UNIVERSITI PUTRA MALAYSIA

# VACCINATION OF VILLAGE CHICKENS AGAINST NEWCASTLE DISEASE

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# VACCINATION OF VILLAGE CHICKENS AGAINST NEWCASTLE DISEASE

by

AINI IDERIS

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Requirements for the Degree of Doctor of Philosophy
in the Faculty of Veterinary Medicine
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DEDICATED TO MY HUSBAND,

OUR FOUR SONS AND OUR PARENTS

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| | | |
|---|---|---|
| ACD | - | acid citrate dextrose |
| ACIAR | - | Australian Centre for International Agricultural Research |
| $^{o}C$ | - | degrees centrigrade |
| EID | - | embryo infective dose |
| ELD | - | embryo lethal dose |
| g | - | grams |
| G | - | centrifugal force |
| GMT | - | geometric mean titre |
| HA | - | Haemagglutination |
| HBSS | - | Hank's Balanced Salt Solution |
| HI | - | Haemagglutination inhibition |
| i/c | - | in-contact |
| i.e. | - | that is |
| i/m | - | intramuscular |
| i/n | - | intranasal |
| k | - | rate constant |
| kg | - | kilogram |
| ml | - | millilitre |
| M$ | - | Malaysian ringgit |
| ND | - | Newcastle disease |
| NDV | - | Newcastle disease virus |
| PBS | - | phosphate buffered saline |

| | | |
|---|---|---|
| pH | - | puissance hydrogene (hydrogen-ion concentration) |
| P$ | - | Philippines pesos |
| psi | - | pound per square inch |
| PVP | - | polyvinyl-pyrrolidoine |
| SEA | - | South East Asia |
| rpm | - | revolution per minute |
| S$ | - | Singapore dollars |
| SPF | - | specific pathogen free |
| sq. cm | - | square centimetre |
| sq. m | - | square metre |
| u | - | micron |
| ug | - | microgram |
| UPM | - | Universiti Pertanian Malaysia |
| US$ | - | American dollars |
| VVNDV | - | velogenic viscerotropic Newcastle Disease virus |

Abstract of the thesis presented to the Senate of Universiti Pertanian Malaysia in partial fulfilment of the requirements for the Degree of Doctor of Philosophy.

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**JUNE, 1989**

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Faculty : Veterinary Medicine and Animal Science

The village poultry is an important component of the poultry industry in South East Asia. However, Newcastle disease is always a threat to them. While the disease is usually adequately controlled by repeated applications of suitable vaccines in commercial poultry, it has not been successfully controlled in village chickens. A new method of vaccine production and administration for the village chickens needs to be developed. The objective of this study was to select an avirulent Newcastle disease virus which is immunogenic, heat resistant and transmissible among chickens and to incorporate the virus in feed that can be offered to chickens.

The vaccine was prepared by coating an immunogenic and heat tolerant substrain of V4 virus onto food pellets. A nominal chicken dose of vaccine was 10 g of pellets containing $10^6$ 50% egg infectious doses of vaccine virus. Studies on

laboratory chickens showed that two doses of vaccine were required to induce immunity and protection against virulent Newcastle disease virus. A similar vaccine regime has been applied to village chickens kept under simulated village conditions. They were substantially resistant to challenge while unvaccinated control chickens, were fully susceptible. Trials were then undertaken in 21 villages, which were supplied with food pellet vaccine about once each month. The efficacy of the vaccine was monitored by observing the natural incidence of Newcastle disease and by buying vaccinated chickens for artificial challenge. Some 60% of village chickens resisted artificial challenge and outbreaks of Newcastle disease were not recorded in the villages during the two year observation period. The oral vaccine has also been proved as an effective booster vaccine for commercial poultry under smallholder conditions.

This study has established that a heat resistant Newcastle disease virus incorporated in feed pellets provides a method of vaccinating village chickens against Newcastle disease in tropical countries. This is the first report of such a vaccine being used in village chickens in Malaysia and probably in Asia. The breakthrough of delivering the vaccine in food has stimulated interest in other South East Asian countries to develop a similar vaccination procedures for trials in village chickens.

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**PEMVAKSINAN TERHADAP PENYAKIT NEWCASTLE BAGI AYAM KAMPUNG**

Oleh

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**JUN, 1989**

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Ayam kampung adalah satu komponen penting dalam industri ayam di Asia Tenggara. Walau bagaimanapun, ayam-ayam ini selalu menghadapi bahaya penyakit Newcastle (penyakit sampar). Penyakit ini selalunya dapat dikawal dengan baik bagi ayam komersial, iaitu dengan pemberian vaksin yang sesuai secara berulang kali, tetapi bagi ayam kampung cara yang lazim ini tidak berjaya mengawal penyakit tersebut. Satu cara baru bagi pengeluaran dan pemberian vaksin untuk ayam kampung harus diusahakan. Objektif kajian ini adalah untuk memilih virus penyakit sampar yang tidak virulen, tetapi bersifat imunogen, tahan haba dan dapat berpindah antara ayam serta dapat dicampurkan dalam makanan yang boleh diberikan pada ayam.

Vaksin ini disediakan dengan cara menyalut gentir makanan dengan substrain virus V4 yang imunogen dan tahan haba. Dos vaksin yang nominal bagi ayam ialah 10 gram gentir makanan yang

mengandungi $10^6$ 50% dos jangkitan telur daripada virus vaksin. Kajian makmal pada ayam menunjukkan bahawa dua dos vaksin diperlukan untuk mengaruh keimunan dan ketahanan terhadap virus Newcastle yang virulen. Satu rejim pemvaksinan yang serupa telah dijalankan bagi ayam kampung yang dipelihara di bawah keadaan yang menyerupai keadaan di kampung. Ayam-ayam tersebut didapati tahan terhadap penyakit Newcastle apabila diuji, sementara ayam-ayam yang tidak diberi vaksin didapati rentan sepenuhnya.

Seterusnya percubaan lapangan dijalankan di 21 buah kampung, di mana vaksin jenis gentir makanan diberi setiap bulan. Efikasi vaksin diawasi dengan memerhatikan insidens penyakit Newcastle yang terjadi secara semulajadi dan dengan membeli ayam-ayam yang sudah diberi vaksin untuk ujian makmal. Lebih kurang 60% ayam kampung didapati tahan terhadap ujian makmal dan tidak terdapat kejadian penyakit Newcastle di kampung-kampung tersebut selama dua tahun dalam pengawasan. Vaksin secara oral ini juga telah terbukti sebagai vaksin tambahan yang berkesan bagi ayam-ayam komersial yang dipelihara secara penternakan kecil.

Kajian ini menunjukkan bahawa apabila virus Newcastle yang tahan haba dicampurkan dalam gentir makanan, ia boleh dijadikan satu cara pemvaksinan bagi ayam kampung terhadap penyakit

Newcastle di negara tropik. Ini merupakan laporan yang pertama mengenai vaksin secara oral yang digunakan bagi ayam kampung di Malaysia dan mungkin juga di Asia. Kejayaan pemberian vaksin dalam makanan ini telah menimbulkan minat di negara lain di Asia Tenggara untuk mengembangkan cara pemvaksinan yang serupa untuk tujuan percubaan lapangan bagi ayam kampung di negara-negara tersebut.

# CHAPTER 1

## GENERAL INTRODUCTION

Newcastle disease (ND) is a highly infectious viral disease mainly of chickens but also infecting other poultry and many wild and cage birds. The disease has been reported in most countries in the world as summarised in Tables 1 and 2 (Anon., 1985), although in some countries such as Australia and Northern Ireland the strains of virus present are particularly avirulent (Simmons, 1967; McFerran et al., 1968). More than one third of the countries of Asia and about one fifth of the countries of the world acknowledge the presence of velogenic strains of ND virus (NDV) (Spradbrow, 1988a). However, the countries of Oceania are relatively free from ND. Freedom from infection in some countries is apparently a result of effective quarantine and geographical isolation, such as natural isolation for many islands. Eighteen out of 45 member countries of the Commission for the Study of Avian Diseases of the Office International des Epizooties reported that ND was their most economically serious poultry disease (Lancaster, 1977). Economic loss may be related to the endemic or the epidemic characteristics of ND. Endemic ND causes continual losses and the epidemic form causes very heavy loss whenever the disease strikes.