 140: 543-545.

LICHT, P. 1975. Temperature dependence of the actions of mammalian and reptilian gonadotropin in a lizard. Comp. Biochem. Physiol. 50 A: 221-222.

LICHT, P. & A. K. PEARSON 1969. Effects of mammalian gonadotropins (FSH and LH) on the testes of the lizard Anolis carolinensis. Gen. & comp. Endocrinol. 13: 367-381.

LICHT, P. & H. WO TSUI 1975. Evidence for the intrinsic activity of ovine FSH on spermatogenesis, ovarian growth, steroidogenesis and ovulation in lizard. Biol. Reprod. 12: 346-350.

MAZZI, V. 1952. Caratteri secretori nelle cellule dell'organo subcommissurale dei Vertebrati inferiori. Archo zool. ital. 37: 445-464.

OKSCHE, A. 1961. Vergleichende Untersuchungen über die sekretorische Aktivitat des Subcommissuralorgans und den Gliacharakter seiner Zellen. Z. Zellforsch. mikrosk. Anat. 54: 549-612.

OKSCHE, A. 1969. The subcommissural organ. J. Neur. Visc. Rel. (Suppl.) 9. 11-139.

PALKOVITS, M. 1961. Zwei karyometrisch unterscheidbare Zelltypen in Subcommissuralorgan der Ratte. Z. Zellforsch. mikrosk. Anat. 55: 845-848.

PELLETIER, G., R. LECLERC, D. DUBE, F. LABRIE, R. PUVIANI, A. ARIMNRA & A V. SCHALLY 1975. Localization of growth hormone-release-inhibiting hormone (somatostatin) in the rat brain. Am. J. Anat. 142 (3): 397-401.

REICHERT, L. E., jr. & A. E. WILHELMI 1973. A summary of the biological activities of the various lots of pituitary hormones produced under the programs of the National Institute of Arthritis, Metabolism and Digestive Diseases. Endocrinology 92 (5): 1301-1304.

RODRIGUEZ, M. E. 1970a. Ependymal specializations. II. Ultrastructural aspect of the apical secretion of the Toad subcommissural organ. Z. Zellforsch. mikrosk. Anat. 111: 15-31.

RODRIGUEZ, M. E. 1970b. Ependymal specializations. III. Ultrastructural aspect of the secretion of the Toad subcommissural organ. Z. Zellforsch. mikrosk. Anat. 111: 32-50.

RODRIGUEZ, M. E. 1976. The cerebrospinal fluid as a pathway in neuroendocrine integration. J. Endocr. 71: 407-443.

STANKA, P. 1967. Über den Sekretionsvorgang im Subcommissuralorgan eines Knochenfisches (Pristella riddlei Meek). Z. Zellforsch. mikrosk. Anat. 77: 404-415.

STANKA, P., A. SCHWINK & R. WESTZSTEIN 1964. Elektronenmikroskopische Untersuchung des Subcommissuralorgans der Ratte. Z. Zellforsch. mikrosk. Anat. 63: 277-301.

Sterzi G. 1907. Il sistema nervoso centrale dei Vertebrati I Ciclostomi. Padova: Ed. Draghi. 731 pp.

Szabo, Z. 1969. Sekretionstätigkeit des Subcommissuralorgans bei Teleostiern in naturlichen und Versuchsbedingungen. Revue roum. Endocrinol. 6 (2): 127-132.

Teichmann, I. 1967. Histochemical studies of the different Gomori-positive substances in the subcommissural organ. Neurosecretion, pp. 92-94. In: F. Stutinsky, Edit. IV International Symposium on Neurosecretion, Strasbourg, 25-27 Juillet, 1966. Berlin-Heidelberg-New York: Springer-Verlag. VIII + 253 pp.

Varano, L., F. Della Corte & M. Galgano 1973. Further observations on the fine structure of the Leydig cells of Lacerta sicula sicula Rafinesque during the annual cycle and after temperature changes. Monitore zool. ital. (N. S.) 7: 167-180.

Vigh, B., P. Rohlich, I. Teichmann & B. Aros 1967. Ependymosecretion (ependymal neurosecretion). VI. Light and electron microscopic examination of the subcommissural organ of the Guinea pig. Acta biol. hung. 18: 53-66.

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