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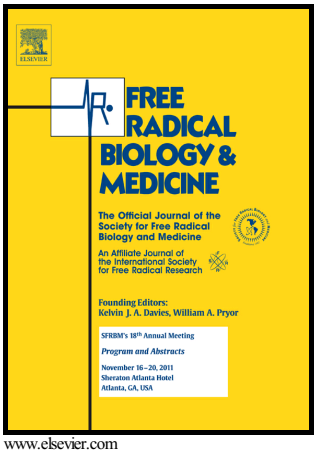

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Small-molecule luminescent probes for the detection of cellular oxidizing and nitrating species

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Abstract

Reactive oxygen species (ROS) have been implicated in both pathogenic cellular damage events and physiological cellular redox signaling and regulation. To unravel the biological role of ROS, it is very important to be able to detect and identify the species involved. In this review, we introduce the reader to the methods of detection of ROS using luminescent (fluorescent, chemiluminescent, and bioluminescent) probes and discuss typical limitations of those probes. We review the most widely used probes, state-of-the-art assays, and the new, promising approaches for rigorous detection and identification of superoxide radical anion, hydrogen peroxide, and peroxynitrite. The combination of real-time monitoring of the dynamics of ROS in cells and the identification of the specific products formed from the probes will reveal the role of specific types of ROS in cellular function and dysfunction. Understanding the molecular mechanisms involving ROS may help with the development of new therapeutics for several diseases involving dysregulated cellular redox status.

Keywords: reactive oxygen species; fluorescent probes; chemiluminescent probes; bioluminescent probes; superoxide; hydrogen peroxide; peroxynitrite

1. Introduction

Experimental research in the field of redox biology requires the use of probes and rigorous assays for cellular oxidants [1-4]. A wide range of chemical probes has been designed and applied for the detection of the oxidants, with new probes constantly being developed and reported [5-18]. However, some of those reports provide contradictory statements, *e.g.*, related