

Preface

The latest progress in the field shows that NO is generated within distinct cell compartments, including specific plasma membrane regions, mitochondria, chloroplasts, peroxisomes, the Golgi-complex and intracellular membrane systems. NO synthesis plays specific roles in these compartments and, in turn, cell organelles also control intracellular NO levels. NO is an important biological signal, but a highly reactive molecule as well; thus its biological effects depend on its concentration and the chemical microenvironment of NO synthesis. A key determining factor of cellular NO effects is the subcellular compartmentalization of NO synthesizing enzymes.

To understand the role of cell compartments in NO biology, we may make an everyday analogy: the energy of fire, which can be used for heating in a fireplace or for lighting with a candle. The same factor (the energy of the fire) is required in different quantities in a fireplace and in a candle, to serve different needs. Organelles determine the effects of NO in a similar way, since they produce and tolerate different levels of NO in spatially separated locations in the cell. Organelles effectively control and maintain NO levels within a physiological range and orchestrate temporal and spatial patterns of NO synthesis. Disturbances of this organelle-specific NO homeostasis evoke cellular degeneration.

The rapid development and complexity of subcellular NO biology made it timely to produce a book dedicated to the better understanding of NO in organelle biology and the molecular mechanisms by which cell compartments give home to NO-signaling microdomains and ensure balanced NO production.

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