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Nitrotyrosine

Nitrated amino acid as biomarker of nitrosative stress in inflammatory diseases

Nitrotyrosine has been found to be elevated in certain cardiovascular and neurological diseases. The modified amino acid can be seen as a correlate of the cytotoxic peroxynitrite and as a biomarker of nitrosative stress.

Nitrotyrosine is the nitrated form of the amino acid tyrosine. The accumulation of protein bound nitrotyrosine is associated with cardiovascular diseases that are based on **inflammatory processes** (e. g., atherosclerosis, myocardial infarction, diabetic vasculopathy, hypertension, or coronary heart diseases). A growing number of studies have also associated the accumulation of nitrotyrosine with **neurological diseases** (Alzheimer´s disease, Parkinson´s disease, multiple sclerosis, stroke). With treatment of some of the associated diseases the levels of nitrated tyrosines have been shown to decrease, so nitrotyrosine has been stated to be a marker of nitrosative stress.

How and when is nitrotryrosine produced?

During inflammatory processes, large amounts of **nitric oxide (•NO)** are locally released from L-arginine. This reaction is catalyzed by the enzyme NO-synthase (NOS). Other causes for the increased •NO production are exposure to chemicals or heavy metals, drugs, nicotine, or physical and psychological stress, as well as extraordinary physical strain with increased oxygen consumption.

Free gaseous •NO diffuses out of the cells and acts as a neurotransmitter: it relaxes smooth vascular muscle cells or inhibits their growth; it inhibits the aggregation of thrombocytes and leuko cytes and the oxidation of atherogenic LDL. NO increases the prostaglandin production. It also plays an important role in attenuating bacterial and viral infections.

Nitrosative stress and its consequences

- Modification of lipids and proteins (for example structural proteins in mitochondria)
- Inhibition of respiratory chain enzymes in the mitochondria
- Glutamate overload
- Disturbances in ion channels
- Calcium overload
- Initiation of apoptosic processes

Clinical associations:

- Blockade of biochemical pathways
- Mitochondriopathy
- Thyroid disturbances
- Neurological diseases
- Cardiovascular diseases

In high concentrations, •NO that is not trapped by mitochondrial superoxide dismutase (SOD) reacts with superoxide ($O2•^-$) to form **peroxynitrite ($ONOO^-$)**. Peroxynitrite is implicated as a key oxidant species in several pathologies and is known to be cytotoxic (nitrosative stress).

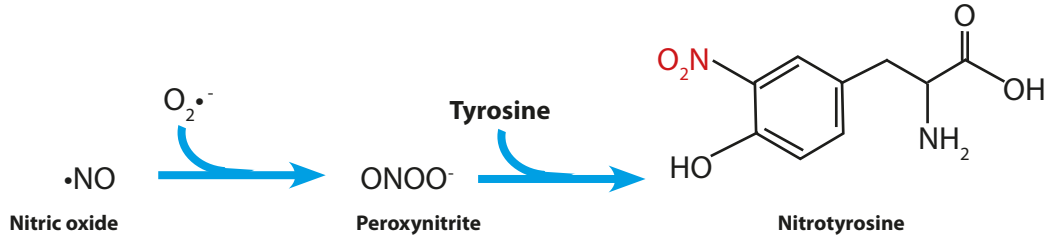

Fig.: *Formation of Nitrotyrosine from reactive nitric oxide*

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How does peroxynitrite affect other molecules?

Peroxinitrite is highly reactive and shows a high affinity to aromatic amino acids, e. g., to the phenolic ring of tyrosine (see figure). The nitration of tyrosine in general is a natural process within the **post-translational protein modification** and serves signaling modalities. Nitration of tyrosine by peroxynitrite is harmful if, for example, tyrosine residues of Mn-SOD are nitrated: the enzyme normally inhibits peroxynitrite formation in mitochondria. When it is inactivated by oxidation, excess oxygen radicals can no longer be eliminated (Yamakura 1998). Thus peroxynitrite inactivates the enzyme that is responsible for eliminating harmful peroxynitrite – a disaster for the organism.

Why detect nitrotyrosine and not peroxynitrite?

While peroxynitrite is instable and thus difficult to detect, nitrotyrosine is a stable product. Nitrotyrosine might be seen as a correlate of peroxynitrite production, and its accumulation in cells and tissues is a marker of oxidative stress and nitrosative stress, respectively (Ischiropoulos 2008). Whether nitrotyrosine is only a marker or also plays a role in the pathogenesis of inflammatory processes is not yet clarified.

Nitrotyrosine ELISAs for various applications

Our nitrotryrosine sandwich ELISAs are suitable for the detection of nitrotyrosine in stool, EDTA plasma, serum and dried blood samples (DBS „dried blood spots").

NItrotyrosine	
Matrix	Stool, EDTA plasma, serum
Sample volume	100 mg (stool) 50 µL (EDTA pl., serum)
Test principle	ELISA
Cat. No.	K 7824

NItrotyrosine	
Matrix	EDTA plasma, serum dried blood
Sample volume	15 µL (EDTA pl., serum) 50 µL (dried blood)
Test principle	ELISA
Cat. No.	K 7829

References

Gatterer, H. et al (2012) Short term supplementation with alpha-ketoglutaric acid and 5-hydroxymethylfurfural does not prevent hypoxia induced decrease of exercise performance despite attenuation of oxidative stress. Int J Sports Med 33:1–7

Gonsette RE (2008) Neurodegeneration in multiple sclerosis: The role of oxidative stress and excitotoxicity. J Neurol Sci, Vol 274 , Issue 1–2 , 48–53

Ischiropoulos H (2008) Protein tyrosine nitration – An update. Arch Biochem Biophys Oct 30

Peluffo G, Radi R (2007) Biochemistry of protein tyrosine nitration in cardiovascular pathology. Cardiovasc Res. Jul 15: 75(2): 291–302

Souza JM et al. (2008) Protein tyrosine nitration – functional alteration or just a biomarker? Free Radic Biol Med. Aug 15; 45 (4): 357–356

Yamakura F et al. (1998) Inactivation of human manganese-superoxide dismutase by peroxynitrite is caused by exclusive nitration of tyrosine 34 to 3-nitrotyrosine. J Biol Chem Jun 5;273(23):14085–14089.

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