Investigation of antioxidant capacity parameters

Direct measurement is difficult due to the short half-life of free radicals (VR). Substances formed by their action are determined.

Direct Determination

Determination of oxygen radicals

- pulse radiolysis – radicals are generated by ionizing radiation
- electron spin resonance spectrometry (ESR) – identification based on spin changes
- chemiluminescence method

Determination of nitrogen radicals and their adducts

- nitric oxide – it is very difficult to determine
- methods as in oxygen
- most often indirect methods - nitrites, nitrates or substances modified by nitration - nitrosohemoglobin

Determination of radical generating substances

- xanthine oxidase – produces superoxide
- determination of transition metals – Fe, Cu (they catalyze reactions where free radicals are formed)

Indirect measurements

- most often determination of lipoperoxidation products, adducts with DNA

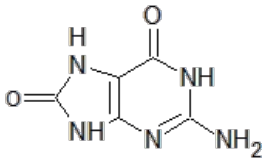
VR damage products

NK damage

- the most significant (irreversible) damage – by the hydroxyl radical
- main product – thymine glycol and 8-hydroxyguanine
- repair enzymes remove them from the cells - we can determine them in the urine

Damage to proteins and AMK

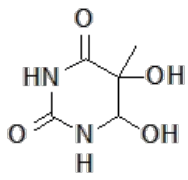
- many damage mechanisms, little used
- sensitive method is for measuring carbonyl residues from lysine.



8-hydroxyguanine

Lipoperoxidation

- in direct connection with the formation of free radicals
- most common – determination of malondialdehyde (MDA) – reaction with thiobarbiturate forms a colored complex, non-specific, also reacts with e.g. bilirubin, DNA
- also other aldehydes (e.g. 4-hydroxynonenal)
- conjugated dienes – characteristic UV absorption (234 nm)
- measurement of hydrocarbons in exhaled air
- isoprostanes - by peroxidation of products arachidonic acids



Thyminglycol

Oxidized LDL

- share of atherosclerosis
- 2 methods

1. change of the delay phase in stimulated peroxidation - examines the ability of LDL to cope with oxidative stress
2. determination of oxLDL – extraction, oxFFA is determined at 234 nm

Antioxidant protection of the organism

Total antioxidant capacity

- artificial formation of free radicals in biological material - we measure the ability to slow down or stop this reaction
- TRAP determination – plasma capacity after adding the generator – conversion to Trolox capacity – 1 trolox

molecule has 2.0 units when using TRAP – disadvantage – end-point oxygen electrode
- more commonly used ABTS – inhibition of the ABTS radical cation

Antioxidant enzymes

- determination of SOD rather indirectly, determination of catalase – rarely

Antioxidant substrates

- vitamins A, E, C
- determination of thiols is irrelevant (they are on albumin, they have a long half-life)
- also others - ubiquinone Q, lipoate, flavonoids..., using high-performance (high-pressure) liquid chromatography (HPLC)

Links

Related Articles

- Basic reactive forms of oxygen and nitrogen

External links

- Tartrate-resistant acid phosphatase

References

- SCHNEIDERKA, Peter. *Chapters in Clinical Biochemistry.* 2. edition. Prague : Karolinum, 2004. ISBN 80-246-0678-X.