

# COMPARISON OF ANTIMICROBIAL PROPERTIES IN THE EPIDERMAL MUCUS EXTRACTS OF DIFFERENT FRESHWATER FISH SPECIES

## ABSTRACT

Mucus covers the epidermal surface of fish as the first line of defense against invading pathogens. The exploration of the antimicrobial properties of fish mucus is limited and scarcely reported in a few marine and freshwater fish species. To date, no studies have shown the antimicrobial properties of fish mucus in Malaysian freshwater fish species such as African catfish (*Clarias gariepinus*), giant snakehead fish (*Channa micropeltes*), striped snakehead (*Channa striatus*), marble goby (*Oxyeleotris marmorata*), tilapia (*Oreochromis niloticus*), and bagrid catfish (*Mystus nemurus*). In this study, a series of extraction solvents (acidic, organic and aqueous) were utilized to screen for antimicrobial activity of the epidermal mucus for the above stated freshwater fish species. Preliminary screening of the mucus extracts against a control strain of *Escherichia coli* showed significant variation in antimicrobial activity among the fish species examined. Only acidic mucus extracts of African catfish, marble goby, tilapia and bagrid catfish exhibited bactericidal activity. No detectable antibacterial activity was noted in the crude and organic mucus extracts of all the fish species. The minimum bactericidal concentration (MBC) for acidic mucus extract of African catfish, marble goby, tilapia and bagrid catfish against a fish pathogen and nine human pathogens were determined. Acidic mucus extracts of marble goby (*O. marmorata*) and African catfish (*C.gariepinus*) have showed the lowest MBC values of 2.51 and 4.28 µg/ml, respectively. Acidic mucus extracts of African catfish (*C.gariepinus*) contained 3.4 times higher protein content than that for marble goby and the former species is commonly cultured and more economically important food fish in Malaysia. For these reasons African catfish mucus was chosen for further study to explore the antimicrobial

properties. The results revealed two distinct bands which inhibited the growth of the tested microorganisms. These two distinct bands of approximately 14.47 kDa (band 1) and 10.33 kDa (band 2) in 16% tricine SDS-PAGE of acidic extract of African catfish inhibiting antimicrobial activity. The two protein bands were excised and subjected to mass spectrometry (sequencing by LC MS/MS) with automatic database analysis. The LC/MS/MS analysis of protein bands 1 and 2 showed a close match to histone H2A of northern pike (*Esox lucius*) and histone H2B of zebrafish (*Danio rerio*), respectively. The observation of antimicrobial activity in the African catfish acidic extract suggests that it plays a significant role in the innate immune function against infectious pathogens and could be a potential source of novel antimicrobial agents for improved fish and human health related management.