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2 Citations

Abstract

Formulation of nano-encapsulated vaccine tablet is a novel technique for the delivery of Newcastle disease (ND) vaccine to village chickens. Vaccine tablets were prepared using gelatin, trehalose and casein as thermostabilisers and binders, respectively, and each vaccine tablet contained a nominal oral dose of Newcastle disease virus (NDV) strain I-2 for a single chicken. These ND vaccine tablets maintained a titre of $10^{8.5}$ EID_{50}/0.1 mL for 90 days at ambient room temperatures (25–34°C). When these vaccine tablets were given to village chickens, a single oral administration of the vaccine produced protective antibody response ($\geq$3.0 log_2) against challenge with virulent NDV. The findings from the present study showed that, if the vaccine tablet formulation technique is optimised, it will allow the delivery of the ND vaccine without depending on cold chains to rural areas in tropical countries.

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ORIGINAL RESEARCH

Formulation of novel nano-encapsulated Newcastle disease vaccine tablets for vaccination of village chickens

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Abstract Formulation of nano-encapsulated vaccine tablet is a novel technique for the delivery of Newcastle disease (ND) vaccine to village chickens. Vaccine tablets were prepared using gelatin, trehalose and casein as thermo-stabilisers and binders, respectively, and each vaccine tablet contained a nominal oral dose of Newcastle disease virus (NDV) strain I-2 for a single chicken. These ND vaccine tablets maintained a titre of $10^{8.5}$ EID_{50}/0.1 mL for 90 days at ambient room temperatures (25–34°C). When these vaccine tablets were given to village chickens, a single oral administration of the vaccine produced protective antibody response (≥3.0 log_2) against challenge with virulent NDV. The findings from the present study showed that, if the vaccine tablet formulation technique is optimised, it will allow the delivery of the ND vaccine without depending on cold chains to rural areas in tropical countries.

Keywords Chickens · Nano-encapsulation · Newcastle disease · Strain I-2 · Vaccine tablets

Abbreviations

EID_{50}	Median embryo infectious dose
HI	Haemagglutination inhibition
NDV	Newcastle disease virus
PBS	Phosphate-buffered saline

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Introduction

Vaccines constitute one of the most cost effective preventive measures against illness and death from infectious diseases. Moreover, advances in molecular biology and biotechnological techniques are generating novel vaccines against infections that were previously unpreventable and are improving the existing vaccines (Levine 2003).

Newcastle disease (ND) is one of the most important diseases which limit the development of village chicken industry in most developing countries (Spradbrow 1993/1994). ND may also pose a threat to commercial chickens in developed countries if allowed to enter the flocks where the disease can cause high mortality rate up to 100% in susceptible non-vaccinated chickens (Alexander 1997).

Vaccination is one of the most effective control methods against ND (Meulemans 1988). This method has been successfully used to control ND in commercial chickens. However, the nature of village chickens husbandry (scattered, near feral and multi-age flocks) had made it difficult to control this disease from chickens. Novel delivery techniques of ND to village chickens are required (Lloyd 2000).

Conventional ND vaccines have many characteristics which pose logistical problems for vaccination of village chickens in developing countries (Spradbrow and Copland 1996). Most of these vaccines require refrigeration. Biodegradable bioadherent nano-encapsulated tablet vaccines could eliminate many of these problems. Moreover, nano-encapsulated vaccine tablets offer the promise of extended antigen presentation.

Casein makes up to 80% of protein content of milk which is found naturally in the form of spherical micelles with diameters ranging from 50 to 500 nm (Daniells 2006). The formation of stable nano-sized micelle naturally encapsulates (self-assembly) heat-sensitive materials (Daniells 2006). This

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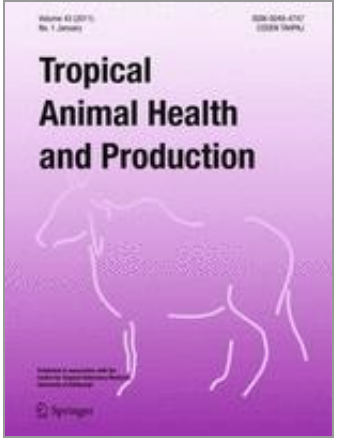

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