Sarcomere disassembly during electrocyte regeneration in the adult fish *Sternopygus macrurus*

Chiann-Ling C. Yeh, Robert Güth, and Graciela A. Unguez  
New Mexico State University, Department of Biology

### Background

Sarcomeres are the key contractile units of skeletal muscle. The expression of sarcomeric proteins and their organization into functional units are essential for optimal skeletal muscle performance (Figure 1). To date, many studies have investigated the changes in the temporal and spatial expression of sarcomeric proteins and how they organize during development. In contrast, the process of sarcomere disassembly is less studied and remains largely unknown. Understanding sarcomere disassembly could greatly inform us of the processes that occur in genetic- and disease-induced muscle wasting states.

We set out to investigate the naturally-occurring disassembly of fully mature sarcomeres in a teleost vertebrate during the process of transdifferentiation of skeletal muscle fibers into non-contractile electrocytes, i.e., the electrogentic cells of the electric organ of the teleost *Sternopygus macrurus* – a developmental process that is recapitated during tail regeneration in the adult (Figure 2).

### Hypothesis

**Sarcomeres disassemble in an ordered step-by-step manner during electrocyte regeneration.**

### Experimental Approach

**Anatomy of 2-week regenerating tail**

**Immunolabeling Analysis**

**Ultrastructure Analysis**

**Region** | **Antibody** | **Antigen** |
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Z-band | EA53 | α-actinin |
I-band | Phalloidin | F-actin |
A-band | MF20 | Myosin heavy chain |
M-line | mMαC | Myomesin |

**Observed Sarcomeric Patterns**

- **Z-disk separation**
- **Missing M-line**
- **Missing A-band**
- **IZI-band formation**
- **I-band dissociation**

**Frequency of Sarcomeric Patterns in Each Region**

**Spatial Distribution of Sarcomeric Markers**

- **M-line:** Myomesin not visible
- **A-band:** MHC remains expressed
- **I-band:** Actin not visible in proximal
- **Z-disk:** α-actinin downregulated

**Conclusions**

Our data support the hypothesis that sarcomeres disassemble in an ordered step-by-step manner.

Though we observed this predominant pattern of sarcomere disassembly during electrocyte regeneration, we cannot exclude the possibility of other patterns of disassembly or the possibility that sarcomeres disassemble in a stepwise manner. However, our data so far strongly support the hypothesis.