RELATIONSHIP BETWEEN HAPTOGLOBIN, SERUM AMYLOID A AND CLINICAL STATUS IN THE SURVEY OF DAIRY HERDS DURING A SIX MONTHS HOUSING PERIOD

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Introduction

Haptoglobin (Hp) and serum amyloid A (SAA) are considered as two of the major acute phase proteins (APPs) in cattle (Conner et al.,. Res Vet Sci., 1986; 41: 126-128; Skinner et al., Vet Rec. 1991; 128: 147-149). They were measured in dairy herds and compared to clinical examination in order to assess their capacity to identify the animals with acute inflammation. Then a comparison was made between these two APPs to check if they were correlated, and if they could help the farmer to identify the animals undergoing an acute inflammatory process.

Material and Methods

Two hundred and sixteen pregnant dairy cows, from two to nine years old, were included in the study. They were randomly chosen from four commercial farms of the Eastern part of Belgium. Blood was sampled every fifteen days during a six months housing period. A complete clinical and gynaecological exam was performed at blood sampling, which allowed the classification of the animals in two categories: healthy and diseased cows. Serum Hp determination was carried on by quantitative measurement of haemoglobin binding capacity as reported by Skinner et al. (Vet. Rec., 1991, 128:7, 147-149). SAA was determined by mean of an ELISA kit (Tridelta Development Ltd, Ireland). Hp and SAA status were allocated to the samples according to the Cut-off point (COP) for medical decision (Table I). Samples were gathered into three different periods: P1 (prepartum), P2 (week 1 postpartum) and P3 (postpartum beyond week 1). APP prevalence was assimilated to the percentage of samples with APP values above the COP (positive APP test). APP sensitivity was assimilated to the incidence of a positive APP test among diseased cows and specificity, to the frequency of a negative test in the population of healthy cows. The assignment of the health status based on clinical and gynaecological examinations was considered to be the gold-standard. Hp and SAA concentrations were related to clinical observations using standard unpaired and paired t tests of the Statview program (SAS Dole Institute Inc.). Differences were considered as significant (S) for $P \leq 0.05$.

APP	Periods	Multiparous cows	Primiparous cows
Hp	***P1 + P3***	Hp– :< 30 mg/L Hp +: 30 - 100 mg/L Hp ++: > 100 mg/L	
	P 2	Hp– :< 150 mg/L Hp +: 150 - 200 mg/L Hp ++: > 200 mg/L	Hp– :< 150 mg/L Hp +: 150 - 250 mg/L Hp ++: > 250 mg/L
SAA	***P1 + P3***	SAA + : > 25 000 µg/L	
	P2	SAA +: > 60 000 µg/L	

Table I: reference values for Hp and SAA were established for dairy cows in a preliminary study (not published). Hp–: absence of inflammation; Hp+: mild inflammation and Hp++: severe inflammation.

Results

The profiles of mean Hp and SAA concentrations throughout the whole study were similar in the four herds: they significantly peaked during the first week after calving both in diseased and healthy cows. Hp and SAA mean concentrations were significantly higher in the samples from diseased cows. A total of 9.7% of samples from healthy cows presented a Hp value above the COP. Hp sensitivity and specificity reached 38.0% and 90.3% respectively. If only P2 was considered, 35.8% of samples from healthy cows presented a Hp value above the COP; Hp sensitivity reached then 85.0%, with a 91.6% specificity. The results were similar in the four herds. In a different approach, 37.0% of Hp+/++ samples were identified as diseased by the clinical exam. This proportion reached a 85.0% value if P2 was considered alone.

SAA sensitivity and specificity were similar to Hp (38.7% and 89.2% respectively) and 10.8% of samples from healthy cows presented a SAA value above the COP. SAA prevalence reached 40.0% and its sensitivity increased to reach a 79.2% value in P2. Only 56.1% of samples SAA+ came from cows clinically diseased. SAA was then investigated on the basis of the samples status allocated by Hp (Hp–, Hp+ or Hp++), and it appeared that 93.2% of samples Hp– were also SAA–, and 76.2% of samples Hp++ were also SAA+. SAA profiles showed that cows with a Hp++ status presented also SAA concentrations corresponding to an acute inflammation, corroborating thus the classification of samples according to Hp. More than 95% of samples from healthy cows were Hp– and SAA–: they identified well animals that were not under an inflammatory status. On the other hand, 76.0% of samples from diseased cows were

Hp+/++ and SAA+. Among samples from healthy cows, 48.6% were SAA+ and Hp–, but only 4.2% were SAA– and Hp+/++. Hp was not correlated with SAA (r^2= 49.5%).

Discussion

Neither Hp nor SAA should be used as inflammation markers in the week following parturition, as they physiologically rise at that time. The ability of Hp and SAA to identify diseased animals was quite low, but they both presented a better specificity. SAA confirmed the inflammatory status defined on the basis of Hp. An inflammatory status was also detected by the acute phase proteins in about 10% of samples from healthy cows. These acute phase proteins could be useful to the farmer: the animals with pathological serum concentrations could be submitted to a deeper clinical investigation. Both APPs were not correlated.