## You are invited to the Biophysics Seminar by

# Tadeusz Sarna

Department of Biophysics, Jagiellonian University, Krakow, Poland

**Tuesday, March 19h at 14:00**

**Physics Department, Seminar Room (3rd floor)**

## Photodynamic therapy of bacterial infections

We have recently demonstrated the paradoxical potentiation of antibacterial PDT activity of methylene blue (MB) by azide, the known singlet oxygen quencher and scavenger of hydroxyl radicals. Interestingly, azide allowed MB-PDT bacterial killing even in the absence of oxygen. In a most recent study, we have observed that thiocyanate, another pseudohalide, which interacts efficiently with hydroxyl radicals, also enhanced the methylene blue-mediated PDT efficacy against Gram-positive and Gram-negative bacteria. Antimicrobial PDT efficiency is of considerable importance, particularly in view of the increasing pervasiveness of antibiotic resistant bacteria. This paper is concerned with the photochemical mechanisms of key processes that might be responsible for the potentiating effects of the pseudohalides.. The MB-photosensitized formation and decay of singlet oxygen was measured by time-resolved phosphorescence at 1270 nm. The formation of superoxide anion, azide and sulfur trioxide radicals was monitored by electron paramagnetic resonance (EPR)-spin trapping using DMPO as a spin trap. Progress of photosensitized oxidation reactions was monitored by EPR-oximetry. In the presence of high concentration of azide, the photoexcited MB predominantly generated relatively long-lived azidyl radical responsible for oxidative damage. On the other hand, singlet oxygen, generated in the presence of high concentration of thiocyanate, converted this pseudohalide to the oxidizing sulfur trioxide radical. Our study suggests that in the presence of pseudohalides, the MB-photosensitized killing of bacteria is mediated by mildly oxidizing radicals formed directly by photosensitized electron transfer or indirectly via the interaction with singlet oxygen.