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CARBAMIDE INDUCED HISTOLOGICAL ALTERATIONS DURING DIFFERENT PHASES OF THE TESTICULAR CYCLE OF A FRESHWATER PERCH, *COLISA FASCIATUS* (BL. & SCH.)

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Jagdamba Prasad Shukla and Kamleshwar Pandey (1984) Carbamide induced histological alterations during different phases of the testicular cycle of a freshwater perch, *Colisa fasciatus* (Bl. & Sch.) *Bull. Inst. Zool., Sinica* 23(2): 181-186. Histological alterations during the various phases of testicular cycle (Preparatory, Mature, Spawning and Post-spawning) of *Colisa fasciatus*, exposed to low level of sub lethal concentration (2,500 ppm) of carbamide (urea) after long term exposure (15 and 30 days) has been scrutinized. Significant alteration viz. abnormal lobular architecture, dissolution of germinal epithelium, scattered interstitial Leydig cells with homogeneous liquefied cytoplasm, prominent vacuolization and necrosis though has been observed during the preparatory and mature phase, however, no such significant alteration has been observed during the spawning and post-spawning phase of testis of *C. fasciatus*. Causes for various significant and non-significant alterations during various phases have been discussed.

Key words: Carbamide, Testicular cycle, Interstitial Leydig cells

Exploratory investigations reveal that chemical pollutants produce an adverse effect on the reproductive physiology, development and growth of fish fauna (Mount, 1968; Brungs, 1969; Farmer *et al.*, 1979; Pandey and Shukla, 1982 and 1983 and Shukla and Pandey, 1984, 1984a). In order to become more precise, additional informations on the action of chemical pollutants on the gonadal cycle of fishes is a pressing need of the time. Carbamide (urea) which is perpetually released from the fertilizer factories (Algarsamy *et al.*, 1973; Pandey and Shukla, 1979 and Pandey *et al.*, 1982) and is a known deleterious pollutant for the fishes (Gillette *et al.*, 1952; Evans *et al.*, 1973 and Pandey and Shukla, 1983). Literature on the gonadal cycle of freshwater teleosts is though excellent yet hardly any literature is available on the toxic effects of agrochemicals in general and carbamide in particular on the gonadel physiology of fishes. Present study has, therefore, been undertaken to record the adverse effects, if any, of the sublethal concentration of carbamide after long term exposure (15 and 30 days) during the four phases (Preparatory, Mature, Spawning and Post-spawning) of the testicular cycle in an Indian freshwater perch, *C. fasciatus*. The study incorporates the histological changes leading to the physiological imbalances and altered spermatogenesis during the testicular cycle.

MATERIAL AND METHODS

Procurement, aclimatization and measurement of the fishes, duration of the phases and

the experiment run during various phases were the same as outlined by Shukla and Pandey (1984a). Though toxic level of carbamide for the fishes lies between 16,000–30,000 mg/l as recorded by Gillette *et al.* (1952), however, sublethal concentration (2,500 mg/L) of carbamide was detected to observe its effect, if any, on different phases of testicular cycle of *C. fasciatus* for long term exposure (15 and 30 days) as recorded by Pandey and Shukla (1983). To save biodegradation of urea into ammonia, the water containing sublethal concentration of urea was changed after each 12 hrs and the control after each 24 hrs interval. For the histological studies the testis from experimental and control groups was dissected out and small pieces were fixed for 24 h in Picro-Mercuro-Formal fixative (Pandey, 1979). Following the routine histological techniques, serial traneverse sections (6–8 micron) were cut and staind with Heidenhain Iron Haematoxylin-eosin.

RESULTS

Fifteen days exposure under carbamide (urea) stress produced no adverse effect on the testicular histology during any phase of the testicular cycle. However, slight distortion in the lobular architecture with scattered interstitial Leydig cells having homogeneous liquified cytoplasm (Fig. 2) has resulted after 30 days of exposure during the preparatory phase. Still more prominent changes were observed during the mature phase incorporating breaking and dissolution of germinal epithelium and the interstitial Leydig cells show necrosis and pyknosis with prominent cytoplasmic vacuolization and degeneration (Fig. 4). However, no apparent change in the testicular histology occurred during spawning and post-spawning phase.

DISCUSSION

Gonads have a high cell turnover during the reproductive cycle and are especially vulnerable to a wide variety of stimuli (Steinberger and Dixon, 1959 and Drobeck and Coulston, 1982). Our study demonstrates that the fish testis is more or less sensitive to carbamide stress. Informations on the effect of chemical pollutants on the gonadal structure and cyclic activity in the fishes are since meagre, the present results have been compared with those of mammals also. Following Lindane treatment, Dikshith and Datta (1972) observed massive degenerative changes in the seminiferous epithelium, changed architecture of seminiferous tubule, increased proliforation in the steroidogenic cells and degeneration in the intra- and interlobular regions of the rat testes. Similar changes have also been reported by Seth *et al.* (1973) due to Manganese intoxication in the rabbit testis. Sanglong and O'Halloran (1973) reported extensive necrosis and degeneration in the lobule boundary cells in the testis of brook trout after cadmium intoxication. In the present investigation altered lobular architecture, braking and dissolution of germinal epithelium, scattered steroidogenic cells (Interstitial Leydig cells) with homogeneous liquified cytoplasm, prominent vacuolization, necrosis and pyknosis may well be compared with the results in mammalian specimens. Apart from these adverse histological changes, these results also point possible hormonal imbalance during the preparatory and mature phases. However, no visible change during the spawning and post-spawning phase of the testicular cycle may be attributed to the attainment of final maturity and consequent ebb of the activity during these phases (Shukla and Pandey, 1984). Present observations get additional support from the results of the biochemical studies during the different phases of the gonadal cycle of *Colisa fasciatus* under Arsenic stress (Shukla and Pandey, 1983, and 1984a). Our investigations dealing with the structural and cellular changes under carbamide stress in testis of *C. fasciatus* is a first report of its kind and contributes greatly to our existing state of knowledge.

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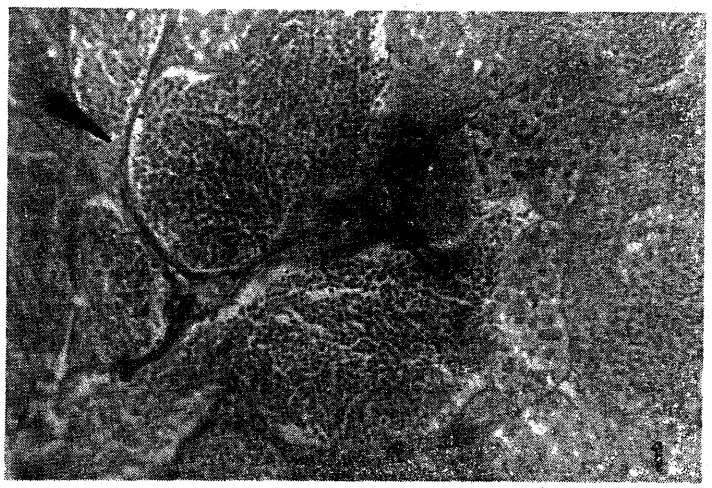
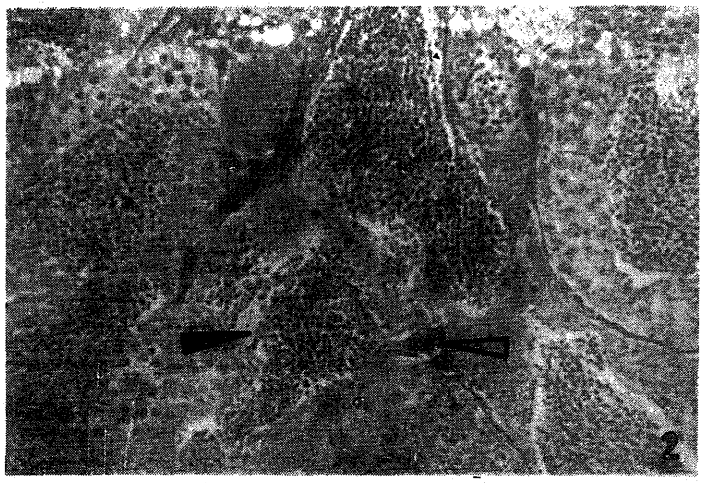
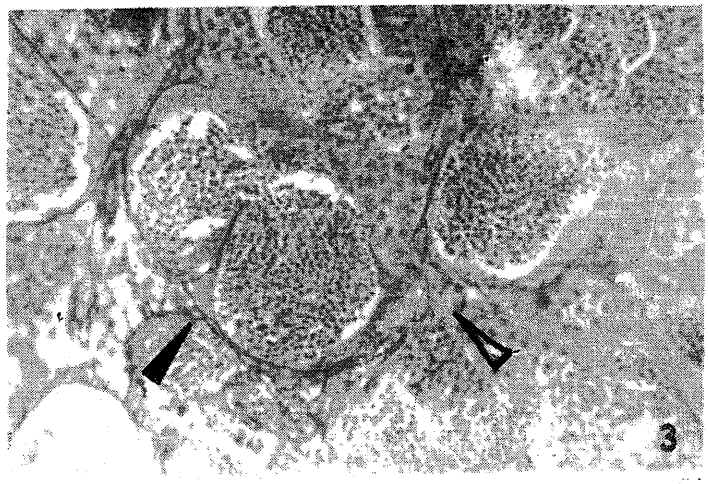
Explanation of Figures







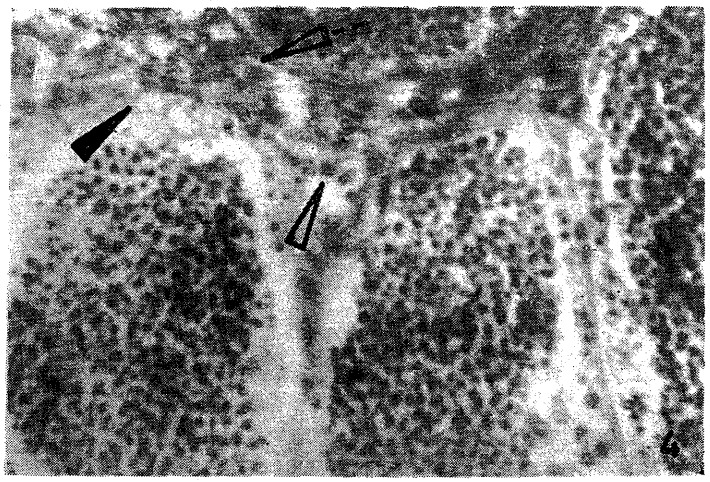


Fig. 1 and 3. T. S. Testis showing normal testicular lobules (▶) and interstitial Leydig cells (▷) during preparatory and mature phases. ×400.

Fig. 2. Slight distortion in the lobular architecture (▶) and scattered interstitial Leydig cells (▷) with homogeneous cytoplasm (during preparatory phase) under carbamide stress. ×400.

Fig. 4. Breaking and dissolution of germinal epithelium (▶), necrosis in the interstitial Leydig cells (▷) and prominent cytoplasmic vacuolization (--▷) under carbamide stress during mature phase. ×1200.

碳醯二胺引發淡水鱸之睾丸組織在不同睾丸週期之變化

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淡水鱸（*Colisa fasciatus*）暴露於 2,500 ppm 碳醯二胺（卽尿素，此濃度爲次致死濃度之下限）15 天與 30 天後，對其睾丸組織在不同睾丸週期（預備期、成熟期、排精期、排精後期）之變化情形加以詳細觀察。雖然在預備期與成熟期可見睾丸組織之顯着變化，卽異常之小葉結構、生殖上皮溶解、分散之萊氏細胞而其細胞質變爲均勻液狀、明顯之空泡形成與壞死，但在排精期與排精後期則無此顯着變化；其原因於文中討論。