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Possibility of disease control by ambient dissolved oxygen level

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Aquaculture has continuously contained a potential risk of hypoxia. Because of this background, many studies on respiration and circulatory function of fish at hypoxic environment have been reported to date. Hypoxia influences the mortality of yellow tail infected with *Enterococcus seriolicida*. These findings suggest that exposing fish to hypoxia around the minimum requirement of environmental oxygen for long term may lead to a decrease in disease resistance in fish farming. Although studies on respiration and circulatory function at environmental oxygen below minimum requirement on fish have been reported, the immunological effect of environmental oxygen around the minimum requirement is unclear. Here, we examined the *in vitro* functions of rainbow trout (*Oncorhynchus mykiss*) leukocytes at environmental oxygen around the minimum requirement. Reactive oxygen generation and antibacterial activity of leukocyte cultured in low dissolved oxygen medium were decreased. The partial pressure of venous oxygen (PvO₂) of fish was decreased during hypoxia but it was quickly recovered by increasing of dissolved oxygen in environmental water. Furthermore, the mortality due to the experimental challenge with *Vibrio anguillarum* was reduced by expanding the ambient dissolved oxygen level. These results suggest that hypoxia around the minimum requirement of environmental oxygen adversely affects the functions of fish leukocytes. Our results also suggest that artificially increasing the PvO₂ can prevent fish from bacterial infectious diseases in aquaculture.

Biography

Masashi Maita is involved in research in fish physiology and pharmacology. He began to work at Tokyo University of Fisheries in 1991. There, he obtained his PhD in 1997 for the Diagnostic Study of Clinical Biochemistry in Aquaculture Fish. He was promoted to Professor at Tokyo University of Marine Science and Technology in 2008. He has been involved in studies on fish health management, risk management of aquaculture products due to harmful chemicals and risk assessment of chemicals in fish.

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