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Recent Researches in Environment and Biomedicine

Proceedings of the 3rd International Conference on Geography and Geology (GEO ‘12)

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Plenary Lecture 1

Biosensors in environmental monitoring – State-of-the-art and perspectives

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Abstract: Environmental pollution monitoring and risk assessment currently lies on small-scale field measurements and extrapolations that provide rough estimates of pollution levels and impacts without the potential to make timely diagnosis or early warning. The systematic monitoring of environmental quality parameters is not an easy task technoeconomically, especially when it runs within the scope of producing a detailed and exact picture of the environment dynamics with a view to estimating the impact of pollutants that are expected to enter the ecosystem in the time course, and the cost and effect of the clean-up measures. Working towards such an objective, Nature should be considered in technology terms, modelling its capabilities, specifications, mechanisms, processes, tools, and functions, allowing for biosensors to assume their traditional role of confining natural chemoreception within a device context. Biosensors have been proposed for environmental analysis and screening in early 1990s, on the premises of such advantages and capabilities as high specificity and sensitivity (inherent in the particular biological recognition assay), in situ long-term monitoring with compact small-sized devices, analysis of small-volume samples, and simultaneous selective detection of many substances using multi-array systems. Owing to the high absorptive capacity and transdisciplinarity of biosensor technology, this sector grasped rapidly the breakthroughs in nanotechnology and bioinformatics, offering now the possibility of determining not only specific chemicals but also their biological effects, such as toxicity, cytotoxicity, genotoxicity or endocrine-disrupting effects, i.e., relevant information that, especially in the case of environmental risk assessment, is more meaningful than the concentration of the pollutant itself; they can provide, also, both total and bioavailable/bioaccessible pollutant concentrations, while advanced microfabrication techniques have facilitated the integration of diverse sensor functionalities on the same chip, making system production and automation more convenient. Possibilities and prospects on building tailored micro- or nano-sensors for environmental applications are enormous. In this paper, the current state-of-the-art of environmental biosensors is extensively reviewed under technoeconomic criteria, while certain environmental parameters that should be contemplated in future biosensing strategies are discussed, putting emphasis on specific case examples, drawn for the various projects carried out in the Laboratory of Simulation of Industrial Processes.

Brief Biography of the Speaker:
Dr. C. Siontorou holds a BSc (Hons) in Biomedical Sciences from the University of Sunderland (UK) and a PhD in Analytical Chemistry (2000) from the University of Athens. She worked as a pharmaceutical enterprise consultant on drug development/validation and regulatory affairs (1998-2004) Since 2003, she serves at the Department successively as adjunct lecturer, Lecturer, and now underway for the position of Assistant Professor, specializing in the “Design/Development of Chemical Technology Products”. Her research interests include: biosensors; nanosensors; multi-arrays; environmental metrology; environmental management; product design; design of field detectors; industrial process biosensing; expert systems; fault diagnosis; knowledge management; technology management; knowledge transfer systems; ontology design. She has 32 publications in highly rated ISI journals and 35 in conference proceedings (of IEEE, CHISA, European Biosensor Society, European Biomass Conferences, etc.) 221 ISI citations and an h-index of 14 (source: ISI Web of Science, Thompson Scientific; self-citations have been excluded). She has recently received the 5th-place award in the 1st i-Bank Innovation & Technology Competition (National Bank of Greece) on the significance of her work on environmental monitoring for the Greek regional development.
Plenary Lecture 2

Mast Cells and Histamine in the Pathophysiology of Diabetic Placenta

Prof. Dariusz Szukiewicz

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Abstract: Human placental tissue contains relatively high amounts of histamine (HA) accumulated mostly in the vesicular structures of mast cells (MC). On the basis of neutral protease composition, human MC have been classified into two phenotypes: MCT (tryptase–positive, chymase–negative MC) and MCTC (tryptase–positive, chymase–positive MC). Degranulation of MC releases locally numerous vasoactive, angiogenic and proinflammatory mediators in addition to HA. The role of placental MC and MC-related mediators in normal course and complicated pregnancies are still under investigation. Accumulated data indicate that inflammatory-like processes and changed angiogenesis observed in diabetic placenta may be caused by an imbalance between tissue needs and availability of the MC-related mediators. This presentation, based on author’s own scientific experience and the results of others, considers placental MC number and their heterogeneity (MCT/MCTC ratio), HA concentration in placental tissue, density of the network of placental vessels, and histamine H1, H2 and H4 receptors expression, with respect to the pathophysiology of diabetic placenta. Analyzed material was limited to the class C of diabetes in pregnancy (after White), the last stage without recognized vascular changes. The results showed that in diabetes class C increased density of the villous network of vessels correlates with both significantly (p < 0.05) higher MC number and increased HA concentration. MCT/MCTC ratio was higher (p < 0.05 in diabetic pregnancy as well as the immunoreactivity for H4. In conclusion, overview of the results may lead to the suggestion that MC and HA contribute to abnormal function of the placenta in diabetes class C.

Brief Biography of the Speaker:
Dr. Dariusz Szukiewicz is Professor of Medicine and Head of the Department of General and Experimental Pathology at the Medical University of Warsaw, Warsaw, Poland. He is Pathophysiologist and specialist in Obstetrics and Gynecology. He received his medical degree from the Medical University of Warsaw, and completed his Residency and Obstetrics/Gynecology Fellowship at the Medical Centre of Postgraduate Education, Warsaw, Poland. Development of his professional career included long term scholarships in the Institute for Basic Research in Developmental Disabilities (IBR), Staten Island, New York, USA and Department of Endocrinology & Reproduction at Erasmus University of Rotterdam, The Netherlands. He is teaching at the interfaculty courses for medical students (topic: Pathophysiology of the Reproductive System) as well as at postgraduate courses for doctors (topic: The Pathophysiology of Pregnancy), both running by the Medical University of Warsaw. Research profile of prof. Szukiewicz is focused on mast cells and their mediators in placental tissue. Based on self-constructed apparatus, he developed the original method of in vitro perfusion of the isolated placental lobule. He also significantly modified a computerized technique for quantitative morphometry. He has published over 100 scientific papers, 10 book chapters, and over 150 conference abstracts.

He is an active member of The American Physiological Society (Teaching and Endocrinology Sections), European Histamine Research Society and Vice-president of The Polish Histamine Research Society. As an internationally recognized expert on placentology and histaminologist he serves on various Grant Review Committees and Editorial Boards worldwide.