Sex Hormones Zebrafish

Hormones and Their Receptors in Fish Reproduction - Philippa Melamed 2005
Research on the molecular aspects of fish reproduction has progressed swiftly over the past few years. With the availability of wide-ranging molecular tools, fish researchers have elucidated many of the molecular mechanisms regulating reproduction which operate in the brain, pituitary and gonad. This research has revealed novel variants of reproductive hormones and their receptors, and has shed new light on the mechanisms through which many of these genes can be activated. Several of the findings, which are reported in this book, have formed the basis for subsequent mammalian research and will also constitute the platform on which new approaches to reproductive management in aquaculture can be developed.
Endocrine Sex Differentiation in Fish - T. J. Pandian 2013-05-07
Of all vertebrates, fish exhibit unparalleled diversity of sexual plasticity and flexibility, ranging from gonochorism to unisexualism, and exceptional patterns of functional hermaphroditism. Fish farming and monosex aquaculture have led to reproductive dysfunction with males producing less milt, and females failing to ovulate and spawn. This book
Estrogen related alternations of gonad development and of reproduction in the zebrafish, Danio rerio, Ham. Buc - Gerd Maack 2002

Estrogen Receptors and Aromatase in Zebrafish (Danio Rerio) Development - Christopher Scott Lassiter 2005

Estrogen related alterations of reproduction and of gonad development in the zebrafish, Danio rerio, Ham.Buc - 2002

Recent Advances in Zebrafish Researches - Yusuf Bozkurt 2018-05-30
Model organisms have been used in various disciplines in order to understand different mechanisms underlying the problems. From this point of view, the zebrafish has become a favorite model organism in different scientific research fields in recent years because of its rapid embryonic development, transparency of its embryos, and its large number of offspring along with several other advantages. Recent Advances in Zebrafish Researches demonstrates the role and the function of zebrafish in different research fields and totally includes 11 chapters, which have been written by the expert researches in their fields. With this book, every researcher will better understand different mechanisms underlying the problems at different disciplines using zebrafish as model organism.
Zebrafish as a Model for Pharmacological and Toxicological Research - Carla Denise Bonan 2022-09-16

Effects of the Aromatase Inhibitor Fadrozole on Gene Expression in the Zebrafish Brain - Martin Paquette 2008

Computational Ligand Discovery for the Human and Zebrafish Sex Hormone Binding Globulin - Nels Thorsteinson 2008

The Regulation of Neuroregeneration in Zebrafish (Danio Rerio) - Amy T. McCurley 2010
Abstract: A lack of understanding of the molecular mechanisms essential for neuroregeneration is a major obstacle to the treatment of neural injury and neurodegenerative diseases. In contrast to adult mammals, teleost fish including zebrafish (Danio rerio) are able to successfully repair an injury to

the central nervous system. Following optic nerve crush (ONX) or sham surgery (SHAM), established markers of neuroregeneration of retinal ganglion cell (RGC) axons (growth associated protein, gap43 ; alpha tubulin 1, tuba1) were measured by quantitative polymerase chain reaction (qPCR) analysis to verify the occurrence and timing of axonogenesis and synaptogenesis. Global gene expression patterns were documented by microarray analysis in zebrafish eye at intervals during neuroregeneration (6 hours-21 days). Of 15,600 total array transcripts, 4,748 were regulated during regeneration. 93% of 42 sequences tested were successfully validated by qPCR, attesting to the accuracy of the arrays. The number and magnitude of changes and the gene ontology of transcripts were functions of time post-ONX. Regulated sequences represented genes controlling cell adhesion, apoptosis, cell cycle activity, energy metabolism, and calcium signaling. Comparison of our dataset with published transcriptional profiles revealed cell types in eye other than RGCs have roles in neuroregeneration, and indicate an overlap with genes regulated in other regenerating zebrafish tissues . Investigation of regulatory pathways known to be neurotrophic/neuroprotective (estrogen-mediated) or neurotoxic (dioxin-mediated) identified gene markers of exposure and effect. Specifically, expression of aromatase and estrogen receptor (ER) genes was up-regulated very early in regeneration. Treatment with aromatase or ER inhibitors suppressed neuroregeneration-associated genes (gap43) and revealed novel downstream estrogen targets (grn1, sox11, stc2). Potential ER-dependent and -independent effects of estrogen were suggested. Conversely, genes known to mediate dioxin actions (aryl hydrocarbon receptor, AhR) and effects (cyp1a, cyp1b1) were down-regulated during

regeneration and dioxin reversed effects of ONX on regeneration-associated markers (tuba1, wnt2, spond1, sox11). Results reported in these studies suggest a physiological role for AhR during neuroregeneration and potential crosstalk between AhR and estrogen signaling pathways. Results of this research advance the zebrafish model for studying molecular processes of neuroregeneration and provide an entry point for better understanding the underlying regulatory and toxic mechanisms.

The Neuroendocrine Control of Feeding and Reproduction in Zebrafish (Danio Rerio) and Glass Catfish (Kryptopterus Vitreolus). - Sydney London 2019

Reproduction and feeding are two critical life processes in all vertebrates, the regulations of which involve a complex network of interactions. It has been suggested that appetite regulators, such as orexin, neuropeptide Y (NPY), and cocaine and amphetamine regulated transcript (CART), and reproductive hormones, like gonadotropin-releasing hormone (GnRH), gonadotropin-inhibitory hormone (GnIH), kisspeptin, and neurokinin B (NKB), interact to regulate both food intake and reproduction. However, this relationship is not well characterized in all vertebrate species, especially fish. The purpose of this study was to examine this relationship and uncover some of the regulating mechanisms underlying these two processes. Specifically, I investigated two species of freshwater fish; glass catfish (Kryptopterus vitreolus) and zebrafish (Danio rerio). In glass catfish, I was able to successfully isolate two reproductive hormones (GnRH1 and GnRH2) and three appetite regulators (orexin, NPY, and CART). I found that fasting affected the relative brain expression levels of all of these peptides, except for GnRH2, suggesting a link between nutritional status and endocrine regulation. In

zebrafish, I examined how nutritional status, reproductive stage, gender, and strain affected the brain mRNA expression of certain appetite (orexin and NPY) and reproductive (GnRH, kisspeptin, GnIH, and NKB) hormones. To compare strains, I used both wild-type and transparent Casper zebrafish. My results suggest gender- and reproductive stage-specific, as well as strain-specific variations in the mechanisms that regulate feeding and reproduction in zebrafish. To further investigate these differences, I compared the brain mRNA expression of genes involved in the melanocortin system and melanin pathway between wild-type and Casper zebrafish. I found that the Casper zebrafish had lower levels of several of the genes examined, suggesting that these strain-specific differences may be mediated by the melanocortin system. Overall, I was able to show a clear relationship between appetite and reproduction in both zebrafish and glass catfish, providing new insights into the endocrine mechanisms that regulate these two processes in fish.

Altered Gene Expression - Jennifer L. Hoffmann 2004

Although reductions in 17[beta]-estradiol and vitellogenin concentrations have been consistently observed in fish exposed to polycyclic aromatic hydrocarbons (PAHs), an understanding of the mechanism behind these changes has yet to be fully elucidated. The overall objective of the present research was to gain a better understanding of the effect of PAHs on transcription of genes involved in reproduction. The first objective of this research was to characterize the expression of follicle stimulating hormone receptor (FSH-R) and luteinizing hormone receptor (LH-R) and four key steroidogenic enzymes (P450-side chain cleavage (P450scc), P450 17[alpha]-Hydroxylase/17-20 lyase (P450c17), 20[beta]-Hydroxysteroid Dehydrogenase

(20[beta]-HSD), P450-aromatase (P450arom)) in oocytes and whole ovaries at different stages of development in zebrafish to gain a better understanding of basic transcriptional regulation of ovarian development and maturation. All genes examined were differentially expressed in pre-, early, mid, and late-vitellogenic oocytes. In contrast, only LH-R was differentially expressed at 0, 48, and 96 hours after spawning. The results of the first experiment provided evidence that transcription of gonadotropin receptors and steroidogenic enzymes may be involved in regulating ovarian development and maturation. Additional objectives of this project were 1) to determine if exposure to waterborne benzo[a]pyrene (B[a]P) (0, 1.5, or 3.0 [mu]g/L) for 61 days affected reproduction in zebrafish and 2) to determine if waterborne exposure to B[a]P affected transcription of gonadotropins, steroidogenic enzymes, activin, vitellogenin, or estrogen receptor [beta]. A 50% and 48% reduction in total egg output was observed in the 1.5 [mu]g/L and 3.0 [mu]/L treatments as compared to controls, respectively. Although not significant, there was a trend towards a decrease in the number of females that spawned following exposure to 3 [mu]g B[a]P/L. Cytochrome P4501A1 (CYP1A1) mRNA was significantly increased in heads of B[a]P-exposed zebrafish whereas it was not elevated in livers of B[a]P-exposed fish. An increase in P450aromB, vitellogenin, and 20[beta]-HSD mRNA occurred in fish exposed to 3.0 [mu]g B[a]P/L as compared to the controls. The results from this study demonstrate that reproduction in zebrafish is affected by waterborne exposure to B[a]P and that transcription of P450aromB, vitellogenin, and 20[beta]-HSD may be one mechanism of B[a]P-induced reproductive toxicity.

Hormones and Reproduction of Vertebrates, Volume 1 - David Norris 2011-05-04

This series of volumes

represents a comprehensive and integrated treatment of reproduction in vertebrates from fishes of all sorts through mammals. It is designed to provide a readable, coordinated description of reproductive basics in each group of vertebrates as well as an introduction to the latest trends in reproductive research and our understanding of reproductive events. Whereas each chapter and each volume is intended to stand alone as a review of that topic or vertebrate group, respectively, the volumes are prepared so as to provide a thorough topical treatment across the vertebrates. Terminology has been standardized across the volumes to reduce confusion where multiple names exist in the literature, and a comprehensive glossary of these terms and their alternative names is provided. A complete, essential and up to date reference for research scientists working on vertebrate hormones and reproduction - and on animlals as models in human reproductive research Covers the endocrinology, neuroendocrinology, physiology, behaviour and anatomy of vertebrate reproduction Structured coverage of the major themes for all five vertebrate groups allows a consistent treatment for all Special chapters elaborate on features specific to individual vertebrate groups and to comparative aspects, similarities and differences between them

Long-term Molecular Effects of Developmental Estrogen Signaling Manipulation in the Zebrafish Retina - Annastelle Lilly Cohen 2022

The steroid hormone estradiol (E2), the biologically relevant estrogen, plays a crucial role in visual system development and maintenance. We hypothesized that manipulation to E2 signaling during critical periods of visual system development would cause long-term changes in the expression and activation of E2 transcriptional and intracellular targets in the adult zebrafish retina.

Zebrafish larvae (72hpf and 7dpf) and adults were transiently exposed to two environmentally relevant concentrations of bisphenol A (BPA), an estrogen mimic and ubiquitous environmental chemical, and the long-term impacts of developmental exposure were compared to immediate effects in adults. RT-qPCR and Western blotting techniques were used to assess changes in gene expression of neural aromatase (AroB) and estrogen receptors (ERs) and the activation of E2-initiated MAPK and PI3K/Akt signaling cascades in retina of adults, respectively. Exposure to low BPA concentrations (0.001ÎơM), but not high (0.1ÎơM), at 72hpf significantly increased AroB and decreased ERÎø gene expression, increased ERÎø expression at 7dpf, and had no significant effect at adulthood. Phosphorylation of Akt and MAPKs ERK and JNK was also exposure age-dependent, where BPA at 72hpf decreased phosphorylation of Akt and ERK but increased JNK phosphorylation at 7dpf. Results were compared in brain, which further revealed concentration and exposure-age dependent effects of developmental BPA exposure. Further, the patterns of BPA-induced E2 pathway dysregulation in retina were unique to those in brain, highlighting the significance of studies examining E2 signaling in retina.

Role of Estrogen-related Receptor in Ionocyte Differentiation and Ionoregulation of Zebrafish (danio Rerio) - □□□ 2012

The Long-term Molecular Effects of Tributyltin on Estrogen Signaling in the Zebrafish Retina - Maya Alyiah Sanders 2023

The development of the retina involves a delicate process that requires careful completion to prevent disruption in proper functioning. A vital component of this careful process involves the production of aromatase, an enzyme that is required for the synthesis of estrogen in the gonads and the brain of teleost

fish. Endocrine Disrupting Compounds (EDCs) affect the inhibition or upregulation of hormones like estrogen, which can cause cell apoptosis (cell death), thinning of the retina and cornea, as well as delayed development that emphasizes the importance of estrogen during this process. Unfortunately, not much is known about the longterm implications of changing the estrogenic signaling involved in retinal development. This study hopes to address this implication by using g adult zebrafish (Danio rerio) and using the EDC tributyltin (TBT), an anti-fouling agent on fishing boats an aromatase inhibitor. This study will expand on previous findings that BPA, an estrogen receptor agonist, causes long-term effects in the zebrafish visual system when a similar methodology is used. Therefore, this study will assess if brief exposure to another environmentally relevant estrogen-targeting EDC also causes long-term effects in the visual system and will help to uncover estrogen signaling mechanisms in the retina by better understanding aromatase regulation, as aromatase inhibitors are used clinically as a breast cancer therapeutics.

Importance of Estrogen Receptors in Early Life Stages of Zebrafish (Danio Rerio) Development - Mirjam Fröhlicher 2008

Steroid-protein Interactions - Ulrich Westphal 1971

Functions of G-Protein Coupled Estrogen Receptor (GPER) in Female Zebrafish Reproduction - Marcus Jermaul Jawanza Williams 2019

Abstract Steroid hormones such as estrogen depend on receptors like Estrogen Receptor alpha (ER[alpha]ł) and Estrogen Receptor (ER[beta]) to mediate their slow "genomic" functions, and G-Protein coupled Estrogen Receptor (GPER) to exert their rapid "non-genomic" functions. The integration of the genomic and the less studied non-genomic functions of estrogen

are crucial to proper reproductive timing and function. The effects of estrogen in reproduction via genomic signaling has been extensively studied. Conversely, the functions of estrogen in reproduction via non-genomic GPER signaling remains poorly understood. The most characterized function of GPER (mammals) in reproduction is the regulation oocyte maturation (the resumption of meiosis). Gper has previously been shown to mediate the estrogen inhibition of oocyte maturation in vitro in teleosts using numerous experimental approaches, such as the silencing of both gper (zebrafish) and Estrogen Receptors (ERs), and in-vitro pharmacological tools. Despite this, no labs have used gper knockouts to investigate this phenomenon in teleosts. Furthermore, the effects of gper in other aspects of reproduction such as fertility and oocyte development remain largely unstudied in zebrafish. However, knockout studies in mice models indicate that GPER may be dispensable in mediating the various effects of estrogen in reproduction, including fertility and reproduction. To investigate the role of gper in fertility, oocyte development, and oocyte maturation in zebrafish, we generated two gper zebrafish mutant lines using CRISPR/Cas9, causing a -8 or a -10 nucleotide deletion, resulting in frameshift mutations in the third exon of gper. The shift in the reading frame resulted in the truncation of the gper mRNA leading to a non-functional product. We then examined reproductive function in homozygous mutant gper8nt zebrafish, assaying their overall fertility, oocyte development, and oocyte maturation. In contrast to previous studies in mice and other zebrafish models, we conclude that gper is essential for reproduction. gper mutant females exhibit a buildup of stage III oocytes compared to wild-type, possibly indicating dysfunction in oocyte development. Surprisingly, we

found no significant difference in oocyte maturation in gper mutants compared to wild-type in an in vitro germinal vesicle breakdown (GVBD) assay. Interestingly, we observed gene expression changes in the hypothalamic-pituitary-gonadal axis (HPG axis) which could indicate gper exerts an indirect effect on genes important for reproduction. In the brain, ER[alpha] (esr1) and ER[beta] (esr2a/esr2b) were upregulated in gper mutants. In the ovary, genes encoding steroid hormone synthesis enzymes were downregulated, including 3[beta]-hydroxysteroid dehydrogenase (hsd3b1), which is essential for progestin synthesis, and 17[beta]-hydroxysteroid-dehydrogenase (17[beta]hsd), which is crucial for testosterone synthesis. Our results suggest an important role of gper in fertility, oocyte development, and female reproduction. Our data has shown that gper is necessary for numerous reproductive processes, but further experimentation is needed to explain the molecular mechanisms which gper effects fertility, oocyte development, and oocyte maturation.

Sexual Differentiation and Steroid Hormone Levels in Zebrafish (Danio Rerio) - Jane Ebsen Morthorst 2010

Sex Hormones Zebrafish:

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