

Functional and structural study of the apoptosis associated protein Betanodavirus B1 which modulate cell cycle G1/S stage in fish.

Pei-Ju Lin(林沛儒)¹, Tzu-Yu Liu(劉子榆)², and Chun-Jung Chen(陳俊榮)^{3*}

¹Institute of Bioinformatics and Structural Biology. National Tsing Hua University

²Department of Chemistry. National Tsing Hua University

³National Synchrotron Radiation Research Center, 101 Hsin-Ann Road, Hsinchu Science Park, Hsinchu, Taiwan.

s104080828@gmail.com

Abstract

Betanodaviruses belong to the Betanovirus class, cause fish viral nervous necrosis(VNN) diseases, such as necrosis central nervous system (hollow brain and retina), darkening body, tissue disease, organs disease, bending body, abnormal swimming and finally cause fish die.

VNN can via mother fish vertical infection to egg, and happen after eggs breed to fries, the death rate high to 90%, also can infect the other fish then be carrier to infect more fish. Also can via brine shrimp infect fish by feeding.

In Taiwan, Aquaculture develops well, Grouper is one of the high economic value fish. But it's easy to spread disease in aquaculture because the small fish farm, poor drainage and high culture density. If Grouper infect VNN, after breed the fish usually die in 40 days, and survive rate only 10%.

Nervous necrosis virus belongs betanodavirus and contain four gene types, (1) striped jack (SJNNV), (2) tiger puffer (TPNNV), (3) barfin flounder (BFNNV) and (4) red-spotted grouper(RGNNV). Taiwan Grouper belongs RGNNV.

Nodavirus have two virus genomes, RNA1 and RNA2. RNA1 (3.1kb) encodes protein A, a RNA-dependent RNA polymerase. RNA2 (1.4kb) encodes structural protein (capsid and envelope). Nodavirus have a sub-genome RNA3, from 3' terminus of RNA1 then encodes B1 protein (Betanodavirus B1, 111 amino acid) and B2 protein (75 amino acid).

Cell apoptosis and necrosis are major factors cause eukaryote cells death. According the RGNNV studies, the grouper fish infect RGNNV will cause cell hollowed and necrosis. B1 protein will improve p53 expression and inhibit Mdm2 produce, and the domain C (63-70 a.a) of B1 protein relate to G1/S stage in cell cycle. And we want to determine the structure and function residue of B1 protein.

Keywords: RGNNV, Betanodavirus, B1 protein, Grouper.