

03/27/2017

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## Certificate of Analysis

**Customer: JSF Technologies****Sample Identification:**

Batch #: B-15364a

BL ID #: 17-0160

Description: Formula 23 (Enteley), liquid, 0221175

Date Received: 03/22/2017

**Results:**

Analysis	Result	Units
ORAC against peroxy radicals	1,368.75	µmole TE/milliliter
ORAC against hydroxyl radicals	3,909.42	µmole TE/milliliter
ORAC against peroxy nitrite	64.38	µmole TE/milliliter
ORAC against super oxide anion	56.92	µmole TE/milliliter
ORAC against singlet oxygen	172.30	µmole TE/milliliter
ORAC against hypochlorite	976.61	µmole TE/milliliter
ORAC 6.0 (sum of above)	6,548.38	µmole TE/milliliter

There are six predominant reactive species found in the body: peroxy radicals, hydroxyl radicals, peroxy nitrite, super oxide anion, singlet oxygen and hypochlorite. ORAC 6.0 provides a measure of the total antioxidant power of a food/nutrition product against the six predominant reactive species.

The ORAC result is expressed as micromole Trolox equivalency (µmole TE) per gram.

**References:**

- [1] Ou, Boxin, Maureen Hampsch-Woodill, and Ronald L. Prior. "Development and validation of an improved oxygen radical absorbance capacity assay using fluorescein as the fluorescent probe." *Journal of agricultural and food chemistry* 49.10 (2001): 4619-4626.
- [2] Huang, Dejian, et al. "Development and validation of oxygen radical absorbance capacity assay for lipophilic antioxidants using randomly methylated  $\beta$ -cyclodextrin as the solubility enhancer." *Journal of Agricultural and Food Chemistry* 50.7 (2002): 1815-1821.
- [3] Ou, Boxin, et al. "Novel fluorometric assay for hydroxyl radical prevention capacity using fluorescein as the probe." *Journal of Agricultural and Food Chemistry* 50.10 (2002): 2772-2777.
- [4] Dubost, N. Joy, Boxin Ou, and Robert B. Beelman. "Quantification of polyphenols and ergothioneine in cultivated mushrooms and correlation to total antioxidant capacity." *Food Chemistry* 105.2 (2007): 727-735.
- [5] Zhang, Liliang, et al. "Novel high-throughput assay for antioxidant capacity against superoxide anion." *Journal of agricultural and food chemistry* 57.7 (2009): 2661-2667.
- [6] Ou, Boxin, Dejian Huang, and Maureen H. Woodill. "Method for assaying the antioxidant capacity of a sample." U.S. Patent No. 7,132,296. 7 Nov. 2006.

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**ORAC 6.0 Method Description:**

Oxygen Radical Absorbance Capacity (ORAC) tests are among the most acknowledged methods that measure antioxidant scavenging activity against oxygen radicals that are known to be involved in the pathogenesis of aging and many common diseases. ORAC 6.0 consists of five types of ORAC assays that evaluate the antioxidant capacity of a material against five primary reactive oxygen species (ROSs, commonly called "oxygen radicals") found in humans: peroxy radical, hydroxyl radical, superoxide anion, singlet oxygen, and peroxynitrite. This is a comprehensive panel that evaluates the antioxidant capacity of a material against oxygen radicals.

The ORAC 6.0 tests are based on evaluating the capacity of an interested material to protect a probe (a fluorescent probe or chromagen) from its damage by ROSs. In all ORAC assays, an ROS inducer is introduced to the assay system. The ROS inducer triggers the release of a specific ROS, which would degrade the probe and cause its emission wavelength or intensity change. When an antioxidant material presents in the environment, the antioxidant absorbs the ROS and preserves the probe from degradation. The degree of probe preservation indicates the antioxidant capacity of the material. Trolox is used as the reference standard, and the results are expressed as  $\mu\text{mole}$  Trolox equivalency per gram (or milliliter) of a tested material.

The ORAC 6.0 values obtained from various natural and synthetic materials range widely due to the significantly different natures of these materials including fresh produce, liquid, extract, pure compound, cream, or oil. [Select ORAC 6.0 values of benchmark materials](#) are listed in our website to provide limited scale. Comparisons between materials from similar categories are more informative and valuable.

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