

RENCONTRE SCIENTIFIQUE

Perturbateurs endocriniens : les nouveaux défis de la recherche

Jeudi 13 juin 2024

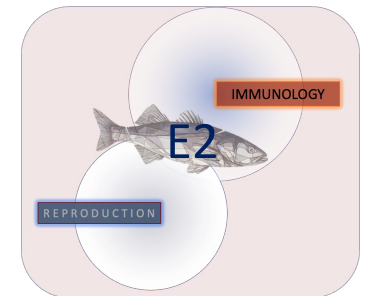
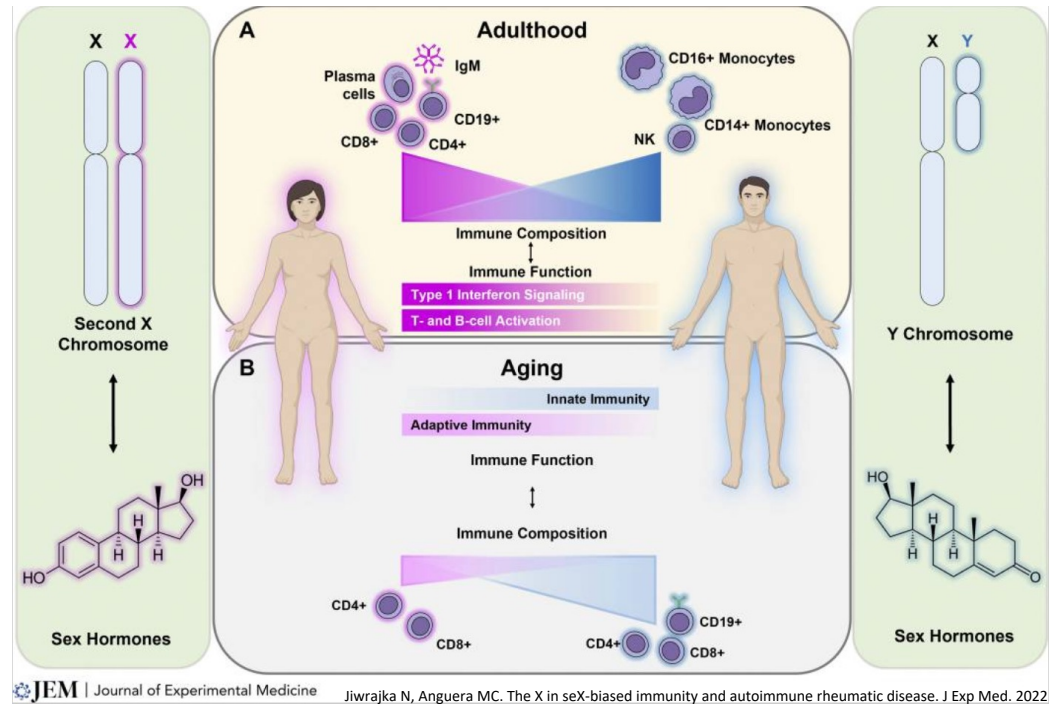
Maison de la RATP - Paris 12

Impact des perturbateurs endocriniens œstrogéniques sur le système immunitaire d'un poisson téléostéen, le bar européen

Tiphaine MONSINJON, MCF HDR, UMR-I02 SEBIO

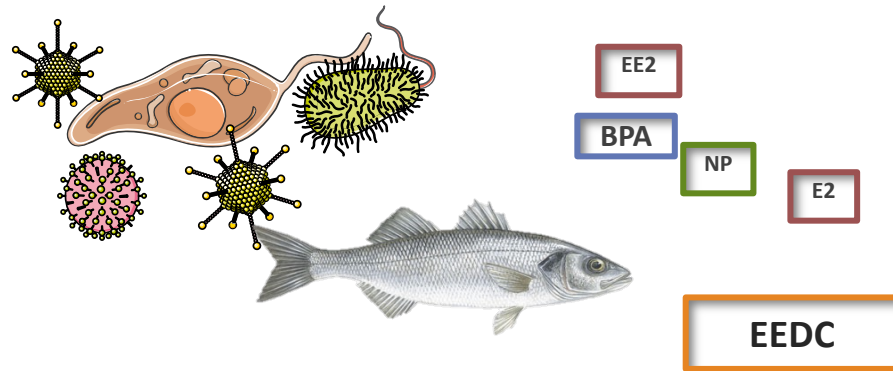
Dimorphisme sexuel dans la réponse immunitaire :

- Estrogène endogène: 17β -estradiol (E2)
 - Hormone femelle majeure
 - Importante pour reproduction sexuelle
- Système immunitaire féminin plus performant
- Maladies auto-immunes: majoritairement chez les femme (>80%)



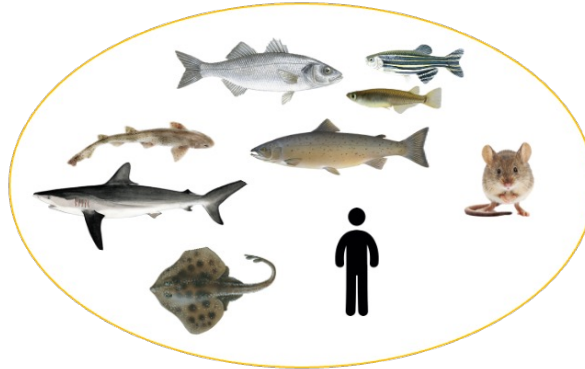
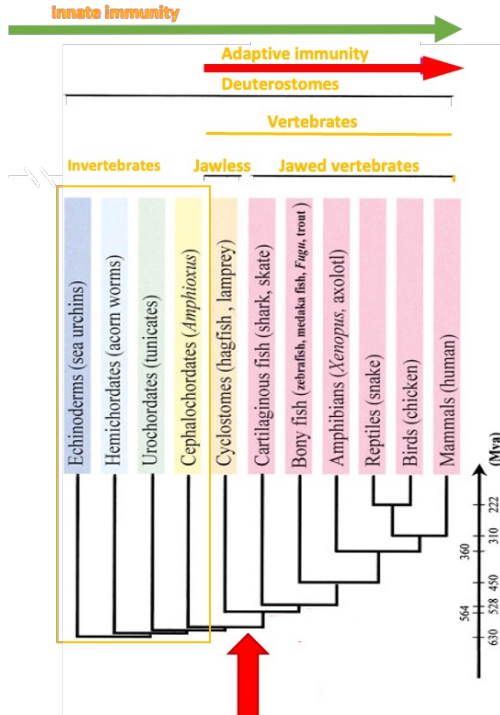
Relation entre la pollution anthropique (PE) et montée des maladies émergentes

- Rôle de la modulation de l'immunité des organismes induite par l'environnement ?
- Quels traits immunitaires affectés par les divers facteurs de stress anthropiques ?



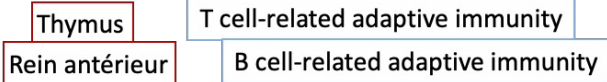
Immunité chez les vertébrés

➤ Vertébrés ont développé un **système immunitaire adaptatif**



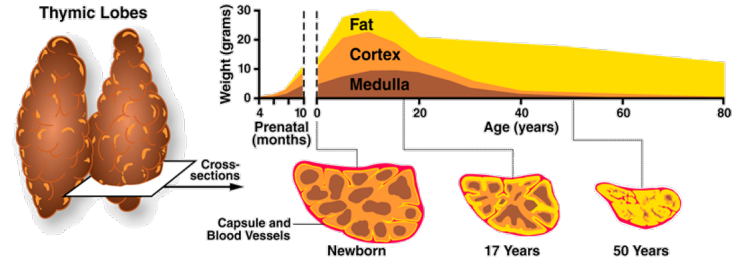
Importance du **thymus** pour l'immunité **adaptative**

after Flajnik & Kasahara, 2001



Influence des œstrogènes sur le SI : **plasticité thymique**

- Organe très **plastique**
- Involution thymique: tissu adipeux/ perte des espaces épithéliaux / réduction de la prolifération des T et de leur nombre: Emigration des cellules T en périphérie moins importante
- Variation associée aux fonctions **reproductives**
- Sous contrôle des hormones stéroïdes sexuelles



Thymus

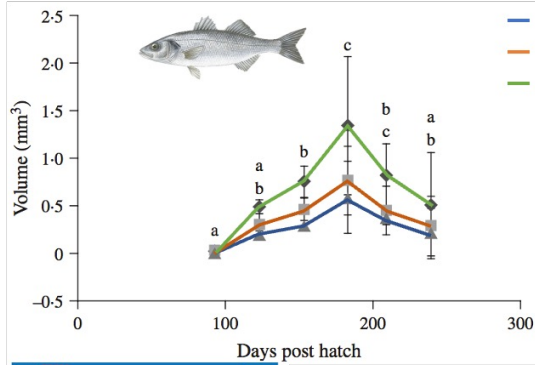


tolérance envers le foetus



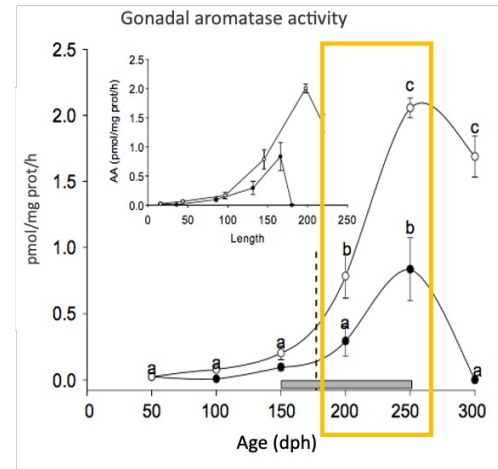
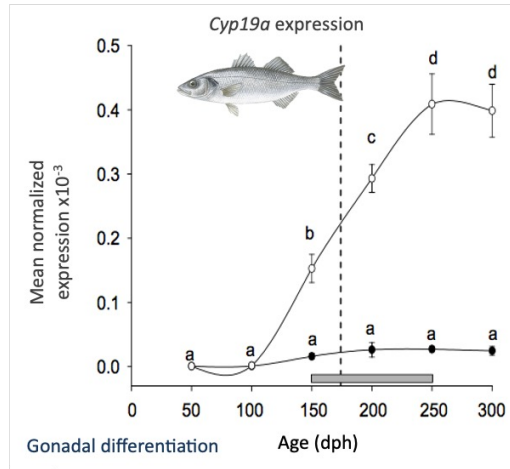
L'involution thymique réversible au cours de la grossesse met en lumière l'importance des œstrogènes dans la modulation de la plasticité thymique.

Mécanisme de régulation hormonale du SI identique et même plasticité thymique ?



• 239 dph: significant thymic involution

Estradiol promotes Atrophie thymique



Journal of Fish Biology (2015) 86, 1186–1198
doi:10.1111/jfb.12626, available online at www.blackwell-synergy.com
Exogenous 17β-estradiol (E2) modifies thymus growth and regionalization in European sea bass *Dicentrarchus labrax*
F. SERMANN*, T. KNIGGT, S. OLIVIERI AND T. MOSSINGHOFF

Blázquez et al 2008. *Gen. Comp. Endocrinol.* 158, 95–101.

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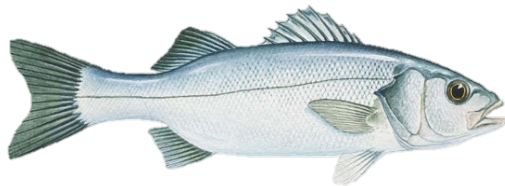
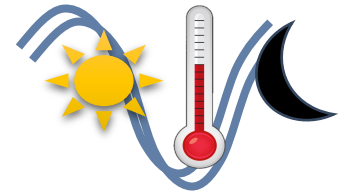
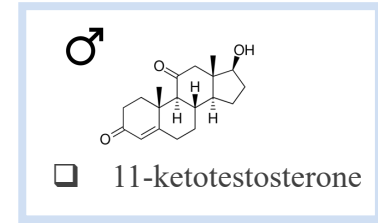
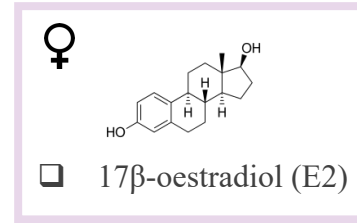
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Quelles sont les implications écologiques de la régulation estrogénique du SI en relation avec la reproduction ?

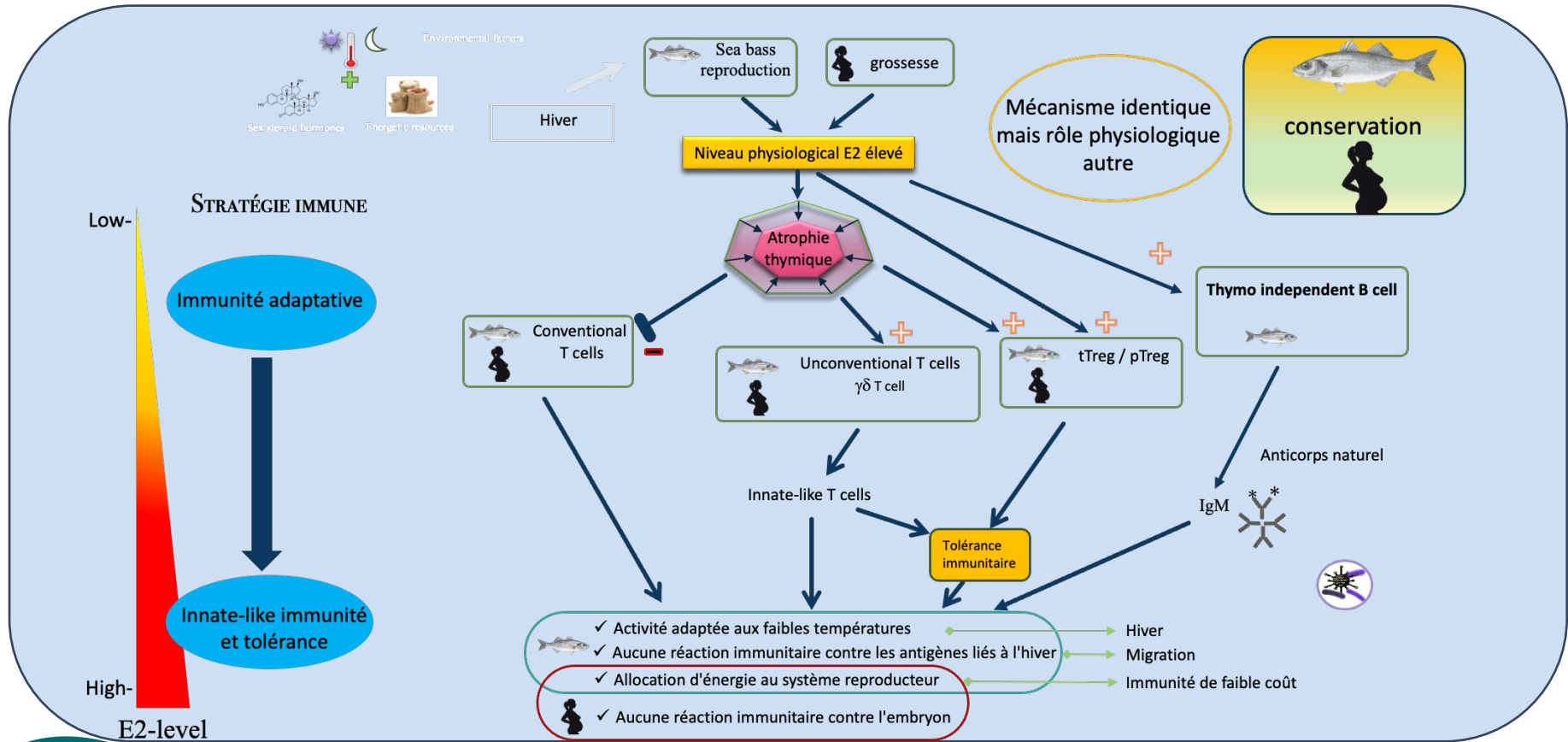
- Augmentation du taux plasmatique d'hormones sexuelles = reproduction
- Reproduction du bar = hiver
- hiver= changement important de la photopériode et température



Facteurs environnementaux

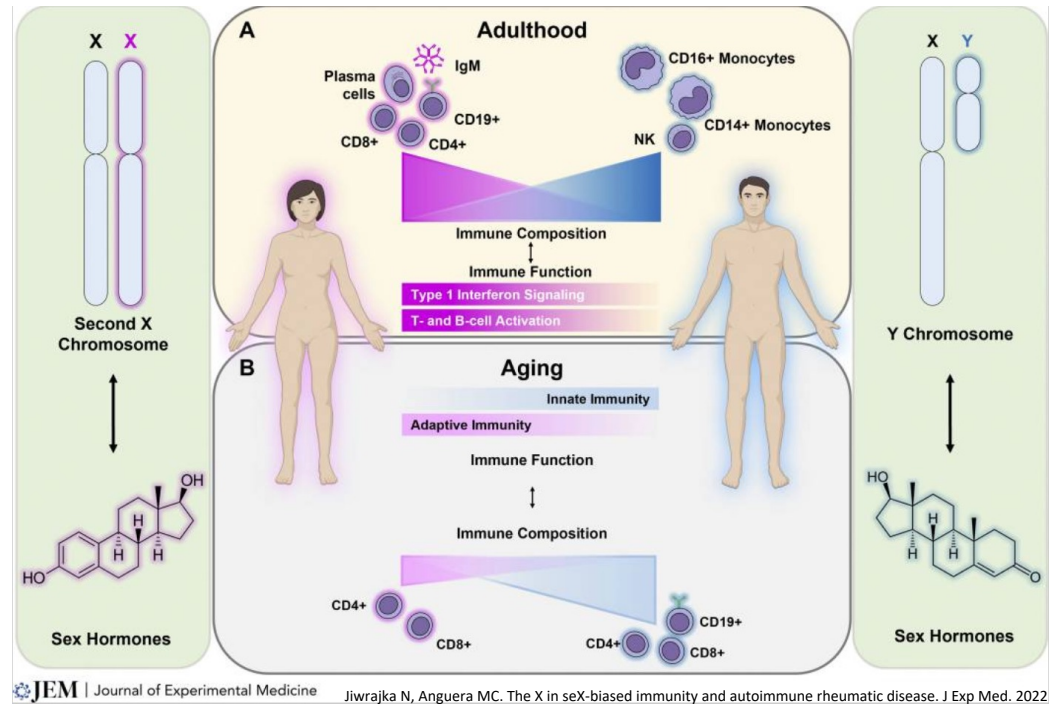


Facteurs Endogènes



Plasticité du SI (thymus) avec âge

- Développement du SI
- Mise en place avant la **puberté**
- Diminution de la performance immunitaire avec l'âge

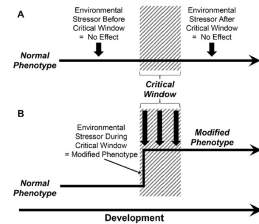


Détermination de fenêtres critiques durant l'ontogénèse du thymus

Experiment	E2 concentration [ng/L]	Initial fish age [dph]
1	0	67 dph
	2	
	20	
	200	
2	0	37
	0	97
	20	127

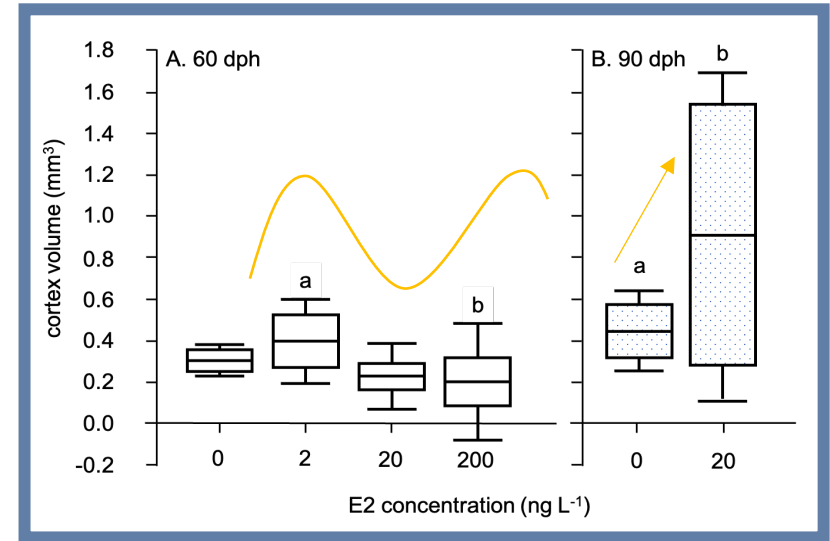
- 60 dph *D labrax* exposés à 2, 20 et 200 ng L⁻¹ E2 pendant 56 jours
- Alevins de différents âges (30, 90 et 120 dph) exposés à 20 ng L⁻¹ E2
- Evaluation des volumes du thymus total, cortex et médulla

BIOLOGY
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F. MEHREZ¹, I. KNIGHT², S. OLIVIER¹ AND I. MONSIEUX¹



Thymus:

- Poissons de 60 dph
 - Courbe dose réponse non monotone
 - Atrophie du cortex
- Poissons de 90 dph
 - Hypertrophie thymique



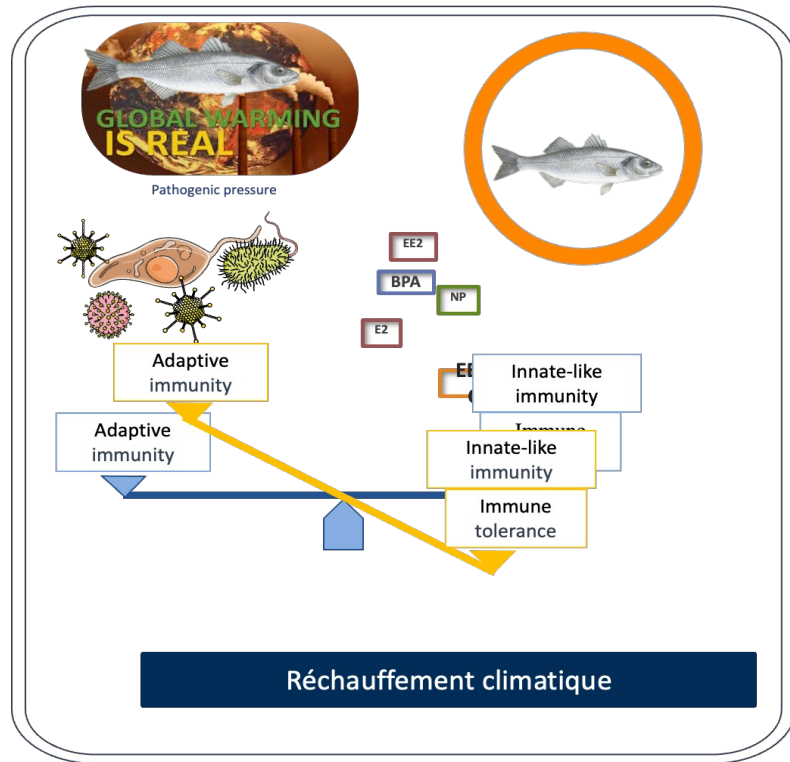
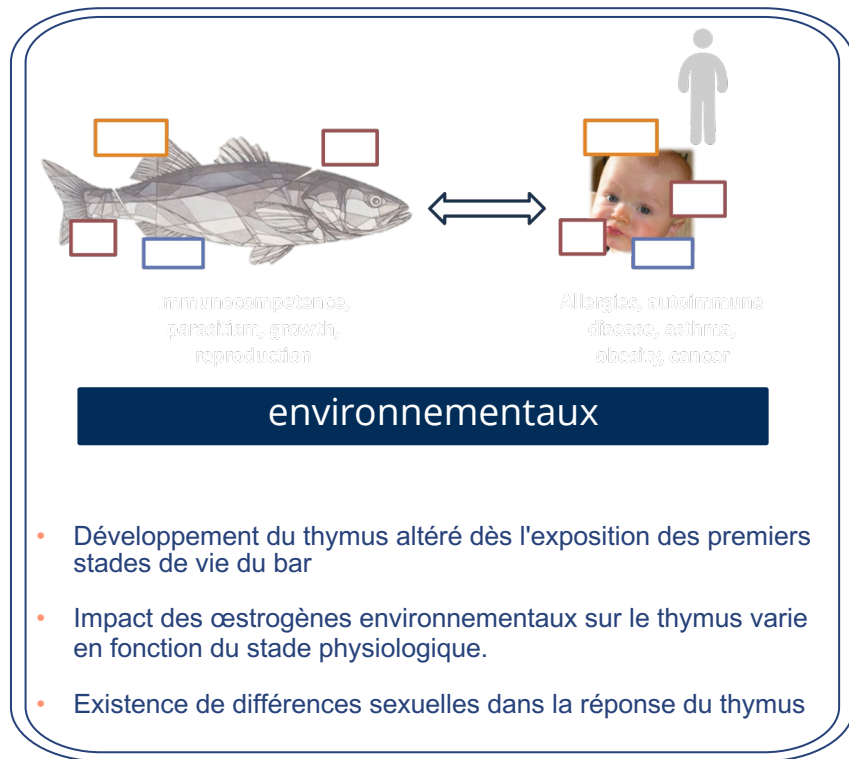
BIOLOGY

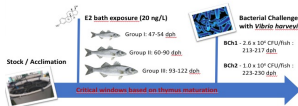
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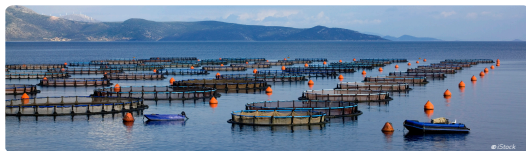
E2 affecte la régionalisation du thymus et la maturation des cellules T

CONCLUSION





+ EFFECT OF OESTROGEN ON THE IMMUNE SYSTEM OF SEA BASS



SUMMARY

This output evaluated the effects of oestrogen (E2) on the immune system of sea bass (*Dicentrarchus labrax*). It was found that oestrogens affect thymus plasticity and T cell maturation, particularly during immune system ontogenesis, therefore affecting the animals' immunocompetence and resistance to pathogens. Increasing our understanding of the impact of environmental contaminants on aquatic life lays the foundation for the enactment of stricter legislation to ensure safer aquatic environments for fish and humans.

KNOWLEDGE NEED

Endocrine Disrupting Chemicals (EDCs) can interfere with hormonal regulation in vertebrates and may disrupt their endocrine systems. A growing body of evidence indicates that many EDCs affect the immune systems of marine organisms, increasing their susceptibility to disease. Natural and synthetic oestrogens are among the most common EDCs. They are frequently found in surface waters, at disrupting concentrations, to which aquatic organisms are directly exposed. There is a clear need to gain further insight into the mechanisms of oestrogenic effects on aquatic animals, such as sea bass. Specifically, little is known about effects of exposure to exogenous oestrogens during immune system ontogenesis and how this affects later immunocompetence.



POTENTIAL IMPACT

- Results provide evidence for the need for improved water quality for aquaculture species, which could lead to strengthened legislation, better sewage treatment, and reduction of farm runoff
- A focus by the aquaculture industry on testing for and maintaining water quality which will lead to improved overall stock health, in turn improving the economic viability of fish farming for certain species or in certain areas.

EATIP - Strategic Research and Innovation Agenda (SRIA) Thematic Area 2: Knowledge and Systems, Goal 1. To see the full list and descriptions of the thematic areas and goals, please visit: eatip.eu/?page_id=45

AQUAEXCEL²⁰²⁰ INNOVATIVE OUTPUT CATALOGUE

WWW.AQUAEXCEL2020.EU
AQUAEXCEL2020

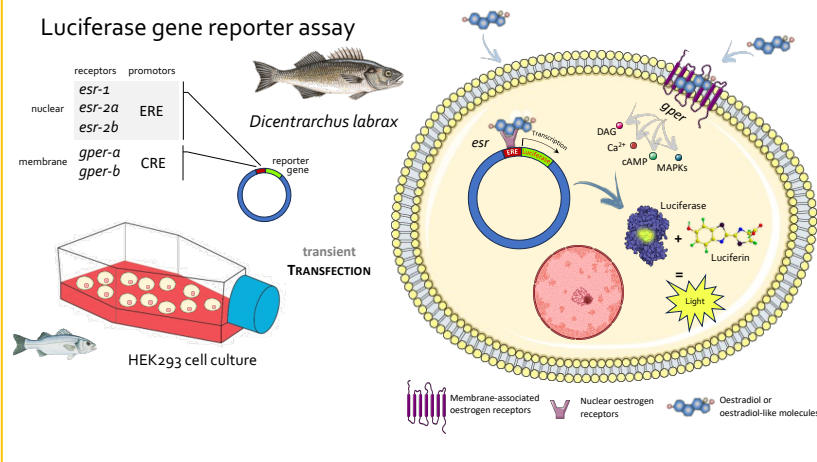
Aquaculture

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Outlook

Luciferase gene reporter assay



Test réglementaire œstrogénique

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Merci de votre attention!