

Plasma-Medizin in Deutschland und den USA - Wissenschaftliche Herausforderungen und technologische Möglichkeiten

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Event-Zusammenfassung (englischsprachig) einer Podiumsdiskussion über neue Entwicklungen in der Plasma-Medizin in Deutschland und den Vereinigten Staaten, die am 8. Dezember stattfand.

There are currently 42 plasma medicine research groups worldwide, and two of the four leading groups are located in Germany (Max Planck Institute for Extraterrestrial Physics in Garching and the Leibniz Institute for Plasma Science and Technology in Greifswald). The two other leading groups are in the United States (Drexel University in Pennsylvania) and France (University of Orleans).

On December 8, 2010, at the German Center for Research and Innovation, Klaus-Dieter Weltmann, the head of the Leibniz Institute for Plasma Science and Technology, Alexander Fridman, the director of the A.J. Drexel Plasma Institute, and Gary Friedmann, director of the Plasma Medicine and Medical Engineering lab at the Drexel Plasma Institute, discussed the current state and future direction of plasma medicine. Van P. Thompson, chair of biomaterials and biomimetics at the New York University College of Dentistry, spoke about plasma in dental applications. Kurt Becker, Associate Provost for Research and Technology Initiatives and Professor of Physics at NYU-Polytechnic Institute, moderated.

Plasma medicine is an emerging field of research which aims to understand and utilize the interaction of plasmas with living tissues and cells. Practical applications currently being investigated include, among others: inducing rapid blood coagulation; killing bacteria, sterilizing wounds, medical instruments, and implants. "The first international conference for plasma medicine was held in 2006 and the third conference took place in September 2010 in Greifswald," said Kurt Becker in his welcome remarks.

Greifswald is also the home of Campus PlasmaMed, the biggest cluster of plasma medicine in Germany. Nadja Dahlhaus from the INP Greifswald presented the key research topics of the cluster: PlasmaVitro, the biological effects in-vitro testing of plasma sources; PlasmaSources, the characterization, modelling and diagnostics of new sources; PlasmaCure, the healing of chronic wounds and prevention of infections; PlasmaDerm, treatment for inflammatory and infective skin diseases; PlasmaDent, inactivation and removal of biofilms from tooth surfaces; PlasmaImp, the generation of antimicrobial layers and control of cell adhesion, as well as wound healing in veterinary medicine.

Gary Friedmann, whose research focuses on medical applications of plasma, electrostatic and magnetic phenomena, and who co-chaired the first two international conferences on plasma medicine, gave an overview of the research that is being conducted at the A. J. Drexel Plasma Institute. He spoke about the development of plasmas for medical applications, non-thermal plasma within liquids as a “new” type of plasma, novel diagnostic and deep treatment within tissue of plasma in fluids, plasma in nanoparticles, mechanisms of interaction between plasma and animal cells, plasma assisted growth of bones, wound disinfection and blood coagulation.

The Drexel Plasma Institute collaborates with the New York University (NYU) College of Dentistry. In his presentation, Van P. Thompson focused on the applications of cold plasma in dentistry. According to Thompson, handheld non thermal plasma devices will prove very useful. Research objectives at the NYU College of Dentistry include an interest in the longevity of plasma-treated bonding agents, the modification of the enamel surface for cost-effective caries prevention, and an increased bone-implant-integration for plasma-treated implant systems.

Alexander Fridman, who heads the A.J. Drexel Plasma Institute and served as founding President of the International Society for Plasma Medicine (ISPM), addressed the perspectives and challenges of plasma medicine. “Plasma medicine is about healing without damaging,” he said, referring to plasma’s killing power through sterilization. He confirmed the field’s possibilities and opportunities, but stated that the language barrier between physics and medicine needs to be overcome first. An additional challenge is the lack of detailed clinical tests to rule out long-term negative effects, especially at the genetic level.

According to the current ISPM-President, Klaus-Dieter Weltmann, “plasma can be a more powerful tool than a laser.” At the INP Greifswald, key results have already been achieved in the areas of PlasmaCure, PlasmaDerm, and PlasmaVitro. Other plasma health care applications can be found in a number of areas, such as public, professional and personal hygiene; medicine and biology; pharmacology, and plasma application in cosmetics and wellness. For 2011, Weltmann announced the establishment of the world’s first plasma medicine professorship in Greifswald.

“The field of plasma medicine is new, with huge chances for medicine. Due to its significant research potential, it is broad enough to promote co-operations and offers an opportunity for plasma technology,” he summarized. All speakers agreed that possible plasma treatments still require acceptance through successful clinical trials for well-controlled and reliable long-term medical effects. Cost-effectiveness also still needs to be evaluated.

For more information about the German Center for Research and Innovation (GCRI), please visit www.germaninnovation.org. For more information about the Leibniz Institute for Plasma Science and Technology (INP Greifswald e.V.), please visit www.inp-greifswald.de. For more information about the A.J. Drexel Plasma Institute, please visit www.plasmainstitute.org, and for more information about the NYU College of Dentistry, www.nyu.edu/dental.

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