

PARATHYROID GLAND OF RANA CYANOPHLYCTIS DURING DEVELOPMENT

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RESUMO - No estágio inicial, objeto deste estudo, a glândula paratiróide de *Rana cyanophlyctis* é uma pequena bola sólida de células epiteliais. Durante a prometamorfose a glândula aumenta de tamanho por proliferação celular. No clímax da metamorfose a glândula parece ser ativa, como é evidenciado pela presença de núcleos hipercromáticos e núcleos picnóticos.

ABSTRACT - The parathyroid gland of *Rana cyanophlyctis* is a small solid ball of epithelial cells at the earliest stage in the present study. During prometamorphosis the gland increases in size due to cellular proliferation. At the time of metamorphic climax gland appears to be active as evident by the presence of hyperchromatic nuclei and pycnotic nuclei.

INTRODUCTION

On the phyletic scale the parathyroid gland first appears in amphibians. There are several reports on the morphology of parathyroid glands in adult anurans (Romeis, 1926; Waggener, 1929; Shapiro, 1933; Cortelyou *et al.*, 1960; Boschwitz, 1961, 1965; Von Brehm, 1963, 1964; Cortelyou & Mcwhinnie, 1967; Sasayama & Oguro, 1974) but only few descriptions about the morphological changes of parathyroid glands of anurans during development are available (Maurer, 1888; Studitsky, 1945; Boschwitz, 1961) An attempt has, therefore, been made to study the changes undergone by the parathyroid gland of *Rana cyanophlyctis* during development.

MATERIALS AND METHODS

Tadpoles of *Rana cyanophlyctis* were collected locally. Different stages (Table 1) of development and metamorphosis were determined according to Agarwal & Niazi (1977 - in *Rana tigrina*) and were fixed in aqueous Bouin, dehydrated in graded alcohol and embedded in paraffin wax. Serial sections were cut at 4-6 μ m and stained with Haematoxylin/eosin.

The volume of the parathyroid gland at different stages was calculated by the following formula - volume = $4/3$

ab^2 (where a is major semiaxis and b is minor semiaxis) because the gland is a prolate spheroid. Since there are four parathyroid glands (one pair on each side) the volume of the paired parathyroid of one side was determined and then doubled.

OBSERVATIONS

The parathyroid glands at stage 32 are two small solid balls on each side at the level of 3rd and 4th branchial pouch. The glands are composed of epithelial cells with chromatin-rich nuclei and are highly vascularized at the periphery (Fig. 1)

During prometamorphosis (stages 33-45) the glands show progressive increase in size (Table 1) due to cellular proliferation (Fig. 2) At the end of prometamorphosis (stage 48) the glands become oval in shape having densely packed epithelial cells (Fig. 3).

At the time of metamorphic climax (stages 50-55) hyperchromatic nuclei are observed. Few cells with pycnotic nuclei have been encountered at the periphery of the glands (Fig. 4)

In froglets a pair of parathyroid glands (ovoid structures) are situated on each side of glottis anterior to the ultimobranchial bodies. The glands are composed of densely packed epithelial cells and are enveloped by connective tissue and blood capillaries.

DISCUSSION

In *Rana cyanophlyctis* parathyroid glands are seen at the level of 3rd and 4th branchial pouches at stage 32 (operculum fused with skin). This derives support from the earlier observations of Maurer (1888) and Boschwitz (1961) who have stated that the parathyroid glands in anurans originate from the ventral part of 3rd and 4th branchial pouches at the time of inner gill formation.

The parathyroid glands at stage 32 (Table 1) are small solid balls (two on either side) of epithelial cells with conspicuous nuclei. Similar observations about the structure of parathyroid glands have been made in *Bufo viridis* (Boschwitz, 1961) and *Bufo andersonii* (Swarup & Pandey, unpublished).

During prometamorphic stage of anuran development there is an active accumulation of calcium in the paravertebral lime-sacs for the further utilization in the ossification of bone during metamorphic climax (Guardabassi, 1960; Pilkington & Simkiss, 1966; Simkiss, 1967) So during these stages an active turnover of calcium occurs (Simkiss, 1967; Baldwin & Bentley, 1980). The occurrence of hyperchromatic nuclei and also the existence of certain pycnotic nuclei (of the exhausted cells) in the parathyroid glands of *Rana cyanophlyctis* indicate the active state of the glands which justify

fies an active turnover of calcium at this stage thus supporting the above statements. Further, Studitsky (1945) has also reported an active state of parathyroid gland at the time of skeletal ossification during metamorphosis.

SUMMARY

The parathyroid glands of *Rana cyanophlyctis* at different stages of development have been studied. The earliest stage of development (32) undertaken in the present study exhibits glands as two small solid balls of epithelial cells on either side at the level of 3rd and 4th branchial pouches. During prometamorphosis (stages 33-45) glands show progressive increase in size due to cellular proliferation. At the time of metamorphic climax (stages 50-55) glands appear to be active as evident by the presence of hyperchromatic nuclei and few pycnotic nuclei at the periphery of the gland.

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Table 1 - General description, size of the tadpole and volume of parathyroid at different developmental stages of *Rana cyanophlyctis*

Stage*	Description	Size of the tadpole (mm)	Volume of parathyroid gland (mm ³)
32	Operculum fused with skin	12	0.0015
33	Hind limb bud	18	0.0042
41	Hind limb digits begin	37	0.0069
43	The toes are longer and webs are prominent	41	0.0368
45	The angle between thigh and shank approximately at right angle	46	0.0404
48	The forelimbs are visible through transparent skin in ventral view	63	0.0573
50	Both forelimbs have emerged	55	0.0771
53	Small tail, about 3/4 of tail is resorbed, No trace of fin	28-34	0.1825
55	Froglet, Tail completely resorbed	24	0.1880

*Developmental stages were determined according to Agarwal & Niazi (1977)

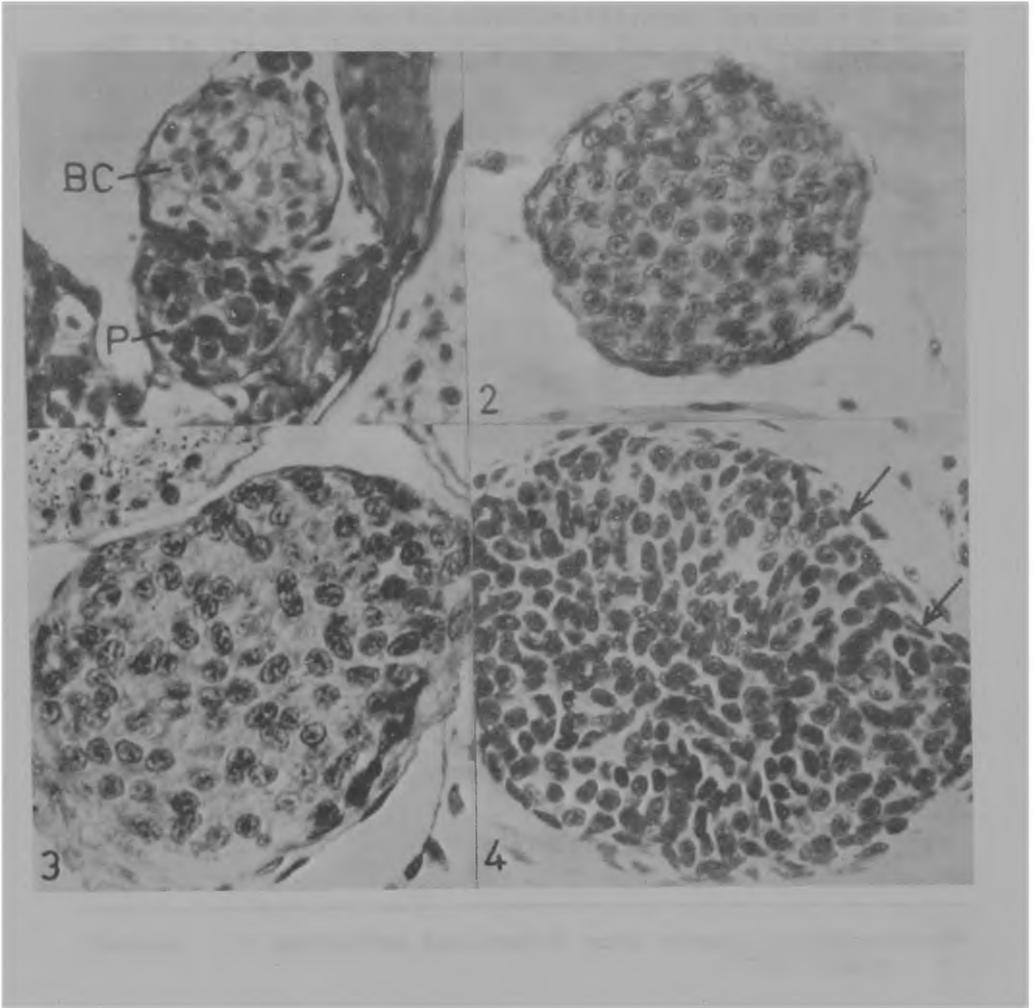


Figure 1 - Parathyroid gland (P) of *R. cyanophlyctis* at stage 32. Note chromatin-rich nuclei and blood capillary (BC) at the periphery. Haematoxylin-eosin. X 500.

Figure 2 - Parathyroid gland of *R. cyanophlyctis* at stage 41 showing increased size of gland due to cellular proliferation. Haematoxylin-eosin. X 500.

Figure 3 - Parathyroid gland of *R. cyanophlyctis* at stage 48 showing further increase in size. Haematoxylin-eosin. X 500.

Figure 4 - Parathyroid gland of *R. cyanophlyctis* at stage 55 showing cells having hyperchromatic nuclei and few cells with pycnotic nuclei (arrows) Haematoxylin-eosin. X 500.