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Novel nanoparticle based vaccine against respiratory virus

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Infectious bronchitis virus (IBV) affects poultry respiratory, renal and reproductive systems. Currently, the efficacy of available live attenuated or killed vaccines against IBV is been challenged. We designed a novel IBV vaccine alternative using a highly innovative platform called self-assembling protein nanoparticle (SAPN). In this vaccine, B cell epitopes derived from the second heptad repeat (HR2) region of IBV spike proteins repetitively presented in its native trimeric conformation. In addition, flagellin was co-displayed in the SAPN to achieve a self-adjuvanted effect. Three groups of chickens were immunized at four weeks of age with the vaccine prototype, IBV-Flagellin-SAPN, a negative-control construct Flagellin-SAPN or a buffer control. The immunized chickens were challenged with $5 \times 10^{4.7}$ EID50 IBV M41 strain. High antibody responses were detected in chickens immunized with IBV-Flagellin-SAPN. In ex vivo proliferation tests, peripheral mononuclear cells (PBMCs) derived from IBV-Flagellin-SAPN immunized chickens had a significantly higher stimulation index than that of PBMCs from chickens receiving Flagellin-SAPN. Chickens immunized with IBV-Flagellin-SAPN had a significant reduction of tracheal virus shedding and lesser tracheal lesion scores than did negative control chickens. The data demonstrated that the IBV-Flagellin-SAPN holds promise as a vaccine for IBV.

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