MEASURING NEGATIVE ACUTE PHASE PROTEINS TO ASSESS ACUTE PHASE RESPONSE AND STARVATION

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A host of different processes induce an acute phase reaction in the body. Most widely studied are infections and inflammations that induce the typical change in blood profile. Although at first efforts have been made to fully understand when and how acute phase proteins (APPs) increase in concentration (the positive reacting proteins), lately more interest is put on the negative reacting proteins. These proteins are normally present in healthy animals, but will decrease in concentration due to the acute phase reaction. As for the positive reacting proteins also the negatives display a species difference. Not all proteins react in all species to the same extend. An overview will be presented on the negative reacting proteins with most emphasis on the pig.

Most proteins that change in concentration during the acute phase reaction play a role in the attempt of the body to regain the homeostasis. The general role of proteins increasing in concentration can be scavengers of free hemoglobin or free oxygen radicals; scavengers of (parts of) bacteria; can activate the complement reaction; help in the transport of cholesterol and more.

Albumin (Alb, MW 66,000 Da) is generally accepted as negative APP present in most species. Furthermore, decreased levels of albumin are also associated with malnutrition. A decline of appetite is a phenomenon often seen in mammals suffering from an acute phase reaction. The decrease in albumin during the acute phase reaction will be a combined effect from the reaction itself and the starvation of the animals. The negative reacting protein transferrin (Tf, MW 80,000 Da) is possibly involved in the innate immunity, perhaps by sequestering ferric ions to prevent pathogens and parasites from using nutrients. Retinol binding protein (RBP) is a small molecular weight protein (MW 21,000 Da), which is the exclusive protein for transport of vitamin A (retinol) in the body. The synthesis and secretion of RBP by parenchymal hepatocytes is mainly controlled by the concentration of retinol in the body. Circulation of retinol bound to RBP occurs mainly in combination with a larger, tetramer protein: transthyretin (TTR, MW approx. 55,000 Da). The complex formation appears to be necessary to prevent extensive loss of the low molecular weight RBP through glomerular filtration. Apart from its role of facilitating the transport of retinol, TTR is one of the three major thyroxin-binding proteins. Measurements of RBP and TTR will strongly correlate; in human medicine these proteins are routinely measured as indicator of health status. Apolipoprotein A-I (ApoA-I) is the major component of α-lipoprotein of high-density lipoprotein. Lipoproteins can inhibit complement binding to the target membrane. Serum Amyloid A (SAA) is positive reacting acute phase protein, also related to high-density lipoprotein (HDL). SAA and ApoA-1 are shown to be expressed as each other's counterparts in an acute phase reaction; possibly due to the competition on the HDL molecule. An increase in SAA is matched by the decrease in ApoA-I.

In human medicine an index was defined were positive reacting proteins were combined with negative reacting proteins. The index obtained was called PINI (Prognostic Inflammatory and Nutritional Index) and reveals a sensitive tool to assess health. For animals a comparable index was defined: the acute phase index (API) were quick and slow reacting positive reacting proteins are combined with quick and slow reacting negative proteins. As soon as the most suitable proteins are defined for different species this tool can be applied as indicator for health, non-health and even be used to define recovery from periods of illness.

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