CHARACTERIZATION OF THE KISSPEPTIN SYSTEMS IN THE BRAIN OF THE EUROPEAN SEA BASS (Dicentrarchus labrax): RELATIONSHIPS WITH OESTROGEN RECEPTORS

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Introduction: Due to the increasing importance of sea bass (Dicentrarchus labrax) in the European aquaculture, puberty control is the focus of intense research. While the GnRH systems have been well described in this species, little information regarding the kisspeptin systems exists. Kisspeptins belong to a family of peptides first identified for their capacity to inhibit tumor metastasis through the receptor GPR54 in mammals. It has been largely demonstrated that the kisspeptin system plays an essential role in the neuroendocrine control of puberty and reproduction by stimulating the GnRH neurons and subsequently releasing gonadotropin hormones. Therefore, the kisspeptin system could be the gatekeeper in the onset of reproduction on fish. In sea bass two ligands and two receptors coded by different genes have been identified and molecularly characterized [1]. Additionally, several sex steroids including öestradiol-17β have been well studied in sea bass and clear evidence exists regarding these hormones play during the period of reproduction. In sea bass, three oestrogen receptors (ERs) have been characterized, named as esr1 (ERα), esr2a (ERβ2) and esr2b (ERβ1) [2, 3]. Here, we report the neuroanatomical distribution of the cells expressing kiss1 and kiss2 and their cognate receptors in the brain of adult sea bass and their relationship with the three oestrogens receptors by in situ hybridization.

Methods: Four brains of adult sea bass maintained under a natural of photoperiod were perfused, embedded in paraffin and transversally cut. Specific probes were synthesized using Dig-RNA labeling Mix according to [4]. The relationships between kisspeptin receptors and the GnRH systems were studied using specific antibodies raised against the GAP portion of the preproGnRH1 [5].

Results and Discussion: Our findings indicate that kiss1-expressing cells are located at the level of the habenular nucleus (Hd) (Fig. 1A) and the mediobasal hypothalamus where a strong expression of kiss1 messengers is observed just above the pituitary stalk (Fig.1B), which is in line with the kiss1 messenger distribution in the medaka fish [6]. Additionally, kiss1 messengers were also detected in the proximal pars distalis of the pituitary gland. In contrast, kiss2 expressing cells were observed around the nucleus of the lateral recess (NRL) (Fig.1 C-D) and in the anterior preoptic area. Interestingly, similar to what shown in zebrafish [7] the kiss1r was also expressed in the habenular nucleus and in the anterior ventral preoptic region. On the other hand, the kiss2r-mRNA had a much wider expression in the ventral, lateral and dorsal parts of the telencephalon, the entopeduncular nucleus, the preoptic region and the hypothalamus. Furthermore, a double staining showed that GnRH1 neurons express the kiss2r- mRNA in the anterior ventral preoptic area.

Conclusion: In summary, this work represents the first neuroanatomical analysis of the kisspeptin systems and their relationships with the three oestrogens receptors in the sea bass brain and suggests a critical role of this system in the control of reproduction.
Figure 1. Photomicrograph of kiss1 and kiss2 expressing cells in the brain of sea bass by in situ hybridization. (A) High number of kiss1 mRNA expressing cells in the habenular nucleus (Hd). (B) Cells located at the caudal lateral tuberal nucleus (NLT) above the saccus vasculosus (VS). In (C-D) a high number of kiss2 mRNA expressing cells located above the nucleus of the lateral recess (NRL) and a lower expression in cells of the ventral part of nucleus of the lateral recess (NRLv) in the hypothalamus.

Reference List


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