

# STUDY OF SOME TRANQUILLIZERS ON THE FISH—*COLISA LALIA* AND *COLISA FASCIATA*

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In the hope to understand the brain and behaviour of man a large proportion of research in neuropsychology is today restricted to the mammals. However, Ingle (6) has very well discussed the role of the fish as a comparative medium of research in neuropsychology. From phylogenetic point of view many workers believed that the progressive development of neo-cortex along the vertebrate series was intimately bound up with the evolution of intelligence and this led to consider the uncorticated fish as a "creature of instinct" (6). Later studies of fish behaviour revealed unsuspected capacities for learning which compare favourably with those of some mammals. In view of the recent analysis of the subcortical structures and simple elements of behaviour, Ingle (6) has pointed out that if the anatomical substrate of fish behaviour differs from the brain of cat and monkey while behavioural functions are similar, one should be cautious about simple correlation between structure and function and hence in the search for underlying mechanisms (regarding brain structure and behavioural function) the comparative method will be useful.

Although *Betta splendens* (Siamese fighting fish) mainly has been employed by some workers in neuro-psychopharmacological studies (1,4), other variety of fish particularly which are locally available can be utilized for the sake of economy, easy maintenance and also to find out the species differences, if any. With this idea a preliminary study on the behavioural effects of some tranquillizers (reserpine and chlorpromazine) was carried out on locally available active fishes (*Colisa lalia* and *Colisa fasciata*). 1-( $\beta$ -phenylethyl) triazolo (4,5-6) pyridine hydrochloride (PCA9), which has shown tranquillizing and sedative properties in laboratory animals (8,2) was included in this study.

## MATERIALS AND METHODS

To study the effects of reserpine ('Serpasil'-Ciba), chlorpromazine ('Largactil'-M & B) and PCA9 [1-( $\beta$ -phenylethyl) triazolo (4,5-c) pyridine hydrochloride] on the fish, *Colisa lalia* of one inch and *Colisa fasciata* of two inches average length (the length was measured from the snout to the base of the caudal fin rays), both of either sex, were employed. The fishes, obtained locally, were brought to the laboratory and allowed to acclimatize for two days before they

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were used for drug testing. The fishes (30-35) were maintained in aquarium (18x18x15 inches) and given tubefex worms as food.

For studying the drug effects, fishes, in groups of 3, were transferred to the glass vessels containing water from the aquarium. *C. lalia*, were kept in beakers (500 ml) containing 250 ml of water and *C. fasciata* in glass jars (2 litre) containing one litre of water.

Reserpine, chlorpromazine and PCA9, were administered either intramuscularly or by dissolving in the glass vessels containing aquarium water and the fishes. For intramuscular injection the fish was secured in a small transparent plastic bag and 0.05 ml of the solution of the drug was injected in the muscle just above the base of the caudal fins. In the control group normal saline solution was administered. The fishes were observed for 30 minutes before and upto 4 hours after the administration of the drugs. In another experiment effects of the drugs were noted on LSD-induced reactions in *C. fasciata*.

The fishes were observed on the following points :

- (i) Spontaneous movements of the fishes alongwith the movements of the pectoral fins.
- (ii) Position—fish remaining at the top of water with nose up tail down or at the bottom of the container.
- (iii) Passivity was tested by catching the fish with the hand gently and noting the struggle and escape behaviour.
- (iv) Pigmentation of body and fins.

#### RESULTS

The effects of reserpine, chlorpromazine and PCA9 on gross behavioural activity of the fish (*Colisa lalia* and *Colisa fasciata*) are given in Table I.

TABLE I

Effect of reserpine, chlorpromazine and PCA9 on gross behavioural activity of the fishes (*Colisa lalia* and *fasciata*)

Drugs	Conc. in glass vessel g/ml	RESPONSES			
		Spontaneous movements*	Passivity†	Position in the glass vessel	Pigmentation‡
Control (saline)	..	+++	0	Not fixed (moving up and down)	0
Reserpine	4x10 <sup>-6</sup>	+	+	at bottom	±
Chlorpromazine	4x10 <sup>-6</sup>	+	++	at bottom	0
PCA9	4x10 <sup>-5</sup>	+	++	at bottom	±

\* +=rare movement; ++=occasional movements; +++=frequent movement; ++++=continuous movement

† 0=absent; +=slight; ++=moderate; +++=marked; ±=slight effect only in a few fishes.

9 fishes were used for each drug.



In the present investigation it was observed that the drugs produced similar effects in *Colisa lalia* and *Colisa fasciata*. With reserpine, chlorpromazine and PCA9 dissolved in aquarium water in the concentration of  $4 \times 10^{-6}$ ,  $4 \times 10^{-6}$  and  $4 \times 10^{-5}$  g/ml respectively, reduction in spontaneous movements and appearance of passivity was observed. All movements of the treated fish were slow and deliberate as compared with the typical swift and sudden movements of the normal fish. Treated fish remained mostly at the bottom of the testing vessels in a quiescent state with occasional upward movement to the surface of water. Movements of pectoral and caudal fins were also markedly reduced. Slight pigmentation of body and fins were noted in reserpine and PCA9 treated fishes. PCA9, in concentration of  $1 \times 10^{-4}$  g/ml, was found to be toxic and lethal in case of *C. lalia*. One out of the six fishes (*C. lalia*) died after 3 hours of chlorpromazine treatment ( $4 \times 10^{-5}$  g/ml).

The effect of reserpine (0.5 mg/ml) and PCA9 (2.5 mg/ml) injected in volume of 0.05 ml. intramuscularly was found almost similar to that produced by dissolving in aquarium water except that the pigmentation was more marked particularly in *Colisa fasciata*.

*Effect on LSD-induced reactions in the fish:* The effect of chlorpromazine reserpine and PCA9 on LSD-induced reactions in the fish (*Colisa fasciata*) has been summarised in Table II.

TABLE II

*Effect of reserpine, chlorpromazine and PCA9 on LSD-induced reactions in the fish (Colisa fasciata)*

Drugs*	Pre-treatment time (min.)	RESPONSES				
		Spontaneous movements	Passivity	Position in glass vessels	Pigmentation	Average duration of pigmentation
Control (LSD)	..	++++	+	Nose up tail down, grouped together at the top.	+++	3 hr
Reserpine	120	++++	+	as above but the fishes moved separately.	+++	3 hr
Chlorpromazine	15	++	++	.. ..	++	1/2 hr
PCA9	5	++	++	.. ..	+++	1 hr

\*All the drugs were injected intramuscularly in the volume of 0.05 ml. The concentrations of drugs were as follows: Chlorpromazine, 0.5 mg/ml; reserpine, 0.25 mg/ml; PCA9, 2.5 mg/ml, LSD, 0.05 mg/ml. 9 fishes were used for each drug. (For symbols see footnote of Table I)

In the control group, LSD (0.05 mg/ml) injected in volume 0.05 ml intramuscularly in *Colisa fasciata* produced typical behavioural response characterised by continuous swimming in a group near the top of water with nose up tail down at an acute angle. Besides, LSD produced a marked effect on body pigmentation. Within 5 minutes of injection the faint stripes on the body of the fish became intense and darker in colour. The caudal fins were blackened and the ventral fins became greenish with red margins. These effects lasted for three hours. No such effects were observed in fishes injected with saline alone.



Pretreatment with 0.05 ml intramuscular injection of chlorpromazine (0.5 mg/ml), PCA9 (2.5 mg/ml) and to some extent, reserpine (0.25mg/ml) reduced the intensity of swimming caused by LSD. The fishes were found swimming separately, near the surface instead of swimming in one group. Fishes recovered from LSD-induced pigmentation in 1/2 hour and 1 hour in the case of chlorpromazine and PCA9 pretreatment respectively, while in the control group recovery took place in nearly 3 hours. Reserpine failed to reduce the duration and intensity of pigmentation, rather it slightly increased this phenomenon.

#### DISCUSSION

Experiments on the fish (*C. lalia* and *C. fasciata*) revealed that reserpine, chlorpromazine and PCA9 produced tranquillizing effects characterised by reduced spontaneous movements (quiescent state) and appearance of passivity. The behavioural changes simulate those produced by tranquillizers in other fishes. Tranquillizers have been reported to inhibit fighting response in Siamese fighting fish (*Betta splendens*) (3,4, 10). The inhibition of fighting response and the depression of motility with the appearance of passivity are probably the manifestation of a central depressant action.

Chlorpromazine, PCA9 and to some extent reserpine reduced the behavioural response induced by intramuscular injection of LSD. Chlorpromazine and PCA9 also reduced the intensity and duration of pigmentation of the body and the fins caused by LSD, whereas reserpine failed to do so, rather the colouration was intensified. The ineffectiveness of reserpine on LSD-induced reactions and pigmentation is in conformity with the results obtained by Turner & Carl (9). The reason for the ineffectiveness of reserpine on LSD-induced reactions is difficult to explain though one may attribute it to the lack of serotonin in the teleost. The lack of serotonin in the teleost has been described to be due to inability of the organism to hydroxylate tryptophane in the metabolic cycle (4). Elder *et al.* (5) and Isbell (7) have also reported that chlorpromazine antagonised LSD-induced reactions in the cat and man but reserpine failed; it even appeared to intensify the reactions.

The fish has been described to be a good subject with which to explore the spontaneous behaviour as well as learning (6). Unlike the frog—who may prefer just to sit—many fishes are continuously active. The fishes show their acute sensitivity to the object's sight, touch, tastes and odours, with a variety of movements—fleeing, following, investigating, digging, snapping.

From the present investigation it may be concluded that *C. lalia* and *C. fasciata* species of the fish, which are locally available and easy to maintain, can be utilized as the comparative medium in the study of psychopharmacological agents.

#### SUMMARY

A study on the gross behavioural effects of reserpine, chlorpromazine and 1-( $\beta$ -phenylethyl) triazolo (4,5-c) pyridine (PCA9) was carried out on the fishes—*Colisa lalia* and *Colisa fasciata*. All these drugs produced a quiescent state and passivity in the fishes. Chlorproma-



zine and PCA9 antagonised the LSD-induced reactions in *C. fasciata* while reserpine failed to do so.

*C. lalia* and *C. fasciata*, which are locally available and easy to maintain can be utilized for comparative study in the psychopharmacological research.

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