Available online at www.sciencedirect.com
SCIENCE DIRECT®
Veterinary Microbiology 114 (2006) 16–24
veterinary microbiology
www.elsevier.com/locate/vetmic

Genetic variations in maternal transfer and immune responsiveness to infectious bursal disease virus

Ahmed S. Abdel-Moneim [a,*], Mona M.A. Abdel-Gawad [b]

[a] *Department of Virology, Faculty of Veterinary Medicine, Beni-Suef University, Beni-Suef 62511, Egypt*
[b] *Department of Poultry Diseases, Faculty of Veterinary Medicine, Beni-Suef University, Beni-Suef 62511, Egypt*

Received 15 July 2005; received in revised form 14 October 2005; accepted 24 October 2005

Abstract

The immune responsiveness to infectious bursal disease virus (IBDV) in four native and crossbred chicken lines was compared. ELISA IBDV antibody titers in hen serum samples, yolk from matched eggs and sera from matched 1-day-old chicks from each chicken line with an identical vaccination program were measured, and plotted. There was considerable variation between lines in the measured IBDV specific antibodies, in vaccinated parent hens and in the amounts of inherited maternally derived antibodies in both yolk and progeny chicks. Differences in ratios of the inherited antibody level from hen to 1-day-old chicks were also found among different chicken lines. Breed differences in regressions of IBDV antibody levels in yolk to that of hen or progeny chicks' sera were also found, so prediction of serum titer of hen and/or progeny chicks from yolk are varied among chicken lines.

Keywords: Chicken breed; Chicken line; Correlation; ELISA; Genetic variation; Immunity; IBDV; Prediction; Yolk

1. Introduction

Infectious bursal disease (IBD) is an acute, highly contagious disease of young chicks. It is caused by a dsRNA virus belongs to family Birnaviridae (Lukert and Saif, 1997). IBD continues to be the most serious problem that contributes to major economic losses in poultry farming worldwide. Breed variation in disease susceptibility has already been shown for IBDV and many other diseases of poultry (Bumstead et al., 1991; Hassan et al., 2004), and it is clear that a range of different genes affect susceptibility to different diseases. Recently, it was suggested that overall immunocompetence can be improved by line selection for high antibody response of young chicks to controlled immunization with a single antigen (Yunis et al., 2002).

Passively acquired antibodies have been shown to protect chickens from IBDV (Corley et al., 2002; Fahey et al., 1987). The titers of antibodies in the circulation correlate with the efficacy of vaccination

Abbreviations: na, native; cr, crossbred; OPD, *O*-phenylene diamine; SDS, sodium dodecyle sulphate; *S/P* ratio, sample/positive ratio

* Corresponding author. Tel.: +20 125705482; fax: +20 822327982.
E-mail address: a_s_abdel_moneim@yahoo.com (A.S. Abdel-Moneim).

0378-1135/$ – see front matter © 2005 Elsevier B.V. All rights reserved.
doi:10.1016/j.vetmic.2005.10.037

and the immune status of the flocks (Wyeth et al., 1981a,b). The frequency and the magnitude of positive results can be used to predict timing of vaccine application without interference with the chicks' response to active immunization, and to assess the susceptibility of the flock to disease (van den Berg and Meulemans, 1991; Kouwenhoven and van den Bos, 1994). Maternal effects may far outreach the presence of maternally derived antibodies in offspring as it positively influences the frequency of MHC II bearing cells and B cell repertoire expressed after antigenic challenge later in life (Rubinstein et al., 1982; Yasuda et al., 1998; Lundin et al., 1999). Therefore, maternal antibodies influence the developing immune system by enhancing the magnitude of the antibody response to initial challenge (Lemke and Lange, 1999).

Since yolk antibody levels are known to be related to serum levels (Rossi et al., 1966; Kramer and Cho, 1970), the use of egg yolk instead of blood serum for monitoring flocks susceptibility to infectious diseases becomes an attractive alternate. By using egg yolk instead of serum for antibody determination, more hens can be sampled and monitoring of flocks becomes more economically feasible. On the other hand, it is an easy matter for flock owner to collect a sample of eggs; it is inexpensive, since cull eggs may be used.

The current study was carried out to monitor whether there are differences in IBDV immune responsiveness and maternal transfer of IBDV specific antibodies in native and crossbred chicken lines. It also claims to establish methods for indirect prediction of antibody titers in hens and 1-day-old chicks with regard to maternal antibodies that transferred to egg yolk and investigate possible chicken line variations.

2. Materials and methods

2.1. Experimental birds

One hundred hens of Dokki-4 (Fayoumi na × - White Plymouth Rock), Bandara (White Cornish × Gimizah cr [Dokki-4 × White Plymouth Rock]), Montazah (Dokki-4 × Rhode Island Red) and Dandarawy (na) breeds (Agriculture Research Center, Seds, Beni-Suef, Egypt) were used in this study (25 hen/line). Chickens were vaccinated during rearing by IBDV D-78 intermediate vaccine (Veterinary Vaccine and Sera Production and Research Institute, Cairo, Egypt) at 14 and 21 days of age. At the beginning of the experiment, each breeder hen (17 weeks of age) was revaccinated with inactivated IBDV vaccine (Merial-France), placed in a single cage, and artificially inseminated twice weekly.

2.2. Sampling

The breeding hens were bled from the wing vein at vaccination time and at 4 weeks post-vaccination. Sera were stored at −20 °C till processing. Matched eggs, laid on the same day, were collected and used for determination of antibody levels from yolks. Matched eggs laid by the same hens at the three consecutive days afterward were labeled with the hen number and at 18 days of incubation, placed in a muslin bag for hatching. Sera of the hatched 1-day-old chicks were sampled within 12 h. after hatching and stored at −20 °C. Non matched samples were rejected while, matched ones (15 hen samples, 15 yolk samples and 15 1-day-old chick samples) from each breed were subjected to processing and analysis.

2.3. Egg yolk preparation

One milliliter of yolk was mixed vigorously with 3 ml of normal saline (1/4 final concentration) and the mixture was incubated overnight at 4 °C. Supernatant fluid containing antibodies was harvested from the mixture by centrifugation at 3000 rpm for 15 min. Supernatants were stored at −20 °C until used

2.4. Virus antigen preparation

IBDV (D-78) lyophilized vaccine was reconstituted in 2 ml sterile phosphate buffer saline (PBS). Stock dilution of the virus was firstly treated for 30 min at 37 °C with 0.5% SDS (w/v) (Snyder et al., 1985).

2.5. ELISA

Optimal dilutions of antigen, serum and antiglobulin conjugate were firstly determined by employing checkerboard titration method as described (Voller and Bidwell, 1986). ELISA plates (96-well) were coated (0.1 ml/well) overnight at 4 °C with a