

**МІНІСТЕРСТВО ОХОРОНИ ЗДОРОВ'Я УКРАЇНИ  
ВИЩИЙ ДЕРЖАВНИЙ НАВЧАЛЬНИЙ ЗАКЛАД УКРАЇНИ  
«БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»**



## **МАТЕРІАЛИ**

**101 – ї**

**підсумкової наукової конференції**

**професорсько-викладацького персоналу**

**Вищого державного навчального закладу України**

**«БУКОВИНСЬКИЙ ДЕРЖАВНИЙ МЕДИЧНИЙ УНІВЕРСИТЕТ»**

**10, 12, 17 лютого 2020 року**

**Чернівці – 2020**

УДК 001:378.12(477.85)  
ББК 72:74.58  
М 34

Матеріали 101 – ї підсумкової наукової конференції професорсько-викладацького персоналу вищого державного навчального закладу України «Буковинський державний медичний університет» (м. Чернівці, 10, 12, 17 лютого 2020 р.) – Чернівці: Медуніверситет, 2020. – 488 с. іл.

ББК 72:74.58

У збірнику представлені матеріали 101 – ї підсумкової наукової конференції професорсько-викладацького персоналу вищого державного навчального закладу України «Буковинський державний медичний університет» (м.Чернівці, 10, 12, 17 лютого 2020 р.) із стилістикою та орфографією у авторській редакції. Публікації присвячені актуальним проблемам фундаментальної, теоретичної та клінічної медицини.

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ISBN 978-966-697-843-4

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університет, 2020



Thus, alloxan toxic effect was proved to occur not only concerning the pancreas, but also leads to change of the main biochemical processes in hepatocytes, namely, the hepatic protein-synthetic function, which indicates a decrease in the total protein content ( $51.1 \pm 0.85$  g/l) due to the generation of a large number of toxic metabolites, including free radicals, which resulting in development of oxidative stress.

**Gerush I.V.**

### **GLUTATHIONE EFFECT ON HYDROGEN SULFIDE LEVEL IN THE BLOOD BY EXPERIMENTAL NEPHROPATHY**

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The incidence of renal disease has increased steadily in recent years. Structural modifications in the kidney may cause oxidative stress related to an imbalance between free radical production and antioxidant capacity. Free radicals formed with oxidative stress, destroy lipids and proteins on the membranes and cause modifications and oxidation of lipids and proteins thereby damaging cells. Currently, therapeutic options available for managing renal diseases are not quite efficient and therefore, there lies a subsequent need for effective therapies that can prevent progressive damage to the kidneys.

Recent researches show that hydrogen sulfide (H<sub>2</sub>S) via antihypertensive, antioxidative, antiapoptotic and anti-inflammatory mechanisms takes part in the protection of the kidney. And our study was designed to investigate the effect of glutathione on H<sub>2</sub>S level in the blood of rats with experimental nephropathy.

The experiment was conducted on 131 male albino rats with the body weight 0.16 - 0.18 kg. Experimental nephropathy was modeled by injection of a single intraperitoneal dose of folic acid (250 mg/kg, (Sigma-Aldrich)). In order to confirm pathology the kidneys were examined by means of morphometric analysis. Glutathione (Sigma-Aldrich) was introduced daily (100 mg/kg) by intragastric way for 3 and 7 days following after the injection of folic acid. Animals were divided into 5 groups: I – control group (n=36), II – nephropathy (3<sup>d</sup> day (n=25)), III – nephropathy + 3 days of glutathione introduction (n=23), IV – nephropathy (7<sup>th</sup> day (n=24)), V – nephropathy + 7 days of glutathione introduction (n=23). Rats were kept under the standard vivarium conditions at constant temperature and basic allowance. Animals were narcotized with chloroform and sacrificed on the next day after the last glutathione introduction. All manipulations with animals were carried out according to European Convention for the Protection of Vertebrate Animals used for Experimental and Other Scientific Purposes and law of Ukraine “On protection of animals from cruelty”. Plasma concentration of H<sub>2</sub>S was measured using spectrophotometer Agilent Cary 60. The type of distribution was estimated using Shapiro-Wilk test. Significant differences between group were evaluated by using Wilcoxon test with  $p < 0.05$  considered. All the results in figures are represented as median minimum-maximum values (Me[*min-max*]).

H<sub>2</sub>S levels in the blood of rats with nephropathy were lower by 35.5% on the 3d day and by 25.7% on 7 days of the experiment than those in control rats. Blood H<sub>2</sub>S level on 3 experimental day was associated with a specific volume of epithelial cells of proximal tubules of the kidney. In particular, the specific volume of epitheliocytes of proximal tubules in the state of alteration is 84.8%. Oxidation modification of proteins increases (according to the R/B coefficient stained with bromophenol blue for Mikel Calvo). Glutathione increases the level of gasotransmitter by 14.3 % in blood plasma of rats on 3 day and by 11 % on 7 day of the experimental period compared with the group of animals without treatment.

Taken together, our studies show the existence of dependence between the concentration of hydrogen sulfide in the blood and development of kidney disease and confirm protective and antioxidant properties of glutathione.



It has been suggested that glutathione therapy might give helpful results in prevention of first stage development of nephropathy. However, the underlying mechanism of relationships between H<sub>2</sub>S and the antioxidant system warrants further studies.

**Kropelnytska Yu.V.**

**AGGREGATION OF THE SQUARAINE DYES AND ITS INFLUENCE ON THE  
PHOTOGENERATION OF ELECTRIC CHARGE CARRIERS**

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As energy consumption is growing dynamically, the need in new and alternative energy sources becomes more and more acute. The efficiency of new solar energy conversion systems can reach up to 42.3 %. Besides, this energy can also be used in various photochemical and photo-generated processes.

TiO<sub>2</sub> is known as the most suitable semiconducting material for various photocatalytic processes, conversion and accumulation of the solar energy and for numerous environment protection applications such as photodestruction of inorganic and organic pollution agents. The photosensitivity range of TiO<sub>2</sub> can be expanded significantly by application of the special dye-sensitizer. The squaraine dyes are known as prospective candidates for such sensitizers since they can form the H- and J-types associates after application on the semiconductor's surface. These associates manifest themselves through expansion of the shortwave (in case the H-type is formed) or longwave (J-type) absorbance bands.

The inter-molecular interaction occurring inside the organic semiconducting films is an influential factor for successful development of highly effective photoelectric cells since this process is a key actor governing the behavior of excitons and electric charge carriers. That is why investigation of the molecules aggregation remains under strict attention in the field of research and development of the organic photoelectric cells. When the concentration of dissolved dye is high, its molecules can form some associates due to the Van der Waals and electrostatic attraction. In contrary to the chemically bonded dimers (bis-dyes), the above associates can form more complex aggregates bonding more than two molecules. The more molecules are involved in the associated complex, the wider is a gap between the states S<sub>1</sub><sup>h</sup> and S<sub>1</sub><sup>l</sup> because each of these states, in its turn, also becomes wider. This process leads to a more active intercombinational conversion in the multimolecular aggregates comparing to that in the dimers. Besides, the probability of formation of the parallel disposition of chromophores in the multimolecular associates is also increasing. If a dye doesn't consist of any bulky substitutes and its planar structure is not disturbed, the molecules would make mostly the H-type associates of the sandwich-like parallel arrangement of the chromophores, which ensures the maximal stability because of the disperse and specific electrostatic attraction forces between the monomers. If the above conditions are not observed, the H-type associates does not form and the dye would form a less stable "head-tail" type associates with the angles between the chromophores close to 180°. In contrary to the monomer spectrum, only the longwave absorbance band appears in a spectrum of such associates. This is a rarer situation of the J-type aggregation. In this case the molecules form a one-dimensional structure manifesting itself through a stronger absorbance and the significant bathochromic displacement of the J-type absorbance band. The J-type films reveal a deeper light absorption even beyond absorbance zone of the corresponding monomer. This brings the light absorption parameters closer to the natural solar spectrum and, consequently, improves efficiency of the solar light conversion. Besides, the inter-molecular attraction is stronger in case of the J-type aggregation, which brings new opportunities for further advances in optical and electric performance of the thin organic films.

On the basis of analysis of the relevant publications it can be concluded that the squaraine dyes are prone either to the H- or J-type aggregation depending on their structure, chromophore positions and external conditions. The hypsochromic H-type aggregates can be formed on the air/water interphase, inside the Langmuir-Blodgett films or in the water or mixed water-organic