

Preface

Gasotransmitters are real and exist everywhere in our body. Gasotransmitters are unique and specifically regulate biological functions. Gasotransmitters are novel signaling gas molecules we cannot live without.

Since its inception in 2002 (R. Wang, Two's company, three's a crowd—Can H_2S be the third endogenous gaseous transmitter? *FASEB J.*, 2002, 16, 1792–1798), the concept of 'gasotransmitters' has been widely accepted and applied in different life-science disciplines. The initial members of the gasotransmitter family included nitric oxide (NO), carbon monoxide (CO), and hydrogen sulfide (H_2S). This concept has continuously evolved and been refined with the inclusion of new members, such as ammonia (NH_3) (R. Wang, Gasotransmitters: Growing pains and joys, *Trends Biochem. Sci.*, 2014, 39, 227–232¹). The birth and growth of the gasotransmitter framework have deepened our understanding of cellular signaling processes and led to the discovery of new pathogenic mechanisms and therapeutic strategies for related diseases. Research on gasotransmitters has also gone beyond the boundaries of mammalian biology and medicine. The production and function of gasotransmitters in plant and bacteria, for example, have attracted the attention and stimulated the interest of numerous research teams and researchers worldwide.

Over the last 15 years, the gasotransmitter literature has exponentially grown. Each year, about 15 000 papers are published on gasotransmitters. A recent study revealed that, before 2004, H_2S biology-related publications were less than 100 per year. By 2015, the annual publications on H_2S biology-related research had increased by about seven-fold (G. Yang and L. Wu, Trends in H_2S biology and medicine research—A bibliometric analysis,

¹Note: This seminar paper framing the concept and establishing the qualification standards for gasotransmitters has been reprinted as an appendix of this book.

Molecules, 2017, 22, 2087). This publication trend also applies to other gasotransmitters, calling for the synthesis and analysis of the current knowledge on gasotransmitters. Several books have also been published on specific and selective topics of 'gasotransmitters'. Examples include the signal transduction mechanisms of gasotransmitters (*Signal Transduction and the Gasotransmitters: NO, CO, and H₂S in Biology and Medicine*, ed. Rui Wang, Totowa, Humana Press, 2004) and the ion-channel regulation by gasotransmitters (*Gasotransmitters: Physiology and Pathophysiology*, ed. Anton Hermann, Guzel F. Sitdikova, and Thomas M. Weiger, Springer, 2012). A book specifically designed to cover the production and function of all gasotransmitters, established or explored, from mammalian to plant cells is urgently needed but not available yet.

This book published by the Royal Society of Chemistry, UK, will be the first one to discuss the structurally independent but functionally intertwined molecular and cellular events related to gasotransmitters. It is also the first book to thoroughly discuss the roles of the gasotransmitters identified so far in the gasotransmitter signalling network. The conceptual advances, scientific discoveries, and newly developed techniques described in this book will have an impact on our understanding of fundamental molecular and cellular events in biology and medicine.

The synthesis of gasotransmitters by living cells shares common mechanisms although with distinct substrates and enzymes. Many proteins produce gasotransmitters, whereas others use them to perform various functions. Some proteins can even produce and use the same gasotransmitters. How is the gasotransmitter production regulated? How do gasotransmitters interact with each other? How can the sensitivity and specificity of detection of endogenous gasotransmitters be improved? Such questions have not been adequately addressed to date and this book has been specially prepared for the readers to find the answers or clues to the answers.

In conclusion, our understanding of the biological importance of gasotransmitters has been significantly improved over the last 15 years. "We are what we smell" in the case of H₂S and NH₃, and "we are what we do not smell" in the case of NO and CO (R. Wang, We are what we smell—not only rotten eggs, *Lab. Invest.*, 2006, 86, 323–325). The discovery of more members of the gasotransmitter family and the effective and efficient regulation and control of their production and function will open a new horizon for health management and disease prevention and treatment.

Enjoy the book!
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