Sergiy Mazura

Kyiv National University of Technologies and Design

(Kyiv)

Scientific supervisor – PhD Maria Chernets

EFFECT OF ACTIVE PHARMACEUTICAL INGREDIENTS ON SUPEROXIDE DISMUTASE

Introduction. Superoxide dismutase is an enzyme that alternately catalyzes the dismutation of the superoxide radical into either ordinary molecular oxygen or hydrogen peroxide. Superoxide is produced as a by-product of oxygen metabolism and, may cause many types of cell damage. Hydrogen peroxide is also damaging and is degraded by other enzymes such as catalase [1]. Thus, we need a strong antioxidant protection and SOD could play the biggest role in it.

SODs catalyze the disproportionation of superoxide:

$$2\ HO_2 \rightarrow O_2 + H_2O_2$$

In this way, O_2^- is converted into two less damaging species.

The pathway by which SOD-catalyzed dismutation of superoxide may be written, for Cu,Zn SOD, with the following reactions:

$$Cu^{2+}\text{-SOD} + O_2^- \rightarrow Cu^{+}\text{-SOD} + O_2$$

(reduction of copper; oxidation of superoxide)

$$Cu^{+}\text{-SOD} + O_2^- + 2H^+ \rightarrow Cu^{2+}\text{-SOD} + H_2O_2$$

(oxidation of copper; reduction of superoxide) [1]

SOD is necessary because superoxide reacts with sensitive and critical cellular targets. For example, it reacts with the NO radical, and makes toxic peroxynitrite.

There are many medicines which can potentially affect SOD, but most of these effects have not been studied. It could have a positive or negative side effect on the human`s antioxidant system. Therefore, it may contribute to the creation of new medicines, the action of which will be directed specifically to this system.

Materials and Methods. All solutions expect hesperidin were prepared with purified water supplied by Sartorius Arium Pro DI. Hesperidin solution was prepared with dimethyl sulfoxide.

SOD enzyme, dimethyl sulfoxide, human serum albumine, hesperidin, sodium carbonate (Na_2CO_3) and sodium bicarbonate ($NaHCO_3$) were obtained from Sigma-Aldrich (Sigma-Aldrich), Steinheim, Germany.

Epinephrine hydrotartrate (1.8 mg/ml) was obtained from PrJSC "Pharmaceutical Firm "Darnitsa", Kyiv, Ukraine.

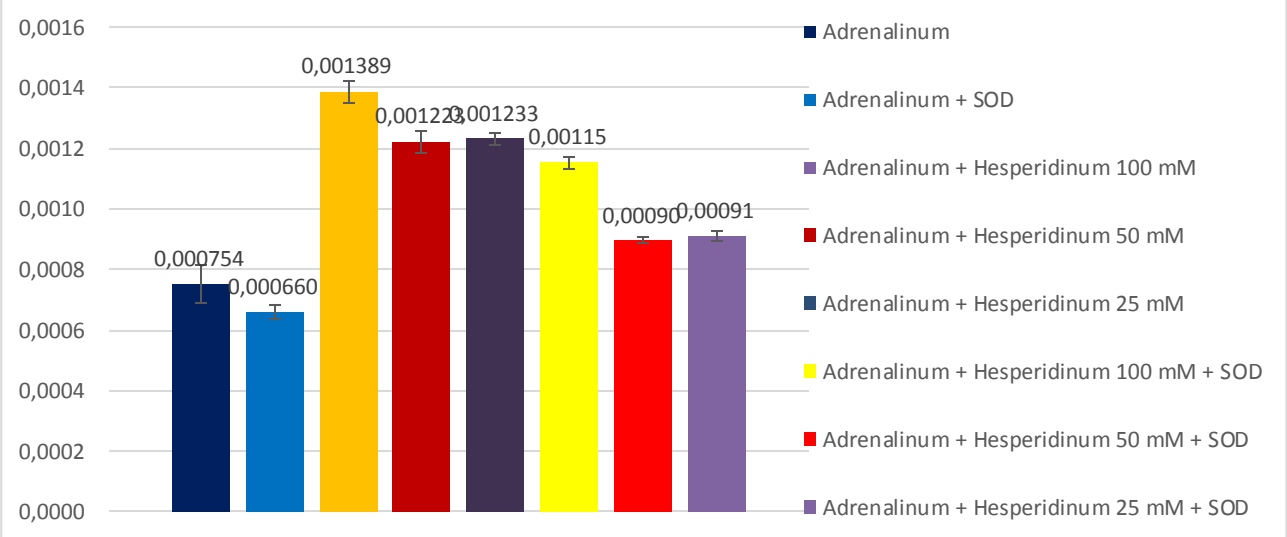
Carbonate-bicarbonate buffer was prepared from sodium carbonate and sodium bicarbonate. pH 10.65.

The stock solution of the hesperidin sample was 100 mM/L; it was then dilated to concentrations of 25 and 50 mM/L and used as standards.

To the solution buffer were added solutions of SOD and hesperidin, then epinephrine hydrotartrate and the optical density was measured on an Optizen pop spectrophotometer [2].

Results. After a small calculation [3], we can conclude that the oxidation rate of investigated concentrations on hesperidin are next: Epinephrine hydrotartrate – 12,5 %, Hesperidin 100 mM – 17,2 %, Hesperidin 50 mM – 26,4 %, Hesperidin 25 mM – 26,2 % (fig. 1).

Figure 1. Oxidation rate



Conclusion. Thus, hesperidine is not only a venotonic but also a human superoxide dismutase activator that can be used in the treatment of diseases

associated with oxidative stress due to the large amount of superoxide and lack of or low activity of this enzyme.

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