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RESEARCH AREAS:

Fish Genetics

1. Hormonal induction of sex reversal
2. Ploidy induction and sex control
3. Androgenesis
4. Interspecific androgenetic cloning
5. Conservation of genomic diversity of fish
6. Transgenesis

HONORS AND AWARDS:

1. Bhatnagar Award
2. Fellow of National Academy (FNA)
3. Fellow of National Academy of Science (FNASc)
4. Fellow of Academy of Science (FASc)
5. Fellow of Third world Academy

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RESEARCH INTERESTS:

In the last few decades my lab has made land-mark contributions on (i) production of supermale (YY) in the male-heterogametic tilapia and barbs (oviparous), guppy (viviparous), and superfemale (ZZ) in the female-heterogametic molly, – all for the first time, (ii) the discovery of natural occurrence of hapliod males and females and tetraploid catfish – again, for the first time (iii) developing a simple widely practicable post-mortem sperm preservation technique, (iv) cloning of growth hormone genes in Indian major carps and catfish, and construction of transformation vectors, for the first time in India, (v) generation of 5-6 times fast growing transgenic rohu and (vi) restoration of rosy barb from its preserved sperm to activate the genome-inactivated eggs of tiger barb. Of these, the most recent contribution is described hereunder:

The non-visibility of egg nucleus renders the fishes not amenable for nuclear transplantation, like that achieved by Wilmut *et al*. (1997) in cloning the Dolly. Yet, being amenable for post-mortem preservation and androgenesis, the fishes are uniquely advantageous, as these techniques can restore a strain/species using the preserved sperm to activate embryonic development of genome-inactivated eggs of another strain/species. Androgenesis is a developmental process facilitating the inheritance of exclusively paternal genome. It obligately involves two steps: (i) elimination/inactivation of egg's genome and (ii) activation of embryonic development and suppression of the first cleavage to restore diploidy. Suppression of the first mitotic cleavage involves technically more difficulties. Not surprisingly, protocols for suppression of the first cleavage and induction of androgenesis are available only for about 10 species. Induction of interspecific androgenesis has been even more difficult.

We have been uniquely lucky to achieve it by restoring the rosy barb with its post-mortem preserved sperm to activate the genome-inactivated eggs of the tiger barb. UV-irradiation at 4.2 W/m^2 for 3.5 min completely inactivated the genome in the eggs of tiger barb. Shocking the 24-min old activated tiger barb eggs at 41°C for 2-min restored diploidy. Purity of these androgenic rosy barb clones has been confirmed by phenotypic markers and PCR analysis. With Tc1 transposon specific primers these clones produced only 800 bp fragment, typical of the rosy barb and not the tiger barb specific 300 bp fragment. We have today a breeding population of interspecfic androgenic clones of over 100 male and female rosy barbs. This kind of cloning may not only restore an endangered fish species, but also mass produce seedlings of, say, carps almost throughout the year and obligate migratory fishes like the eel, from the eggs of the undesired fishes like tilapia.

SELECTED PUBLICATIONS:

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