



HAL
open science

Testicular organoids in teleost fish: current progress and perspectives

Nathalie Chenais, Rafael Henriquenobrega, Manon Thomas, Beatrice Porcon, Adèle Branthonne, Agnès Burel, Aurelien Dupont, Francis Gouttefangeas, Jean- Jacques Lareyre

► To cite this version:

Nathalie Chenais, Rafael Henriquenobrega, Manon Thomas, Beatrice Porcon, Adèle Branthonne, et al.. Testicular organoids in teleost fish: current progress and perspectives. 8. International Workshop on the Biology of Fish Gametes, Sep 2022, Gdansk, Poland. hal-03911854

HAL Id: hal-03911854

<https://hal.inrae.fr/hal-03911854v1>

Submitted on 23 Dec 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

TESTICULAR ORGANOIDS IN TELEOST FISH: CURRENT PROGRESS AND PERSPECTIVES

Nathalie CHENAIS¹, Rafael Henrique NOBREGA^{1,2}, Manon THOMAS¹, Beatrice PORCON¹, Adele BRANTHONNE¹, Agnès BUREL³, Aurelien DUPONT³, Francis GOUTTEFANGEAS⁴, Jean-Jacques LAREYRE¹

¹Laboratory of Fish Physiology and Genomics, INRAE, 35042 Rennes cedex, France, nathalie.chenais@inrae.fr; jean-jacques.lareyre@inrae.fr

²Reproductive and Molecular Biology Group, São Paulo State University, Botucatu, Brazil; rafael.nobrega@unesp.br

³Microscopy Rennes Imaging Center, 35000 Rennes cedex, France; agnes.burel@univ-rennes1.fr; aurelien.dupont@univ-rennes1.fr

⁴CMEBA, 35042 Rennes cedex, France; francis.gouttefangeas@univ-rennes1.fr

During the last decades, several strategies have been developed to study spermatogenesis *in vitro*. However, most of the existing methods were not able to reproduce the cellular interactions as similar as in the native testis. Recently, the establishment of a culture system based on scaffolds would provide a 3D microenvironment to support testis cells growth and development, facilitating the *de novo* testis organogenesis and functioning. This artificial system, named as organoid, would permit a more detailed investigation of physiological testicular functions, including the interactions between germline stem cells (GSCs) and somatic cells, as well as mechanisms involved in male infertility (disease, ecotoxicology). Moreover, for species or individual with high genetic value, organoids would also allow the amplification of GSCs for the conservation of genetic resources and the regeneration of the cohorts of interest. Considering this background and the lack of testicular organoids in teleost fish, the current study aimed to develop a scaffold-based testis culture system in fish. The first approach consisted in developing an endogenous hydrogelscaffold from decellularized extracellular matrix (dECM) of rainbow trout immature testes. The second approach aimed to test different commercially available hydrogels (natural and synthetic) for establishing fish testicular organoids. In the first part, we successfully obtained dECM from immature trout testes without affecting its natural composition and structure, as shown by histochemistry, immunofluorescence, and scanning or transmission electron microscopy. These data open future possibilities to develop testicular organoids using a natural/endogenous scaffold. With regards to the second strategy, we showed that zebrafish testicular cells were able to form cell clusters when encapsulated into commercial hydrogels (Vitrogel or Matrigel). The use of testicular cells from different reporter lines demonstrated that these clusters were not derived from partial cell dissociation but were rather formed from spontaneous reaggregation of previously dissociated cells. The cell clusters encapsulated into Matrigel presented a more regular and round shaped morphology as compared to Vitrogel. We also observed that cell clusters changed in morphology, cell density and some exhibited bud formation during the culture period (19 days). Future studies will be required to further characterize the structure of these cell clusters and improve the culture medium to promote cell growth and *de novo* testis organogenesis.

Keywords: teleost fish; testicular organoids; stem cell; germinal niche; biotechnology

Acknowledgements: Aquaexcel 3.0 (2020-2025) and FAPESP (20/03569-8).