Reactive Sulfur Species: From natural product research to applications in Medicine and Agriculture

Uma M.Viswanathan[1,2], Brigitte Czepukojc[1], Thomas Schneider[1], Torsten Burkholz[1], Claus Jacob[1], Shiraz Markarian[2]

[1]Division of Bioorganic Chemistry, School of Pharmacy, Saarland University, Building B 2.1, Campus, D-66123 Saarbruecken, Germany,[2]Chair of Physical and Colloids Chemistry, Department of Chemistry, Yerevan State University, Yerevan, Armenia, u.viswanathan@mx.uni-saarland.de.

The complex chemistry with exciting biological activities, polysulfanes forms a class of compounds which are opening interesting research area in the sulfur chemistry. These elixir compounds are found naturally in edible plants especially in the *allium* species, these agents are also of considerable interest in the field of chemoprevention, therapy and in the development of natural, eco-friendly pesticides.

Intracellular thiolstat, a pivotal regulatory element responsible for numerous 'life and death' decisions are being interfered by the polysulfanes which are redox active. These redox interactions include direct S-thiolation and regulation of key enzymes. Thus via the formation of superoxide radical anions, redox interactions like regulation of key enzymes and S-thiolation are proved to take place. Our recent research was focused on bio-chemistry of these substances either in their naturally existing forms or with its mimicking derivatives which could even overtake these readily available ones and in turn may form the basis for future drug development.

At the same time, the polysulfane motif enables rather strong interactions with the metal centers of metallo-proteins which are proved by spectroscopic measurements, while the inherent lipophilicity and unusual helical structure of the S-S-chain facilitates interactions with membranes and hydrophobic parts of proteins and enzymes. Ultimately, these interactions allow various polysulfanes to act fairly selectively against certain cells, such as cancer cells under oxidative stress. At the same time, organisms with a poor antioxidant defense, such as Plasmodia, various fungi and certain nematodes seems to be also affected.

References

*[1] C. Jacob, Biochem. Soc. Trans., **39**, 1247-1253 (2011).*
*[2] M. Doering, L.A. Ba, N. Lilienthal, C. Nicco, C. Scherer, M. Abbas, A.A. Peer Zada, R. Coriat, T. Burkholz, L. Wessjohann, M. Diederich, F. Batteux, M. Herling and C. Jacob, J. Med. Chem., **53**, 6954-6963 (2010).*
[3]Uma M. Viswanathan, B. Czepukojc, A. Raza, S. Ali, T. Burkholz, C Jacob, DOI: 10.1080/10426507.2012.746691
[4] Shiraz A. Markarian, Mikayel G. Aznauryan, Molecular Biology Reports, 39, 7559-7567 (2012).