BIO-MARKERS MEASURING HEALTH STATUS AND MANAGEMENT TOOLS TO IMPROVE PRODUCTIVE PERFORMANCE AND ANIMAL HEALTH ON SWINE COMMERCIAL FARMS

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Agriculture program

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1 Research goal

The research goal of this Thesis is to determine the utility of biomarkers and two practical management protocols to control and minimize the acute phase reaction triggered by immunological stressors and its impact on the efficiency and quality of production, mainly related with the use of antibiotics.

2 Summary of the chapters

Current swine production is led by competitiveness worldwide, achieving higher productive performance combined with the compliance with highest quality standards related to welfare, control of pollutant emissions and food safety assurance including antibiotic restriction or even free of them. For this purpose, traditional methods of raising pigs may not be enough and the need of new procedures and tools arise. Among the proposals in the last decade, the use of biomarkers and new procedures can be mentioned to detect early problems or risk that can lead to later problems, lack of efficiency or loose of quality and animals delivered out of the market specifications.

In Chapter 1, biomarkers in the swine industry have been reviewed, being candidates to detect stress, loses of performance, subclinical disease of pigs or even early warnings. Probably the most reliable group recently characterized have been acute phase proteins (APP) and are those plasma proteins whose hepatic synthesis rate is significantly modified under stress situations. The plasma concentrations of these proteins may be decreased (in which case they are called APP-negative, such as prealbumin, transferrin, albumin and others), or increase

considerably (APP-positive). Among the positive APP are C-reactive protein, serum amyloid A, pig major acute-phase protein (Pig-MAP) and haptoglobin.

In Chapter 2, to understand the contribution of the most relevant acute phase proteins, two were studied (Pig-MAP and Haptoglobin) to determine his respective reference levels on commercial farms. The study included the most important production phases, reproductive sows in gestation phase, boars and pigs from weaning to finishers. Sows' results were relevant since set as the first reference levels under commercial conditions in farms, standardizing results for parity, sex and season.

In Chapter 3, the influence of psychological stress induced by means of a disordered feeding pattern on APP's levels and productive performance was studied. The study is closely related with the concept of chronic-intermittent stress, where the animals only perceived stress in those moments where pigs in other pens were fed and they saw them without having their feed delivered. Therefore, this study supports the notion that non-inflammatory, psychophysical stress can induce a discernible APP response in healthy domestic animals, since the APP response has been considered almost an exclusive marker of inflammation and / or infection, suggesting that the acute phase response is inducible to a considerable extent by stressful event to which domestic animals are ubiquitously exposed during daily management.

In Chapter 4, a protocol based on parity segregation of the progeny was assessed, including productive performance, immunoglobulin (IgG) and acute phase proteins serum concentrations from birth to slaughter. Parity of the gestation and lactation sow affected growth performance. G:F ratio tended to be higher in piglets from multiparous the same as IgG serum concentration and with lower PigMAP serum concentrations at risky certain time points in the life of the pig. This study showed the coherence of productive performance and immune system reaction that can be modulated in a practical way on farms by promoting the use of multiparous sows' colostrum and the segregation and proper treatment of the higher risky piglets as piglets from gilts are, achieving a better performance and lower use of antimicrobials by the proper implementation of this protocol.

In Chapter 5, the IPC protocol has similar objectives qualifying individual pigs on early symptoms and treating them accordingly, with the right antibiotic, during the right time and the right dose. The application of the protocol demonstrated positive effects on productive performance and homogeneity, and the methodology for its application at large scale (more than

one million pigs controlled) delivered new insights on type of disease prevalence, dynamics epidemiological curves for every disease and antibiotics use and dosage.

All of them, individually or combined, are efficient tools to improve the quality of production and ensure the highest production standards required from the market and institutions.