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The use of boronate probes for the detection of reactive oxygen and nitrogen species

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During the last forty years a tremendous progress in the understanding of the biological chemistry of reactive oxygen and nitrogen species (RONS) has been done. Now it is commonly accepted, that overproduction of RONS (e.g. superoxide, hydrogen peroxide and peroxynitrite) plays an important role in a variety of pathological processes. Due to the high reactivity of reactive oxygen and nitrogen species resulting in their short half-life and rapid scavenging in biological systems, the direct detection of intracellular RONS is impossible.

In the middle of past decade boronate-based fluorogenic probes have been proposed as a tool for the detection of hydrogen peroxide. Detection of H_2O_2 with the use of those probes is based on the oxidative conversion of weakly fluorescent boronates into strongly fluorescent phenolic products. Recently it has been shown that boronic acids and their esters react directly with peroxynitrite a million times faster than with hydrogen peroxide, and corresponding phenols are formed as the major products. The reaction mechanism of the peroxynitrite-derived oxidation of boronic acids has been described in details. It has been proposed that fluorogenic probes with boronate groups may be used in the detection of peroxynitrite, and some of those probes have been successfully used for that purpose in enzymatic and cellular systems.

Biography

Adam Sikora has completed his PhD from Lodz University of Technology and postdoctoral studies from Medical College of Wisconsin. He is currently an Associate Professor in the Institute of Applied Radiation Chemistry at Lodz University of Technology. His research interests focus on the biological chemistry of reactive oxygen and nitrogen species and the development of methods for their detection.

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