EVALUATION OF THE HEALTH STATUS OF SUBCLINICALLY DISEASED POULTRY BY THE USE OF BLOOD PARAMETERS

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Introduction

The intensive animal production of the last decades was mainly focused on the achievement of maximal production results (eggs, milk and meat). In recent years the European consumer has expressed his concern towards animal welfare and food safety. The intensive animal production is forced to produce a high quality product with special attention towards animal health and food safety. Growth, product quality and animal welfare are influenced by subclinical multifactorial diseases and stress. The common veterinary diagnostic techniques (autopsy, histology,…) are therefore not always useful to screen the health status of the animal. Other diagnostic bloodparameters, for example biochemical enzymes and acute phase proteins, can be an alternative option. Especially in poultry, little is known about the value of blood parameters in the screening of the animal's health.

Aim

Analyse the value of blood parameters to evaluate the health status of poultry in case of subclinical diseases and stress.

Materials and Methods

During a two year period several poultry trials were set up with special attention towards the induction of stress and subclinical diseases by oral application of lectins, cyclophosphamide, lipopolysaccharides and vaccination. A total of 377 animals were slaughtered at the age of 28 days for autopsy scoring and blood sample collection. The following bloodparameters were determined: total protein, albumin, phosphatase alkaline (AP), alanine aminotransferase (ALAT), creatine kinase (CK) and alpha-1-acid glycoprotein (AGP). All parameters were analysed in serum using Vettest, Idexx Laboratories, except for alpha-1-acid glycoprotein which was analysed using the alpha-1-acid glycoprotein assay from Tridelta Development Ltd., Ireland. Based on the autopsy score (evaluation of different organ systems and Eimeria lesions), the live weight and the bursa/live weight ratio the animals were divided into two groups: healthy or subclinically diseased. The animals were classified as healthy if the autopsy score was 0 (no abnormalities) and both the live weight and bursa/live weight ratio were situated in the range of the average of the control animals (no stress induction) +/- (2 x the standard deviation). Animals that showed a high score for the autopsy and/or had a live weight and/or bursa/live weight ratio that was out of the range of the average of the control animals (no stress induction) +/- (2 x standard deviation) were classified as subclinically diseased. The subclinically diseased animals were in turn subdivided into subgroups. Subclinically diseased animals with a score ≥ 3 for coccidiosis (Eimeria ascervulina, maxima and tenella) were classified in the subgroup lesion. Subclinically diseased animals were classified in the subgroup systemic disease if the autopsy score was ≥ 5.

Results

There were no significant differences in the concentration of total protein, alpha-1-acid glycoprotein and the 3 enzymes (AP, ALAT and CK) between both groups. The concentration of albumin in the serum of the subclinically diseased animals was significantly lower compared to the healthy animals. Power analysis revealed that a significant difference in the alpha-1-acid glycoprotein concentration can be detected in subclinically diseased animals if a total amount of 500 animals is used. The serum ALAT-concentration of the subgroup lesion decreased significantly compared to the healthy animals. The concentration of CK, ALAT and AGP in the serum of systemic diseased animals showed major non significant differences compared to the healthy animals. According to statistical analysis the p-value of these three parameters was low, with values of respectively 0.37, 0.39 and 0.15.

Table 1. Average (standard deviation) of the determined blood parameters in the groups healthy and subclinically diseased and the subgroups lesion and systemic disease
(Means with different letters are significantly different at $p < 0.05$).

	# animals	Autopsy score	Total protein (g/l)	Albumin (g/l)	CK (IU/l)	AP (IU/l)	ALAT (IU/l)	AGP (µg/ml)
Healthy	145	0	30,3 a (1,27)	7,95 a (2,38)	4460 a (2140)	12900 a (10985)	33,5 a (13,6)	284 a (182)
Subclinical	232	3	29,8 a (5,10)	7,34 b (2,55)	4445 a (2146)	12310 a (8437)	31,3 a (12,3)	306 a (160)
Lesion	92	3	30,3 a (5,40)	7,61 a (2,82)	4378 a (2231)	10998 a (7361)	29,3 b (10,8)	293 a (143)
Systemic	13	5	30,8 a (5,30)	7,62 a (2,02)	5203 a (1902)	10678 a (8411)	29,0 a (7,9)	385 a (167)

Discussion and Conclusion

Determination of the health status of poultry in case of a subclinical disease or stress is not possible by using total protein and the 3 enzymes AF, ALAT and CK. In case of a large amount of serum samples, alpha-1-acid glycoprotein is a useful blood parameter, together with albumin, to make a distinction between healthy and subclinically diseased animals. The interference of several mild pathologies is a possible explanation for this conclusion. In the subgroup lesion, animals with a high score for coccidiosis were selected. To make a distinction between healthy animals and animals with coccidiosis the serum ALAT-concentration is the only useful parameter. Due to the fact that subclinically diseased animals have no major pathologies in either one or several organ systems, deviations in the level of the parameters from normal values may be too small to be significant. The animals, classified as systemic diseased, had a high autopsy score (≥ 5), which indicates severe pathologies on either one or several organ systems. These animals had a major non significant difference in the serum concentration of CK, ALAT and AGP compared to the healthy animals, even if only a small amount of animals was used. Furthermore the p-value of these three parameters was low. The results of this trial indicate that it should be possible to make a distinction between healthy and systemic diseased animals by using blood parameters, even if a low number (50 for ALAT and CK, 20 for AGP) of animals is used.

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