Abstract

Evaluating Repetitive Mucus Extraction Effects on Mucus Biomarkers, Mucus Cells and Skin-Barrier Status in a Marine Fish Model †

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Abstract: Among all the mucosal barriers, the skin and its surrounding mucus are possibly the main defensive tools used by fish against the environment. Due to its less-invasive extraction, the study of its production and functions has gained high interest in the last years. However, there are still many gaps in research, such as the possible alteration of mucus composition or the skin integrity resulting from the sampling process. In the current study, skin mucus extraction impacts were determined by comparing the effects of one-single extraction (SEG; single extraction group) and three successive extractions (REG; repetitive extractions group, separated by 4 days) on mucus properties and on skin epithelial integrity. In terms of analytical evaluation, plasma biomarkers and plasma antibacterial capacity were also determined. With regard skin histology and skin barrier properties, both SEG and REG did not evidence differences with respect to intact skin (ØEG). Interestingly, the repetitive mucus extraction protocol seemed to activate skin mucus turnover, significantly increasing the number of low-size mucus cells (cell area < 100 µm²) and reducing the number of high-size mucus cells (cell area > 150 µm²). Repetitive extraction of skin mucus diminished the amounts of soluble protein and glucose in mucus with regard to one-single extraction and increased cortisol exudation. These metabolites remained unaltered in plasma, indicating the different response among both sampling targets. Despite mucus biomarkers modification, the antibacterial capacity against the pathogenic bacterial (P. anguilliseptica and V. anguillarum) was maintained in both plasma and mucus irrespective of the number of mucus extractions. Overall, the mucus sampling protocol scarcely affected skin integrity and mucus antibacterial properties and only modified metabolites exudation, evidencing a feasible and minimally invasive method for studying fish health and welfare as an alternative or as a complement to plasma. The knowledge provided here highlighted that this methodology is putatively transferable to farm culture conditions and showed that it is very useful for the study of threatened species aimed at preserving fish welfare.

Keywords: skin mucus; mucus barrier; biomarkers; antibacterial activity

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