

*Materials of Conferences*

**CHEMILUMINESCENCE  
DIAGNOSTICS AND ANTIOXYDANT  
CORRECTION OF THE HEALTH  
DEVIATIONS CAUSED  
BY OXYDATION STRESS**

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Oxidation stress as a misbalance between production and elimination of free radicals in organism is one of the strongest factors reducing body's adaptive potential. The oxidation stress can be initiated by different external determinants such as:

- Lack of antioxidants in food;
- Side pro-oxidant effects of medications and cosmetics;
- Inadequate doses of physiotherapeutic measures (magnet-, UV- and ozone therapy);
- unfavorable working conditions;
- artificial desynchronosis (adjustment to daylight saving and standard time).

Effective protection against environmental risks means a reliable control over the dynamics of the free radical oxidation (FRO) in the oxygen-transporting tissues. Such control can be provided by means of measuring the induced chemiluminescence (CL) in blood cells.

Luminescence as a diagnostic method has been used successfully for a long time. For example, bioluminescence (enzyme-dependant fluorescence) is being used for environmental monitoring. Chemiluminescence (fluorescence resulting of a chemical reaction) is used in medicine to diagnose and prognosticate immune, cardio-vascular and other diseases. At the same time, mass evaluation of healthy people's resistance to the environmental risks with the help of this method, is currently not available despite its obvious advantages for effective prevention and timely (i.e. early) diagnostics of health deviations.

It is proved that the level of CL-response of activated *in vitro* phagocytes of the whole blood equally reflects the adaptive potential of an apparently healthy person (Lesovskaya, 2004). The risk of misbalance between production and elimination of biogenic free radicals under the influence of different aliments, medications, allergens and etc, can be estimated using the Fenton models ( $H_2O_2 + Fe^{2+}$  or  $H_2O_2 + Fe^{2+} + RH$ , lipids). Catalytic decomposition of hydrogen peroxide in the presence of  $Fe^{2+}$  leads to formation of reactive oxygen species, initiating FRO processes. Chemiluminescence occurs in the presence of a luminescent sound

(luminol), which dies out due to the antioxidant activity or becomes stronger under the influence of pro-oxidants in test. This let estimate an initial level of FRO compensatory mechanisms in organism, as well as antioxidant/pro-oxidant potential of nutrients and xenobiotics.

An express, objective and PC-compatible analysis can be carried out using 36-cuvet biochemiluminoscent analyzer «BHL-3606-M» (Special Design-engineering Department "Nauka" of the Krasnoyarsk Science Centre, the Siberian branch of the Russian Academy of Science). FRO assessment is based on parameters  $I_{max}$  (peak height, imp/sec),  $T_{max}$  (peak access time, min),  $S(t)$  (area under kinetic curve or full light sum, million imp),  $a = S_{bas} / (S_{act})$  – basal-activated light sum index;  $tga$  – maximal slope of the curve to the time axis (parameters are calculated automatically).

This approach can be widely used (in human ecology, physiology, clinical and rehabilitation medicine, food and pharmacy industries, education in natural science) and has technical and economic advantages. The ratio of basal to stimulated CL-activity of the cells let range the adaptive reserves of the organism, distinguish and prevent critical conditions, which can lead to pathologies. The method is clear, quick and cost efficient. It allows to reduce several times the input of time and materials when measuring the nonspecific adaptive reactions of human body under the unfavorable conditions.

The following results speak in favor of the effectiveness of this approach. Antioxidant activity of more than 70 biologically active additives was tested; the amount of antioxidants in different food substances (fruit and vegetable juices, milk, milk products and etc) was determined; the range of the phagocyte functional activity in human blood was defined; the risk of FRO because of desynchronosis, emotional, physiological and professional stress was evaluated; safe mode of magnet therapy was determined; the side pro-oxidant effects of medications were revealed. Currently, a scientific verification of essential oil use, based on their antioxidant potential, is under development using standardized chemical and physiological models.

The work was submitted to the International Scientific Conference «Environment and development of the person», Irkutsk, 5-7 July, 2010, came to the editorial office on 20.05.2010.