



CONGRESS AND SCIENTIFIC MEETING REPORT /
ИЗВЕШТАЈ СА КОНГРЕСА И НАУЧНОГ СКУПА

Digest of the round table titled “Medicine and engineering: An inexhaustible source of challenges for cooperation between medical doctors and engineers”

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The Academy of Medical Sciences of the Serbian Medical Society (AMS-SMS) and the Academy of Engineering Sciences of Serbia (AESS) have successfully organized the first joint scientific meeting – the round table titled “Medicine and Engineering: An Inexhaustible Source of Challenges for the Cooperation of Doctors and Engineers” held in Belgrade, Serbia on June 24, 2021.

At the opening of the meeting (Figure 1), presidents of the academies greeted the audience and expressed their satisfaction that AMS-SMS and AESS have signed a protocol on cooperation in 2020. Prof. Ljubica Đukanović, the AMS-SMS president pointed out the goals of the meeting as to inform our scientific community about the established cooperation and to illustrate, by several lectures, how wide the cooperation field of engineers and doctors is. Prof. Branko Kovačević, the AESS president, added that the aim of the cooperation is not only to contribute to the multidisciplinary collaboration, but also to undertake activities that would lead to the realization of the appropriate place of national academies in the scientific community of Serbia.

The program of the meeting consisted of five lectures covering different fields of biomedical engineering.

Prof. Dr. Nenad Ignjatović (Institute of Technical Sciences of the Serbian Academy of Science and Arts; AESS) presented the lecture “A bridge over the great challenges in medicine: connecting doctors and engineers” showing the research on calcium phosphate-based nanoparticles designed at the molecular level for use in reconstructive, preventive, regenerative and cancer medicine. Joint teams composed of engineers and medical doctors participated in this scientific research. The synthesized nanoparticles have been successfully used as carriers of vitamins and antibiotics in bone tissue

engineering; as a basis for contrast agents in multimodal imaging techniques; as scaffolds and carriers of stem cells and vehicles for delivery of steroid drugs as well as for targeting breast cancer cells.

Prof. Emeritus Miroљub Adžić (University of Belgrade, Faculty of Mechanical Engineering; AESS) aroused the interest of the audience with his lecture “Lesser-known connections between mechanical engineering and medicine”. He presented research aimed to find a harmless liquid insecticide acting so to physically stop the flight of insects. The focus was on mosquitoes, the main vectors in transmitting vector-borne diseases, which have evolved into brilliant flying machines with exceptional sensors and behavior. The wings and body are hydrophobic due to the specific microstructure. Detailed calculations of flight dynamics, strength and wing deformation under the action of surface stresses depending on physical properties of the applied liquid were performed. Tying at least one drop 0.1 mm in diameter to the mosquito’s wing would disrupt the dynamics of synchronous flapping of the wings and prevent flight, while several droplets attached to the insect’s body block transpiration, with a possible lethal outcome. Based on this knowledge, a multicomponent liquid insecticide exceptionally efficient and safe for living beings was formed, which acts exclusively physically, preventing the flight of insects.

Vladimir Nešić, Senior Embedded Software Engineer at the Institute Mihailo Pupin, Belgrade, delivered the lecture “Application of automation in medicine” presenting the production program in the Institute and the current level of technology applied in power plants and traffic management. Various management segments of thermal and hydroelectric power plants, electrical power transmission, as well as in traffic management were introduced. Special attention was put on examples of development

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Figure 1. Opening of the round table titled "Medicine and Engineering: An Inexhaustible Source of Challenges for the Cooperation of Doctors and Engineers" – the first joint meeting of the Academy of Medical Sciences of the Serbian Medical Society and the Academy of Engineering Sciences of Serbia held on June 24, 2021 (Amphitheater of the Serbian Medical Society, Belgrade, Serbia).

of novel devices at the Institute such as Smart Blot, a device for automatic incubation of western blot membranes, and the first respirator designed and produced in Serbia. It was interesting to learn how the technology used in electricity industry was applied in the development of these devices, which indicated possible future directions in this area. The practice has shown that there are sufficient resources in knowledge and professional staff (medical and engineering) in Serbia for novel biomedical devices invention. However, the main problem is the placement of domestic medical equipment on the market, which is already profited by the world's leading manufacturers.

Prof. Dr. Dragan Dankuc (University of Novi Sad, Faculty of Medicine; AMS-SMS) delivered the lecture "Artificial inner ear" presenting the results of cochlear implantation at the Center for Cochlear Implantation at the Clinic for Ear, Nose and Throat Diseases, Clinical Center of Vojvodina in which the first such successful implantation in Serbia was performed in November 2002. A cochlear implant is an electronic device, which bypasses damaged or destroyed receptor cells and transmits electrical stimulation directly to the fibers of the auditory nerve. Such an implant provides the opportunity for patients with severe-to-profound hearing impairments to hear again, for children to learn to speak and to involve in everyday life

and regular schooling. Today, cochlear implantation is the standard treatment of severe-to-profound sensory-neural hearing loss but it would not have been possible without close collaboration between engineers, neurologists, otorhinolaryngologists, and speech and hearing health professionals.

Prof. Dr. Bojana Obradović (University of Belgrade, Faculty of Technology and Metallurgy; AESS) delivered the lecture "Biomimetic bioreactor systems for tissue and tumor engineering" presenting the main concept and purpose of biomimetic bioreactors, which aim to mimic conditions in tissues and organs *in vivo*. These bioreactors were initially developed for use in tissue engineering in order to stimulate the cells to regenerate functional tissues under *in vitro* conditions. Still, bioreactor cultivation of cells in a three-dimensional environment is also significant for cultures of cancer cells and tumor engineering that is, complex model systems which replicate certain features of the tumor microenvironment *in vivo* ultimately providing faster and more reliable anticancer drug testing and development of personalized medical therapies at reduced animal experimentation. Further, Prof. Obradović presented biomimetic bioreactors developed in her research group and the application of perfusion bioreactors in three-dimensional cultures of osteosarcoma and glioma cell lines in

alginate hydrogels performed in collaboration of engineers and molecular biologists.

Prof. Dr. Dragoslav Stamenković (University of Belgrade, Faculty of Dental Medicine, AMS-SMS) presented in his lecture “Biomedical engineering in dentistry” how the digital revolution in dentistry has enabled support to almost all clinical and laboratory procedures by digital technologies. The progress is evident in various fields of dentistry: medical imaging, data processing, computer-aided production, biomaterials, education and science, as well as in patient record management. Prof. Stamenković illustrated this progress by presenting the results of his scientific research and professional work. It is evident that the increasingly integrated digital technologies in everyday dental practice contributed to faster and more accurate diagnosis of oral diseases as well as more precise, efficient and for patients more comfortable clinical procedures. Just as significant are financial savings and environmental protection.

After the lectures, a discussion with the audience was dedicated to presented results and issues but also to some organizational problems in this area. It was concluded that

regular joint meetings of experts in different fields of biomedical engineering are necessary. The emphasis was put on the fact that the sporadic development and placement of single medical devices on the market do not lead to sustainable economic development. Economic sustainability could only be achieved through the planned development of a complete range of products with the accompanying provision of services. Therefore, it is necessary for the two academies to define strategic development goals in the field of biomedical engineering in cooperation with the competent state institutions. It is also necessary to require recognition and inclusion of educational profiles in biomedical engineering, which have been introduced at several universities in Serbia, in the public sector jobs' catalogue.

The meeting confirmed the justification and importance of the established cooperation between AMS-SMS and AESS, which is expected to contribute better cooperation of doctors and engineers as well as experts in other fields to solve so far unresolved problems in the area of biomedical engineering.

Conflict of interest: None declared.