Kurant Volodymyr Z et al., J Aquac Res Development 2015, 6:6
http://dx.doi.org/10.4172/2155-9546.S1.003

OMICS International
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International Conference on
Aquaculture & Fisheries
July 20-22, 2015 Brisbane, Australia

The evaluation of the metals toxicity in water using the lipid ratio

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Lipids and fatty acids perform important functions in cellular metabolism and play a significant role in biochemical adaptation of fish including toxins of ecosystems. These lipids are not only sources of energy in the body but are essential structural components of cell membranes. The changes in lipid composition of cell tissues of some fish can be used as a specific indicator of metal ions toxicity present in the aquatic environment. For these purposes we proposed "Method of evaluation of the toxicity of the water using the lipid ratio" which is calculated by the following ratio:

$$K = \frac{\text{Phosphatidylethanolamine} + \text{Lysophosphatidylcholine} + \text{Free fatty acids}}{\text{Phosphatidylcholine} + \text{Sphingomyelin} + \text{Triglyceride} + \text{Cholesterol}}$$

The numerator of the formula is the sum of lipid parameters causing violations in the structure of cell membranes and increases its permeability. This is because the lysophosphatidyl choline and free fatty acids have detergent properties and accumulation phosphatidyl ethanolamine with decreasing of phosphatidyl choline content damages the lipid bilayer structure. In the denominator there are indicators of lipid content contributing to the maintenance of the functional structure of the membrane in normal state, its condensation, reducing permeability to metal ions and protection from the pathological action of ROS and lysosomal lipases. The increase in the coefficient compared with control values indicates the formation of an adaptive response of cells through the cell membrane condensation and reduce its permeability. Instead, the reducing of its value indicates the pathological state of membranes due to changes in the structure of the lipid bilayer and lipid accumulation with detergent properties.

Biography

Kurant Volodymyr Z is currently working in Ternopil National Pedagogical University, Ukraine.

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