IMPLEMENTATION OF THE ACUTE PHASE PROTEIN HAPTOGLOBIN IN ENCOMPASSING PREVENTIVE HEALTH PROGRAMS IN PIG PRODUCTION

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Introduction

Traditional quality control - performed at the end of the production process - is no longer the means to economically ensure food safety and quality.

Important aspects of the extended comprehension of quality in meat production are, for instance, simultaneous ideas about the type of production, housing of animals or environmentally friendly production. Therefore it is essential in agriculture and in the food industry, as it is the case in other industrial sectors, to implement new strategies aimed at process improvement. Thus an efficient quality and health management becomes more and more essential in animal production (1).

As sensitive markers for disturbances of the homeostasis, acute phase proteins are discussed as potential parameters to assess animals' health and welfare (2). Haptoglobin (Hp) belongs to the positive acute phase proteins in pigs (3) indicating inflammatory or infectious lesions by increasing serum concentrations (4). It is a very sensitive parameter that can support the evaluation of the general health status of pigs within the scope of veterinary herd-health-analysis or comprehensive preventive health programs (2, 5).

The purpose of three studies was to prove how to implement the screening parameter Hp in preventive health management systems, i.e. determination of sampling time in the production stage as well as the evaluation of benefits.

Material and Methods

The first study aimed at the assessment of new control strategies including the screening parameter Hp in different piglet rearing systems.

Seven piglet breeding farms, 15 piglet rearing farms and two fattener farms were available. According to the customer-supplier-contacts the piglet rearing farms were divided into five categories:

Category I: own breeding
Category II: one supplier
Category III: up to 40 suppliers
Category IV: some suppliers and
Category V: work distributed pig production.

In every farm a weak-point-analysis was performed using check lists which constituted as main criteria housing, building, production process, germ contamination, parasites, sty climate, fodder/water and individual animal health. In the categories I and II blood sampling was performed a few days before moving the piglets to rearing, 3 weeks after housing and a few days before moving the animals to the fattener. The categories III to V realized blood sampling directly after receiving and a few days before moving the animals to the fattener. During the whole production period diseases and rearing performance were recorded by the farmers.

In a second study Hp was tested as a marker of less hygienic conditions (evaluated by check lists) in two breeder-fattening farms (A, B). Clinical examinations and blood samples of indicator groups of 16 pigs each were performed.

The third study examined Hp as a tool to monitor pig health status at slaughter. Blood and muscle samples from diaphragmatic pillar (d.p.) and m. brachiocephalicus (m.b.) were collected from 330 slaughter pigs. Meat juice was obtained after freezing and thawing the muscle samples and post mortem examination including bacterial analysis as well as the determination of salmonella-antibodies in meat juice were performed.

In all studies Hp determination in serum respectively meat juice was performed according to the method of HISS and co-authors (6).

Results

In study one it turned out that piglets from one origin had significant lower Hp concentrations at the beginning of the rearing period than animals received from different origins. The retrospective view showed that animals causing medical treatment costs over € 1,50 had higher Hp levels at the time of coming into the rearing than animals which caused lower costs. The prospective view about the expected growth performance in the fattening period showed that piglets in the rearing with daily weight gain over 350g had lower Hp concentrations at the end of the rearing period. Obviously a close connection between the hygienic status of the rearing farm in the receiving inspection, the in-process inspection and the final inspection and the Hp serum concentration did exist. Out of these results a test strategy for Hp-Screening was developed (figure 1).

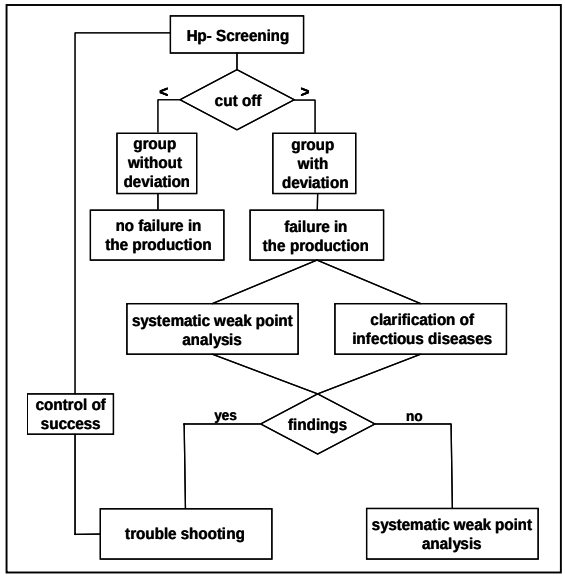

Figure 1: Test strategy for Hp-Screening

The results of the second study proved this connection. In contraste to farm A, farm B only acquired half of the maximally available points concerning relevant hygiene

factors and was therefore rated „unsufficient“. The pigs of farm B showed more often clinical symptoms than those of farm A which was reflected by comparing the time course of growth of the two fattening groups. The performance of pigs in farm A followed the normally observed physiological course of growth while the growth of pigs in farm B was depressed (figure 2). It was conspicuous that there were also statistically significant differences in Hp concentration between animals showing no observable clinical deficits from farm B in comparison to pigs from farm A.

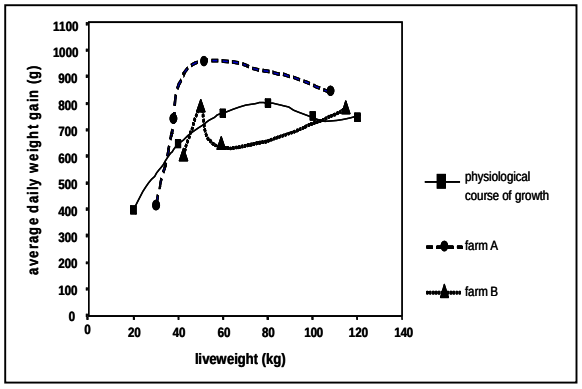

Figure 2: Physiological cost of growth and average daily weight gain of pigs in farm A and B

In the third study Hp concentrations in blood could be correlated significantly ($p<=0.001$) with those in d.p. juice ($r=0.7$) and m.b. juice ($r=0.8$). Significant ($p=0.046$) higher Hp levels in pigs tested positive for salmonella-antibodies could be found in blood (figure 3). Furthermore higher Hp levels appeared in meat juice of salmonella positive samples but could not be proved statistically.

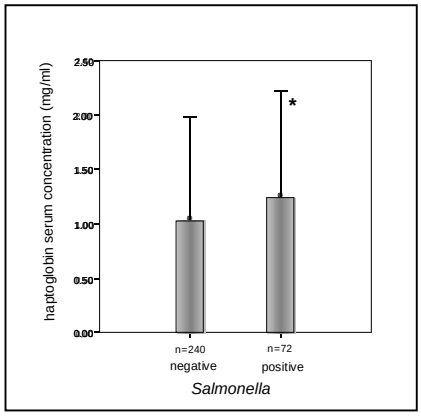

Figure 3: Hp serum concentration of Salmonella positive and negative slaughter pigs

Discussion

The significant higher Hp levels of pigs from category III to V could be the result of the crowding-effect during the transport of the pigs. Different studies proved the relationships between the daily weight gain and the Hp concentration (7, 8). Our own studies prove this relationship. Furthermore Pedersen and Dahl (9) as well as Ice and co-authors (10) found out that different environmental and management factors affect animals' health and its performance.

Also this close connection between the hygienic status of the farms and the Hp values of the pigs could be observed in our field studies.

Conclusion

A test strategy combining the measurement of Hp, check lists and ranking system in the preventive health management is suggested. Favourable points in time for the receiving inspection are three days before moving the animals to the breeder or directly at the receiving time, for the in-process inspection three weeks after receipt and for the final inspection three days before moving to the fattener. Hp was demonstrated to be a useful tool to assess animal health in all production stages and to identify animals living in less hygienic environment. Furthermore, Hp quantification in meat juice might be a useful parameter to assess meat quality in terms of animal health at slaughter.

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