

Guest Editorial

Antje Ebert*

Signal transduction in health and disease

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Signal transduction is essential for maintenance of balanced cellular functions. The complexity of communication within the cell and with the extracellular space implies a dissection of signaling at the macro-molecular and nanoscale levels to explore its mechanistic functions. In the past decades, remarkable progress has been made in this research area, providing insights into the diversity of signaling mechanisms and their regulation in cells.

Signaling circuits reach from the extracellular space through the plasma membrane into the diverse organelles or vice-versa, allow for intra-organellar communication, and elicit a variety of specific cellular responses. Long-standing interest in these processes has revealed various layers of signal transmission occurring in different ways, such as electrochemically or mechanically, via post-translational modification of proteins, especially receptors or ligands, etc. To date, entire pathway networks are mapped, and their constitutive activation, inhibition, or interconnection is

frequently regulated at the genetic level. These achievements allowed further insights into the regulation of central mechanisms in signal transduction such as growth and survival of healthy as well as malign cells.

Recently, signal transduction has rapidly evolved to reveal additional functions like the role of epigenetic- or lipid-based modifications. An area of particular focus has been to explore how disease-specific signaling is mediated and regulated at the molecular level. Of note, substantial progress in genome and proteome analysis has catalyzed this transformation, enabling a new magnitude of exciting discoveries in signal transduction. Together, these advances not only enriched our insights into signal transduction, but also outline the directions ahead in order to further advance our understanding of molecular signaling functions. In this context, the current Highlight Issue of *Biological Chemistry* – Signal Transduction in Health and Disease – covers a range of state-of-the-art topics from gene regulation and protein modifications to metabolism as well as potential modifiers of these processes.

*Corresponding author: Antje Ebert, Heart Research Center Goettingen, Department of Cardiology and Pneumology, University Medical Center Goettingen, Georg-August University of Goettingen, Robert-Koch-Strasse 40, D-37075 Goettingen, Germany; and DZHK (German Center for Cardiovascular Research), Partner Site Goettingen, Goettingen, Germany, E-mail: antje.ebert@med.uni-goettingen.de. <https://orcid.org/0000-0002-3642-242X>