

Steroid signalling and temperature-dependent sex determination-synergism between temperature and estradiol in an oviparous lizard

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In vertebrates, the offspring sex is known to be influenced by a variety of sex-determining mechanisms (SDMs). In birds and mammals, sex is determined at fertilization of zygotes by sex chromosome composition, known as genotypic sex determination (GSD). In some species the gender is dependent on environmental cues, predominantly temperature, often called temperature-dependent sex determination (TSD) as reported in fish, amphibians and reptiles. In reptiles with TSD, temperature initiates a cascade of events, involving steroid hormones and culminating in sex determination. How does TSD differ from GSD? It is proposed that sex steroids are the main factor and there is evidence to support that endogenous E2 levels are influencing gene expression in the developing gonad and consequently, sex determination, by up-regulating SF-1 and aromatase expression in the female gonad while decreasing it in the male gonad. Nevertheless, the key role of aromatase and estrogen in the early steps of ovarian differentiation is still controversial in many reptilian species. The Indian garden lizard, *Calotes versicolor* that lacks heteromorphic sex chromosomes is an excellent model to study the molecular cascades of sex differentiation pathway which exhibits a unique pattern of TSD. The novel sex-determining pattern that we have reported for the first time in this lizard, is neither compared to Pattern I [Ia (MF) and Ib (FM)] nor to Pattern II (FMF) and we refer to it as FMFM pattern of TSD. This pattern is likely to have an adaptive significance in maintaining the sex ratio in *C. versicolor* with increasing global warming. The gonadal expression of ER- α and aromatase enzyme (CYP 19A1) in embryos of this species revealed two protein bands with apparent molecular weight of ~55 kDa and ~45 kDa for ER- α and 58 kDa for aromatase in the total protein extracts of adrenal-kidney-gonadal (AKG) complex suggesting the occurrence of isoforms of ER- α . The increase in expression of ER- α variants and aromatase enzyme during later stages of development divulge responsiveness of AKG to estrogen suggesting the up regulation of estrogen. Further, the apparent surge in endogenous estradiol coincides with the first indication of gonadal sex differentiation at FPT and reveals that estrogen signaling is crucial for sexual differentiation of gonad in this lizard, thereby suggesting the synergistic action of incubation temperature as well as steroid hormones.

Biography

Laxmi S Inamdar obtained her MSc and PhD degree in Zoology from Karnatak University, Dharwad. Currently, she is Professor and Chairperson of Zoology Department. Her areas of research interest include endocrinology, reproduction and development principally focusing on the sex determination and differentiation. Her group is the first one to show a novel FMFM pattern of temperature dependent-sex determination in the developing embryos of a reptile, *Calotes versicolor* (Daud.). Currently, her research group is concentrating on: 1) Endocrine and Molecular mechanism of sex determination and differentiation, 2) *Wnt* signalling during early embryonic development in mouse *Mus musculus*, 3) Biochemical and Pharmacological Impact of Anabolic - Androgenic Steroids. She has been INSA visiting Scientist to Indian Institute of Science twice. She has published 21 papers in international journals of repute. She has received grants from UGC and DAE, India. She is life member for several scientific bodies. She is the recipient of Best Research Publication Award (2012-13).

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