

Distinct dynamics of muscle stem cells associated with the hyperplasia decline in trout

Sabrina Jagot, Nathalie Sabin, Candice Babarit, Jérôme Bugeon, Cécile

Ralliere, Karl Rouger, Jean-Charles Gabillard

▶ To cite this version:

Sabrina Jagot, Nathalie Sabin, Candice Babarit, Jérôme Bugeon, Cécile Ralliere, et al.. Distinct dynamics of muscle stem cells associated with the hyperplasia decline in trout. French Society for Stem Cell Research, Jan 2024, Paris, France. hal-04496483

HAL Id: hal-04496483 https://hal.science/hal-04496483

Submitted on 8 Mar 2024

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.



DISTINCT DYNAMICS OF MUSCLE STEM CELLS ASSOCIATED WITH THE HYPERPLASIA DECLINE IN TROUT

S. Jagot^{1,2}, N. Sabin¹, C. Babarit², J. Bugeon¹, C. Ralliere¹, K. Rouger², J-C. Gabillard¹

1: INRAE, UR1037 Laboratory of Fish Physiology and Genomics, Rennes, France; 2: Oniris, INRAE, PAnTher, Nantes, France



INTRODUCTION AND OBJECTIVES

Post-larval growth in salmonids results from intense muscle hyperplasia and hypertrophy^[1]. These processes are directly linked to the specific proliferation and differentiation behaviors of muscle stem cells, also known as satellite cells (SCs)[2].



Hyperplasia allows exponential muscle growth during the post-larval phase but declines during the juvenile stage to cease afterwards. Thus, a 200-fold increase of muscle fiber number is observed between the hatching embryo and a 4 kg salmon^[3]. Therefore, the intensity and duration of post-larval hyperplasic growth are crucial for the potential development of fish muscle mass.

While evidences for the existence of a diversity of SC subtypes are clear in mammals^[4], similar data on fish are still lacking. We aimed to elucidate the cellular and molecular

dynamics of SCs during the decline of muscle hyperplasia in trout.





3) Eight clusters belonging to myogenic lineage are identified at various stages between quiescent SCs to myocytes



Along with weight gain, the proportion of primitive cells increases while the most committed myogenic precursors into the differentiation program decreases



myod2 ed Cell Time Inferred Cell Tim Inf ads myod Inferred Cell Time Inferred Cell Tim Spliced reads CONCLUSIONS

We show that decline of hyperplasia is associated with a weight-related decrease of SC number in trout. We found that duplicated myod2 and myod genes provide molecular markers of myogenic cell lineage heterogeneity. Additionally, our results show the loss of generation of new committed myogenic precursors associated with the hyperplasia arrest, although the most primitive SCs are preserved, revealing a shift of the latter towards symmetrical division modalities. Importantly, our data reveal that these primitive SCs exist in 2 subtypes that differentially expressed pax7 paralogs and describe clearly distinct trajectories with the decline of hyperplasia. Overall, our findings underline specific behaviors in growth that suggest a modified founder cell/fusion competent myoblast model operates in fish

5) Differential transcriptional trajectories associated with weight determined by velocity analysis



- Two transcriptional trajectories towards differentiating cells exists, one of which disappears with weight concomitantly with the appearance of horizontal trajectories between primitive cells
- Driver genes and pathway enrichment analyses reveal an association between the Notch and Wnt pathways and their shifts in trajectory
 - REFERENCES ton, N. I. Bower, and D. J. tion of myotomal muscle , vol. 214, no. 10, pp. and D. J. Macqu mass in teleost fish,"
 1617–1628, 2011 dr 10.1242/jeb.038620. ston, "Mus ns for flesh
 - non-index of the second sec 99-115, 1999, doi: 10.1016/S0

sabrina.jagot@inrae.fr