



PRESS RELEASE

Geneva | October 17th, 2017

WARNING: embargoed until October 18th, 2017, 00:01am GMT

When teeth grow on the body

The body of some catfishes is completely covered with teeth, for defense and seduction purposes, imitating extinct species.

Today, certain species of catfish are covered with bony plates bristling with thin teeth, like some extinct vertebrate lineages. These teeth, which regularly fall out and then grow back, are used for defense and, in males, also to seduce the females. Researchers at the University of Geneva (UNIGE), Switzerland, wanted to understand how these teeth capable of regeneration can develop outside of the mouth. They discovered that the extra-oral teeth always grow on a bone, regardless of its type, even in the absence of a bony plate. This suggests a role for bone in the induction of dental tissue. These results, published in the journal *Proceedings of the Royal Society*, help to elucidate the mechanisms allowing the formation and regeneration of teeth in all vertebrates, including in humans.

The appearance of teeth in early jawed vertebrates allowed the emergence of super-predators capable of biting, grabbing and shredding their preys. In most current vertebrates, teeth develop only in the mouth. “There are, however, rare exceptions, animals that also display teeth on the body, as observed on certain fossil species. This is the case for so-called denticulate catfish, which have ‘reinvented’ a body dentition during evolution”, explains Juan Montoya-Burgos, Group Leader at the Department of Genetics and Evolution of the UNIGE Faculty of Science.

Examine genes to go back in time

The denticulate catfish don’t have scales. Many species possess an armor of bony plates coated with thin teeth - including pulp, enamel and dentin. These teeth, which are capable of regeneration, play a role in defense against predators, in relationships between individuals and can even lengthen in males during the reproductive season. “We tried to find out how these extra-oral teeth, called odontodes, have reappeared in the course of evolution and how they develop”, adds Carlos Rivera-Rivera, member of the Geneva group and first author of the study.

The researchers reconstructed the evolutionary history of catfish by comparing specific genes of the different denticulate families with those of other families lacking odontodes, and were thus able to go back in time. “Odontodes appeared around 120 million years ago in the denticulate catfish lineage, long before the emergence of bony plates. The latter do not therefore constitute a prerequisite to activate the development of the teeth present on the body”, says Juan Montoya-Burgos.

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Male denticulate catfish during the courtship period.

High definition pictures

Toothy fins

It was through the analysis of the different locations of odontodes that the scientists have discovered the following prerequisite: “In species without bony plates, these teeth always develop on a bony structure, of any type, for example on an ossified fin ray. Thus, the bone probably plays a key role in the induction of the dental tissue”, notes Carlos Rivera-Rivera.

What is this role? The researchers are now trying to decipher the molecular dialogue that takes place during the formation of the bone and that of the tooth to allow the latter to develop and then regenerate. It will also be possible to identify the genes linked to the development of odontodes by comparing gene expression in the denticulate and non-denticulate species. Understanding the processes involved in the development and regeneration of teeth in our ancestors and cousins is a first step in uncovering the mechanisms, both stimulatory and inhibitory, at work in all vertebrates.

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