



Editorial

Critical Methods in *Free Radical Biology & Medicine*

The editors of *Free Radical Biology & Medicine* have had an ongoing discussion about the importance of establishing standards for methods used in the field. One constant issue is the measurement of ephemeral reactive species for which the specificity of methods and the quantification of the species present problems that are not easily resolved. Yet, the need for measurement has resulted in the development and broad use of methods that are far from ideal but have become accepted by a large number of investigators as adequate for the task. The inherent problems in this state of affairs was addressed in a review by Wardman, which suggested a way to improve these measurements [1]. The editors decided, however, that what was needed was a more prescriptive remedy, which a set of articles providing standard methodologies with caveats explaining the limits of the methods and interpretation of results could provide. Whereas some articles in this volume provide methods for the measurement of reactive species, most concern methods for the measurement of other important parameters in studies of oxidative or nitrosative stress and redox signaling. Recognizing that refinement of these methods and advances in our field will continually need new methods, the goal of this compendium of Critical Methods is to provide the current standards for methods in our field. The articles here have all been published in the past couple of years. Although they are gathered here, citations should actually be made to the articles' original publication dates.

One group of articles concerns the measurement of reactive species. Zielonka and coworkers [2] describe a method for the measurement of superoxide. Bryan and Grisham [3] and Khramtsov and coworkers [4] describe different methods for the measurement of nitric oxide and its derivatives. Methods for the study of hydrogen sulfide are described by Moore [5].

A second group of articles describes methods for the measurement of protein and/or DNA modifications. Higdon and coworkers [6] describe methods for the measurement and imaging of proteins modified by reactive lipids. Different detection methods for oxidized proteins are described by Akagawa and coworkers [8] and Hawkins and coworkers [7]. Measurement of the turnover of oxidatively modified proteins is described by Catagol and Grune [9]. An article by Gomez-Mejiba and coworkers [10] describes measurement of protein radicals as well as DNA radicals. Jaruga and coworkers [11] describe the measurement of formamidopyrimidines in DNA.

Thiols and protein thiol modification are the subject of a third group of articles. Higdon et al. [12] describe methods for protein thiol modification in general, whereas Forrester and coworkers [13] describe methods for detection of protein S-nitrosylation. An article by Jones and Liang [14] describes the measurement of thiol redox couples.

The final group of reviews concerns measurement of oxidative stress. A mouse model of ischemia-reperfusion is described by Abe and coworkers [15]. Liu and coworkers [16] describe measurement of isoprostanes.

These articles, which were all submitted by invitation, represent the beginning of *Free Radical Biology & Medicine's* goal of providing the standard methods that should be used for articles submitted to the journal. We realize that new and improved methods will continually be developed and now welcome the submission of such critical methods articles that should follow the format used in these 16 Critical Methods articles.

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