Editorial

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Dynamics of thiol-based redox switches: redox at its peak!

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In 2014, the Deutsche Forschungsgemeinschaft (DFG) established the Priority Program ‘Dynamics of Thiol-based Redox Switches in Cellular Physiology’. This allowed more than 30 investigators to work in a close-knit network (Figure 1) to study fundamental questions of redox biology, in a broad variety of model systems and physiological contexts. The unifying idea for this research consortium was the concept of ‘thiol-based redox switches’, oxidative posttranslational modifications that adapt protein function to physiological needs. After having run for over six years, the program is now about to conclude.

When the priority program was first established, new and pathbreaking research tools had just become available. One prominent example are the genetically encoded redox probes. These enabled highly specific observations of intracellular redox species (such as hydrogen peroxide or glutathione) with unprecedented temporal and spatial resolution, in a non-disruptive manner, i.e., in living cells and whole organisms. Measurements with such probes in individual subcellular compartments revealed that several long-held beliefs and concepts about intracellular redox conditions were in need of revision (Schwarzlander et al. 2016). These insights, together with many more innovations, from advanced redox proteomics to genome editing, paved the way for the many advances that happened over the last couple of years, many of them with substantial contributions arising from within the priority program.

This Highlight Issue of *Biological Chemistry* assembles 11 review articles, written by members of the consortium.

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It serves as a report to the DFG but is also an opportunity to showcase the breadth of the ‘thiol switch’ concept to a wider life science audience. The articles span the gamut of model organisms (Linzner et al. 2021; Meyer et al. 2021; Wittmann et al. 2021), describe manifold and often complex protein thiol modifications (Pedre and Dick 2021; Ulrich et al. 2021), their impact on cellular functions (Barbarino et al. 2021; Buday and Conrad 2021; Herrmann and Riemer 2021; Lorenzen et al. 2021), converging on systemic processes as diverse as host-pathogen relationships (Varatnitskaya et al. 2021) and embryonic development (Breus and Dickmeis 2021).

There can be little doubt that this priority program has been highly efficient in enabling new and lasting collaborations, across specialties and model organisms, and highly successful in driving the field forward. This has been made possible because the DFG is dedicated to the funding of basic research and transdisciplinary exchange.

Also essential for the success of the priority program was the close interaction with leading redox biology scientists outside of Germany who served both as friends and critical referees for the program. We are very grateful to the DFG that they encouraged and supported these international contacts, for example by funding international conferences beyond the borders of the priority program. Finally, we wish to thank the authors for contributing to this exciting collection of articles and De Gruyter for making it possible, after a first Highlight Issue in 2015, to publish another thematic issue devoted to redox biology.

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Figure 1: This Highlight Issue presents a collection of review articles written by members of the priority program ‘Dynamics of Thiol-based Redox Switches in Cellular Physiology’ which was funded by the DFG von 2014–2020. The photograph shows the members of this consortium at their annual meeting in 2018, held in Berlin. The drawing (lower left) by Carsten Berndt (University of Düsseldorf) emblemizes the central role of thiol redox modifications in all of biology.

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