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Mannan-binding lectin (MBL) in two chicken breeds and the correlation with experimental *Pasteurella multocida* infection

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Abstract

The present study is the first demonstration of an association of the genetic serum Mannan-binding lectin (MBL) concentration with bacterial infections in chickens. The genetic serum MBL concentration was determined in two chicken breeds, and the association with the specific *Pasteurella multocida* humoral immune response during an experimental infection was examined. Furthermore, we examined the association of the genetic serum MBL concentration with systemic infection. The chickens with systemic infection had a statistically significant lower mean serum MBL concentration than the rest of the chickens, suggesting that MBL plays an important role against *P. multocida*. A statistically significant negative correlation was found between the specific antibody response and the genetic serum MBL concentration for both breeds. This indicates that MBL in chickens is capable of acting as the first line of defence against *P. multocida* by diminishing the infection before the adaptive immune response takes over.

Keywords: Mannan-binding lectin; MBL; Innate immunity; Humoral immunity; *Pasteurella multocida*; Chickens

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Résumé

L'étude présente est la première démonstration d'une association de la concentration de Mannan-Binding-Lectin (MBL) génétique avec les infections bactériennes dans les poulets. La concentration de sérum MBL basale a été déterminée dans deux espèces de poulet, et l'association avec la réponse immunitaire humorale du *Pasteurella multocida* spécifique pendant une infection expérimentale a été examinée. De plus, nous avons examiné l'association de la concentration de sérum MBL génétique avec l'infection systémique. Les poulets avec l'infection systémique ont eu une concentration de sérum MBL génétique moyenne, plus basse et statistiquement significative que le reste des poulets, suggérant que MBL joue un rôle important contre *P. multocida*. Une corrélation négative statistiquement significative a été trouvée entre la réponse d'anticorps spécifique et la concentration de sérum MBL basale pour les deux espèces. Ceci indique que dans les poulets MBL est capable de servir de la première ligne de défense contre *P. multocida* en diminuant l'infection avant que la réponse immunitaire adaptive reprend.

Mots clés : Lectine liant le mannose ; L'immunité innée ; L'immunité humorale ; *Pasteurella multocida* ; Poulets

1. Introduction

Mannan-binding lectin (MBL) is an important constituent of the innate immune system in vertebrates [1,2]. MBL is a member of the collectin family of proteins which contain carbohydrate-recognizing domains that have been shown to bind to a variety of microorganisms, including species of bacteria, viruses, fungi and parasites [3]. Upon formation of complexes with MBL-associated serine proteases (MASPs), the complement system can be activated through a distinct third pathway called the MBL pathway [4,5]. Furthermore, MBL can act as an opsonin in its own right, promoting phagocytosis by neutrophils and macrophages [6]. The MBL concentration has been shown to increase 1.5–3-fold during infection and is therefore regarded as a minor acute phase protein [7,8]. In man, the concentration of genetic serum MBL typically ranges from a few nanograms per ml plasma to approximately 5 μg/ml [9–11]. However, MBL deficiency is quite common, occurring at an estimated prevalence of 5% or more of the human population [12], and several studies have shown that MBL deficiency or low concentrations of MBL are associated with increased susceptibility to infectious disease [13–15].

MBL has also been shown to be involved in the innate immune response in chickens [16–18] although it remains to be demonstrated whether or not the genetic serum concentration has an influence on the susceptibility to infectious disease. The serum MBL concentration in chickens is in general considerably higher than in humans, with concentrations ranging from 0.4 to 37.8 μg/ml [19], and no chickens have so far been found MBL deficient, which may indicate the importance of MBL in chickens [20,16].

The Gram-negative bacteria *Pasteurella multocida* is considered the causative agent of fowl cholera, which occurs in most countries and is of special economic importance in free-range production systems where contact with wild fauna is inevitable [21]. Fowl cholera is a respiratory disease, which may lead to an acute stage associated with high morbidity and