

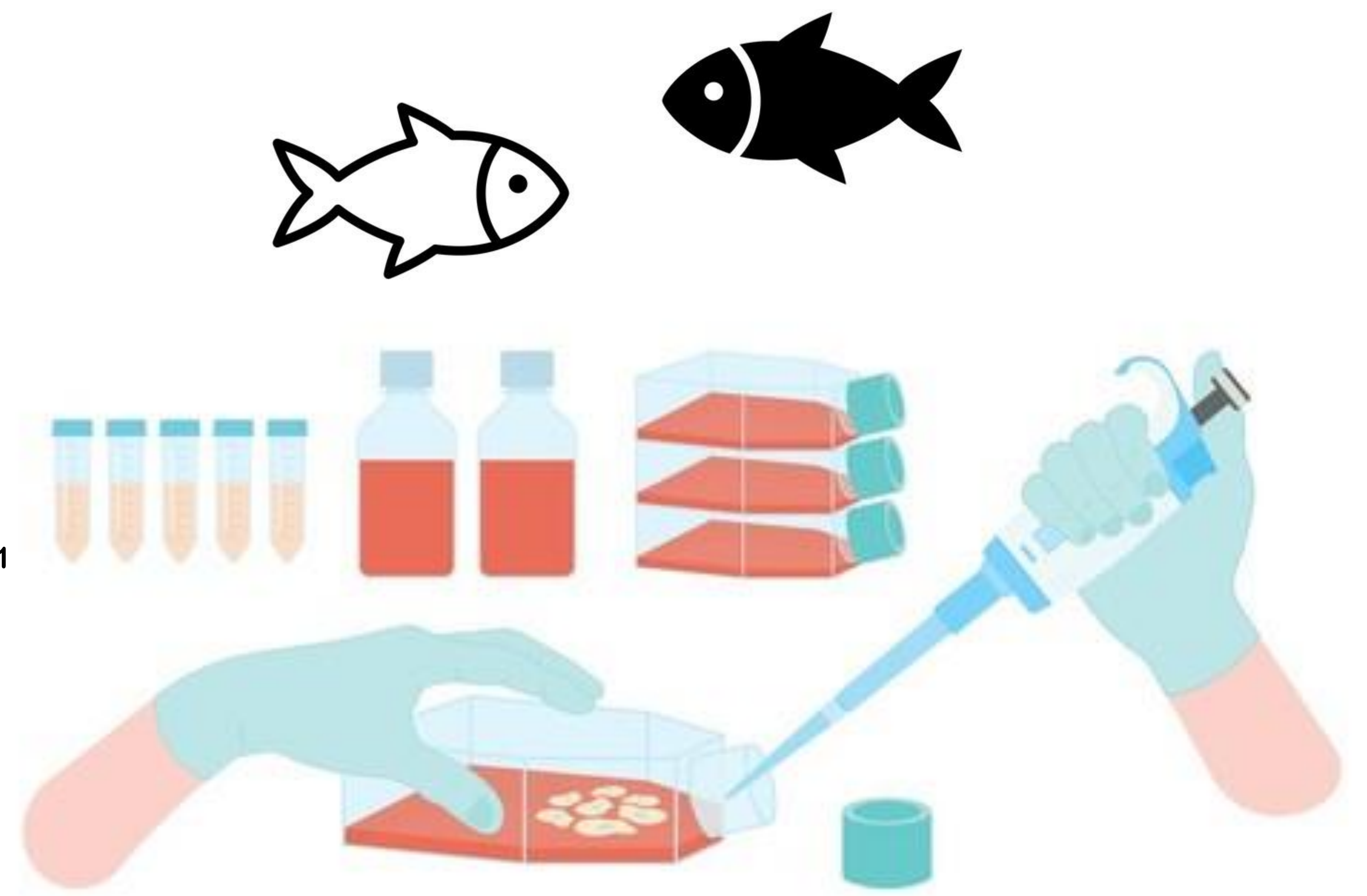
# Fish cell lines as tools for ecotoxicological applications and replacement of whole-organism models. Is it necessary to develop lines from Neo-tropical species?

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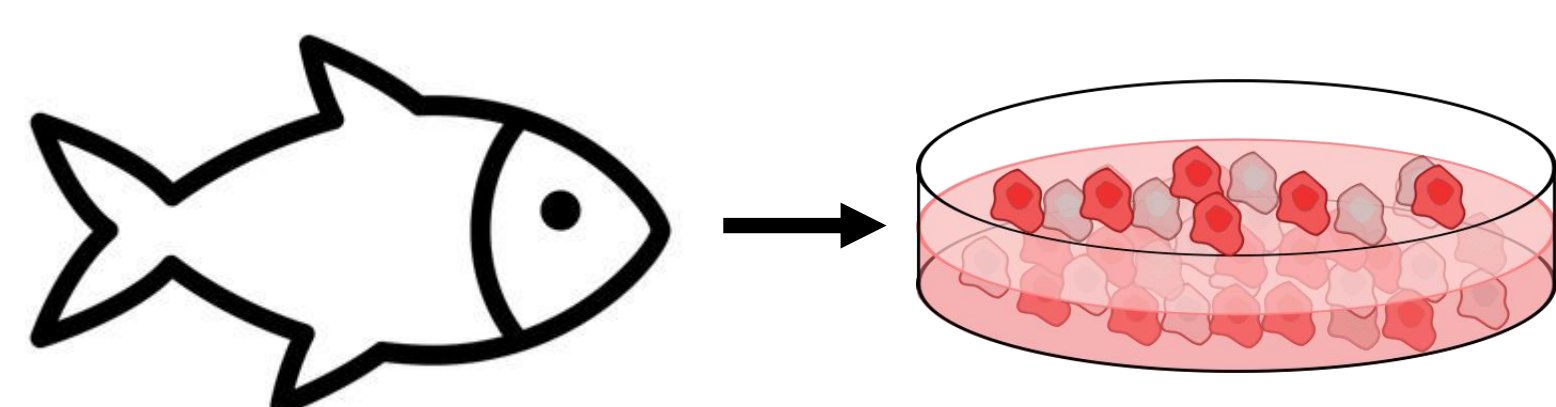


## Problem & scope

-Restrictions for experimentation on animals.



-Cell cultures as alternative to whole-animal experiments.

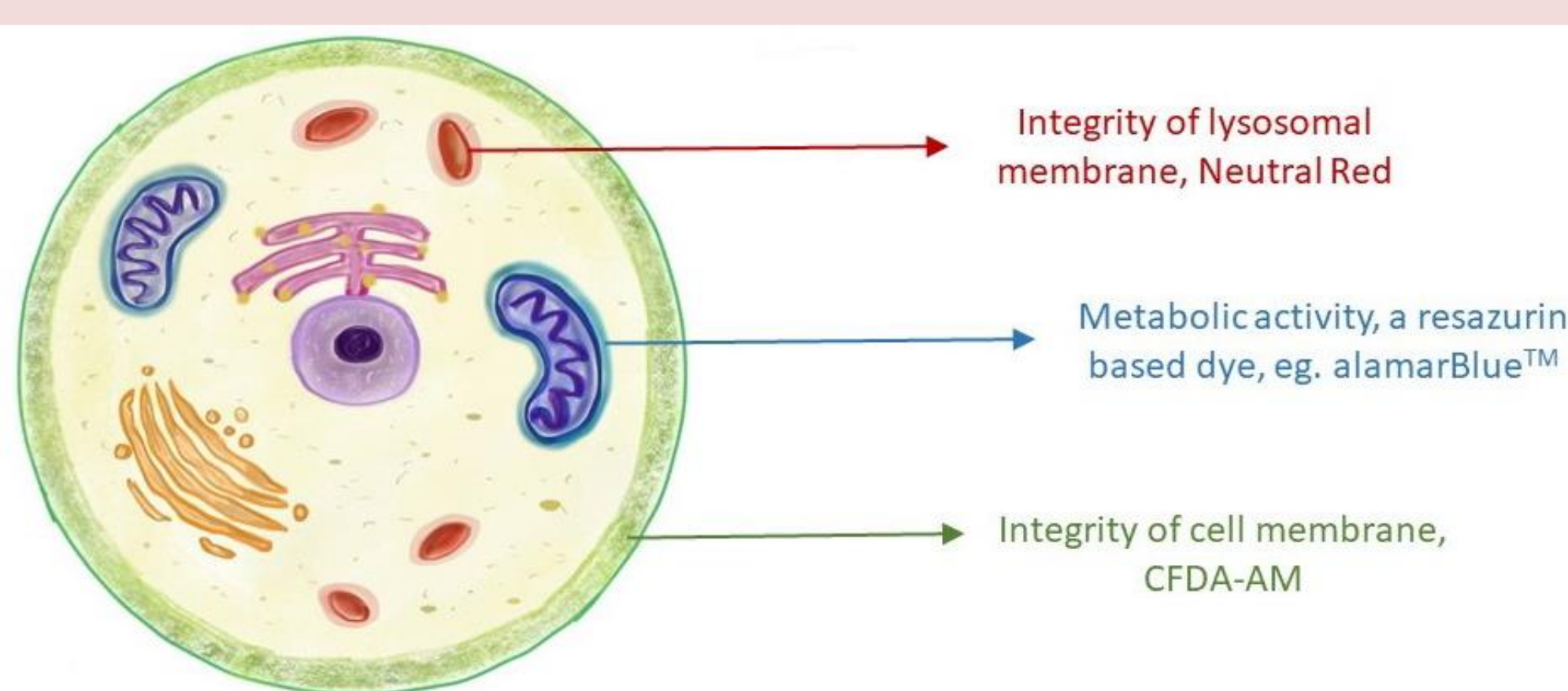


## Driving questions for review

- How have fish cell lines been developed and used in research?
- How have fish cell lines been used and incorporated into ecotoxicological studies?
- How have fish cell lines been used as models in toxicity testing and biomarker assessment?
- How necessary are cell culture models of local species?
- What is the contribution of fish cell culture models regarding the reduction and replacement of whole-animal assays (3R) and the scope of the One health approach?

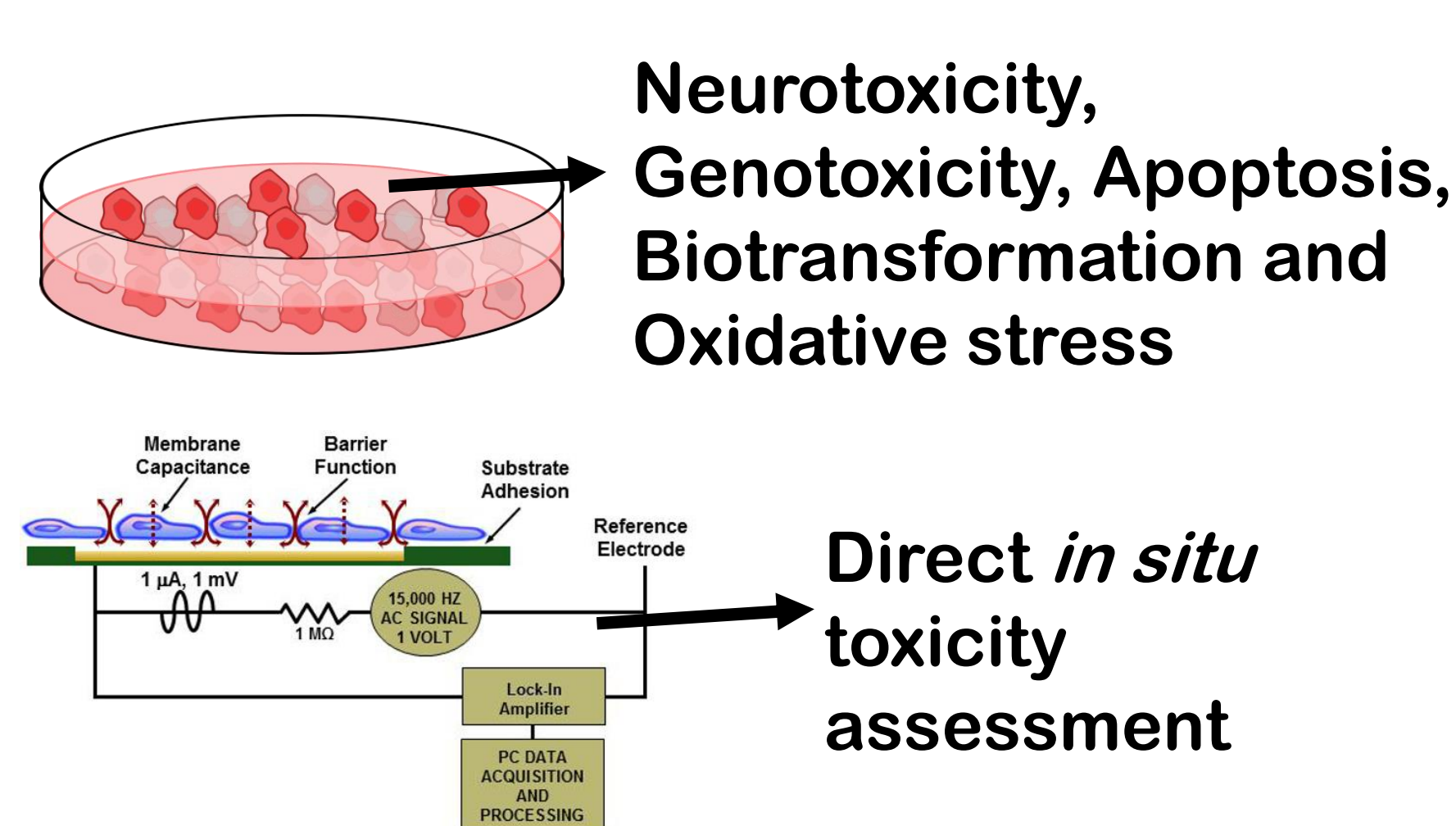
## Fish cell lines in Ecotoxicology

### Toxicity testing

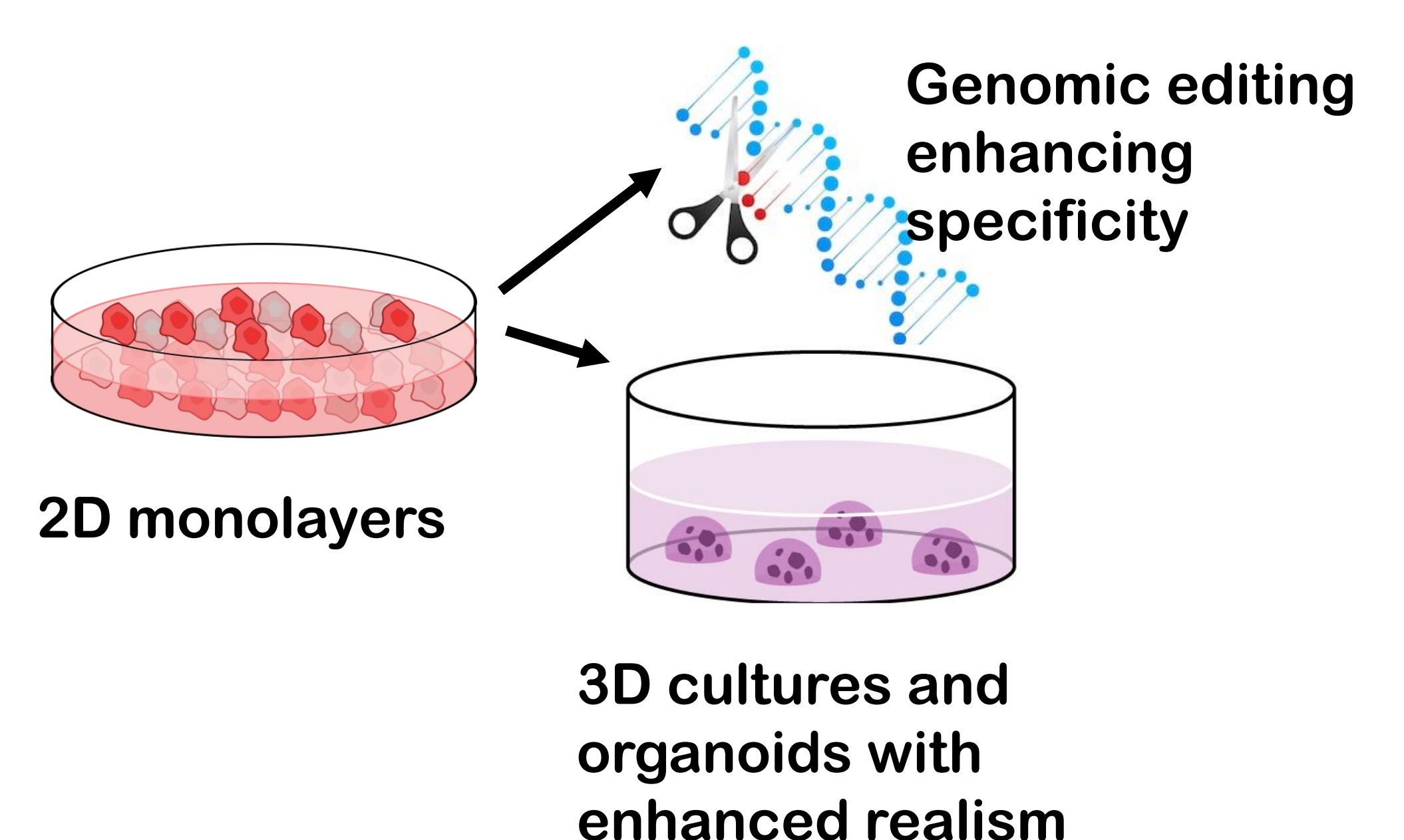


OECD method 249 - Cell viability of RTgill-W1

### Biomarkers and biosensors



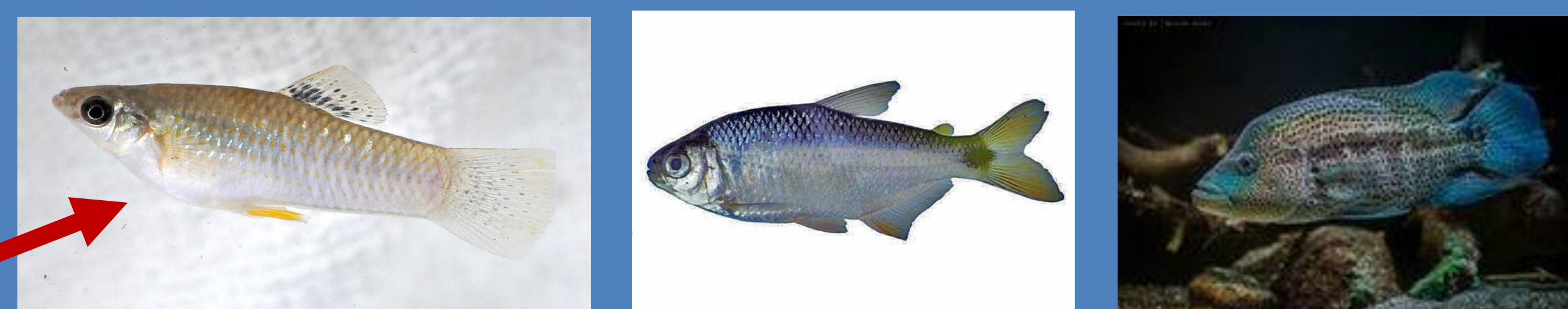
### Advances and perspectives



## Necessity of neo-tropical representatives

- Species-specific sensitivity
- Adaptation to specific ecosystems
- Different responses

### Candidate species representative of Costa Rican freshwater ecosystems



*Poecilia gillii*

*Astyanax aeneus*

*Parachromis dovii*

## Fish cell lines, 3R and One health



- Replacement of in vivo models
- Reduction of animal use
- Assessment of relevant health parameters
- Recognition of ecotox into one Health

## Conclusions:

•Cell cultures are adequate models to replace whole-animal assays in ecotoxicology and accomplish 3R and One health objectives.

•The access to culture techniques should promote the development of cell lines representative of local ecosystems, especially considering the species-specific sensitivity that transcend in vivo models.

•Ecotoxicology laboratories should undertake the effort of developing and applying cellular models, especially the more complex 3D models, to improve their assessment methods.

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## Key References:

- Alonso Aguirre et al. 2016. Environ. Toxicol. Chem. 10.1002/etc.3557.
- Brennan et al. 2016. J. Vis. Exp. 10.3791/53555.
- Bols et al. 2005. Biochemistry and Molecular Biology of Fishes. 10.1016/S1873-0140(05)80005-0.
- Csukovich et al. 2022. Animals. 10.3390/ani12182461.
- Lakra et al. 2011. Fish Physiol. Biochem. 10.1007/s10695-010-9411-x.
- OECD Guidelines for testing of chemicals. 2021. Test Guideline No. 249 Fish Cell Line Acute Toxicity: The RTgill-W1 cell line assay.
- Schirmer. 2006. Toxicology. 10.1016/j.tox.2006.04.042.

