

Biomarkers in Stress Diseases

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Description

Some biomarkers determine the extent of damage and serve as indicators of degradation by stress or disease, such as MDA, isoprostanes, while others, such as anti-oxidant markers reflect a status of body's defense mechanism against stress-induced alterations. Among them, some have dual nature of being both body's normal excretory or metabolic products and anti-oxidant defense, e.g., urates. Some hormones are the normal mediators of the stress process, such as cortisol and adrenaline, while as copeptin or chromogranin A (CgA) prohormones can indirectly determine renal, cardiovascular, or neuroendocrine dysfunction. Enzymes, such as alpha-amylase and lysozyme also serve as biomarkers of stress. Some proteins, such as secretory IgA and heat shock proteins (HSPs) serve as indicators of immunity or resistance mechanism to stress, while as acute phase proteins reflect body response to invading agents. So a broad range of areas concerning these biomarkers needs to be discussed.

Investigations in dairy cattle indicated that the highest levels of plasma MDA reflected metabolic disturbances, especially around parturition and the early stages of lactation (Turk et al., 2004; Castillo et al., 2005). MDA and total anti-oxidant status (TAS) values are suggested as effective indicators for the oxidant-antioxidant balance and could be employed to generate complementary measures of animal homeostasis. HPLC with diode-array detection (HPLC-DAD) was revealed as a selective, reproducible, and sensitive method to measure MDA in goat plasma as an oxidative stress biomarker. In addition, gas chromatography coupled with tandem mass spectrometry (GC/MS/MS) is a useful method in long-term clinical studies of circulating MDA as a biomarker of lipid peroxidation, and its relevance to F2-isoprostane 15(S)-8-iso-prostaglandin F2 α and nitric oxide (NO) has been demonstrated. Another study reported that GC-electron-capture negative ion chemical

ionization (ECNICI)-MS measurement of nitrite and malondialdehyde in human urine is important as a surrogate internal standard for MDA. A recent study demonstrated malondialdehyde-modified low-density lipoprotein (MDA-LDL) to be a good candidate for predicting the endovascular therapy outcome in patients affected with peripheral artery disease. Acute stroke can be identified using levels of MDA. Recently, MDA has been evaluated as an oxidative stress diagnostic biomarker in diabetes ketosis, ovarian cyst, mastitis and lameness. Its elevated concentration in milk and meat has shown deleterious effects on milk, and meat quality and hence can serve as a quality biomarker in foods.

Conclusion

As MDA is a lipid peroxidation product and determines the extent of damage of biological membranes, it can suitably be evaluated as a biomarker for degradative processes/stresses or diseases.

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