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Improving antiviral capacity in silkworm by transgenic technology

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Bombyx mori is an important economic insect for silk. Sericulture is one of the principal sources of income for farmers in many rural areas in China, India, Brazil, and so on. However, silkworm diseases cause serious losses of almost 20% of the cocoons each year. B. mori nucleopolyhedrovirus (BmNPV) is the primary pathogen in sericulture. So far, no effective strategy exists for controlling the virus.

Breeding resistant strains is an approach for disease control. Transgenic technology is an available tool for species improvement. In our previous studies, four antiviral strategies were established to inhibit BmNPV in transgenic silkworms according to the viral infection process. (1) Overexpression of endogenous antiviral gene Bmlipase-1 in transgenic silkworms to suppress BmNPV at initial infection stage. (2) Inhibition of BmNPV mRNA in transgenic silkworms targeting viral genes by RNAi. (3) Suppression of BmNPV protein synthesis by overexpression of exogenous gene hycu-ep32 in transgenic silkworms. (4) Regulation of host immunity pathway in transgenic silkworms to inhibit BmNPV proliferation. The four antiviral strategies can significantly enhance the resistance of transgenic silkworms, of which the mortality was decreased about 30% after BmNPV infection compared with non-transgenic control. We also confirmed that

overexpression of antiviral genes combined with silence of viral genes can further enhance the resistance of transgenic silkworms. In attempt to create a transgenic silkworm with high resistance to BmNPV, we are integrating the former four antiviral strategies in a same vector to create transgenic silkworm, which would suppress BmNPV at initial infection and affects virus mRNA, viral protein synthesis, and host immunity.

Virus infection is a serious threat to plants, animals, and humans, so antiviral researches occur worldwide, we use the lepidopteran model B. mori for antiviral studies. Studies of anti-BmNPV strategies that target multiple stages of viral infection could pave the way for antiviral studies in other organisms, and use of transgenic silkworms with strong antiviral capacity to decrease silkworm larvae mortality would provide new strains for sericulture.

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