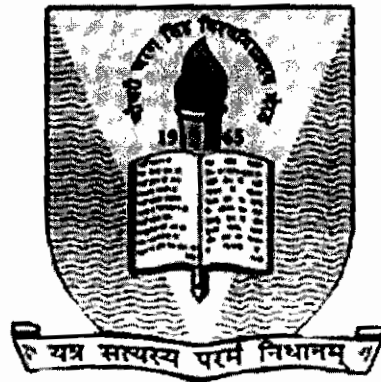


**DEVELOPMENT OF NANOPARTICLE BASED VACCINE
AGAINST NEWCASTLE DISEASE**



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Ph.D Thesis

Submitted to carry out the research work

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SUMMARY

In developing countries such as India, the poultry industry plays a major role in fulfilling the increasing demand for animal protein for human consumption. Newcastle disease (ND) caused by Newcastle disease virus (NDV) is an infectious poultry ailment that causes an enormous economic misfortune by prompting high death rate, and reduced egg production. Though, live NDV vaccines are administered to achieve effective prophylactic measurements but could not fulfill all the requirements to improve the infectivity and productivity of the poultry industry. In the present study by utilizing the nanotechnology approach an attempt has been made to enhance both animal health and immunity. The study aims to prepare and characterize copper oxide nanoparticles (CuONPs) utilizing green chemistry principles and using it as an adjuvant with live NDV vaccines to evaluate its immunogenicity in pre-challenged and post-challenged white leghorn chicks. CuO nanorods of average particle size of 61 nm were prepared from aqueous fruit extract of *Momordica charantia* and conjugated with a live NDV vaccine. The entrapment efficiency of NDV-CuONPs was evaluated following the standard Biuret method and was found to be about 67.24%. Further, immunogenicity and protection level were evaluated against R2B NDV strain in 2-week old chicks after intramuscular immunization. On vaccination, few chicks get lethargic but after 2-3 days they get recovered. After 21 days of vaccination trail, 5 chicks from each group were exposed to the virus. It was observed that unvaccinated chicks (Group-A) developed typical clinical signs and symptoms of NDV on 2nd day of virus exposure characterized by paralysis, open mouth breathing and weakness. All chicks that develop clinical signs and symptoms of the disease did not get well and died within 6 days of virus exposure. It was observed that before vaccination, the HI antibody titer was almost 0.47 ± 0.14 in all chicks. This suggests that the maternal antibody level for NDV was below 2^3 . Besides, it was observed that the HI antibody titer gradually increases from 1st week to 3rd week of vaccination in groups B and C but remained almost the same in control group A. Moreover, the HI titer was found to be 5.04 ± 2.3 , slightly higher in group C when compared with group B where it was found to be 4.5 ± 2.13 . In pre-challenged animals, it was observed that the total RBCs count and total WBCs count increase while hemoglobin concentration, hematocrit value and RBC indexes decrease in both Group B and Group C when compared with control. Moreover, ESR increases in group B but slightly decreases in group C when compared to control. Besides, after 14 days of virus exposure in the control group A all animals get killed due to viral infection. However, it was observed that virus challenge increases total WBCs



Dr. Damer

count and ESR in both group B and C. Beside, hemoglobin concentration, hematocrit value, MCV and MCH decrease in both Group B and C. Also, RBCs count increase in group C but remained same in group B when compared with control. Similarly, MCHC increases in group B but slightly decrease in group C. Biochemical parameters were analyzed after 21 days of vaccination. It was observed that blood glucose, total serum proteins, uric acid, serum acid phosphatase, ALT and AST get elevated in vaccinated animals when compared with control. However, cholesterol level increases in group B but decreases in group C when compared to control. Meanwhile, creatinine and serum alkaline phosphatase levels decrease in group B but increases in group C when compared to control. A significant alteration in biochemical parameters was observed in both Group B and C animals when compared to control. However, in post-challenged animals, it was observed that blood glucose, total serum proteins, cholesterol, uric acid, creatinine, serum acid phosphatase and AST levels get elevated while serum alkaline phosphatase and ALT levels decline in vaccinated animals when compared with control. Thus, a significant alteration in immunological, hematological and biochemical parameters was observed in both Group B and C animals when compared to control. Among different groups of vaccination trials, the survival rate is higher in CuONP based nanovaccine with slightly higher HI titer when compared to control and standard live vaccine. It's concluded that the novel vaccine prepared would find a future platform to improve the infectivity and productivity of the poultry industry.



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