

## The Total ORAC Program

### Total ORAC<sub>SC</sub> and Why All 5 Radicals Matter

#### Key Points:

- There are a variety of “free radicals” that operate in humans – the most important of which are the primary radicals hydroxyl, peroxy, peroxynitrite, singlet oxygen, and superoxide anion
- These radicals are formed, behave, and are defended against differently
- They all contribute to (1) a general condition called “oxidative stress,” or cellular damage, and (2) broad human health concerns caused, for example, by inflammation, DNA and protein damage
- They are each implicated in different health problems – from cardiovascular disease to macular degeneration and Alzheimer’s disease
- They are directly linked to skin damage and aging

#### Q: Is peroxy the most important radical, or the one that best measures antioxidant capacity?

A: While peroxy is an important radical, and was as good a starting spot for developing a single ORAC assay, it is not *more important* than the other primary radicals. From a commercial standpoint, it was first to market and has gained use and recognition. Brunswick Labs has always stated clearly that peroxy ORAC is a representation of antioxidant capacity; it does not measure complete or comprehensive antioxidant capacity; it is not a “universal” antioxidant measurement.

#### Q: What do you mean by “universal” measurement?

A: We mean that peroxy ORAC favors certain antioxidants that work better against the peroxy radical. For example, compounds such as anthocyanins in the flavonoid family quench peroxy better than compounds such as lycopene in the carotenoid family.

#### Q: Why should I test against hydroxyl or other radicals?

A: For the same reason that a health checkup measures blood pressure, cholesterol, PSA (for men), and a mammogram (for women). The following descriptions demonstrate the important differences between the radicals and their roles in human health concerns.

Premium antioxidant products are often a complex matrix of compounds that come from diverse natural sources. Such products are likely to have broad-spectrum antioxidant potential and are ideally suited to Total ORAC<sub>SC</sub>.

#### Q: Can you describe how the other radicals are different from peroxy?

A: Hydroxyl. Hydroxyl is highly reactive and cannot be eliminated by our endogenous enzymes (such as SOD and glutathione). It can damage virtually all types of macromolecules: carbohydrates, nucleic acids, lipids, and amino acids. In the skin, hydroxyl radicals are created by UV exposure.

Peroxynitrite. Peroxynitrite is a reactive nitrogen species that is particularly harmful to proteins. It has been implicated in the development of certain cancers, hepatitis, and chronic inflammation. In the skin, peroxynitrite contributes to the breakdown of vital proteins, such as collagen.

Singlet Oxygen. In the skin, singlet oxygen is generated by UV. In vivo, it is linked to the oxidation of LDL cholesterol and cardiovascular disease. Singlet oxygen is highly unstable and durable. Carotenoids are very effective at scavenging singlet oxygen.

Superoxide anion. Superoxide anion is a precursor of all other reactive oxygen species – sometimes referred to as “the mother of free radicals.” It is highly toxic and contributes to lipid and DNA damage. Antioxidants that scavenge superoxide anion also help prevent the formation of radicals such as hydrogen peroxide and hydroxyl. Superoxide anion has been linked to hypertension and cardiovascular damage.