ABEL®-RAC Antioxidant Scores for Quality Control of Ingredients and Quality Assurance of Products

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Abstract

Among the words that have migrated from the laboratory to the high street is 'antioxidant'. Even more than the man in the street, will his wife be familiar with the word 'antioxidant'. Antioxidants rule, OK!

Nutraceuticals, functional foods and cosmetics may include the antioxidant word in their promotion and antioxidant materials in their substance. Manufacturers of these products, aware of the current and growing interest in antioxidants, should now be prepared to justify any claims they make for their product from the results of rigorous analysis.

So, what are antioxidants? They are the substances that react with certain potentially damaging species in our bodies and neutralize them. Leading the nasties are the free radicals, electrically unbalanced molecules with an excess of negative charge. While free radicals are produced by the body and play an essential part in the body's biochemistry, an excess of them can have dire effects. Antioxidants neutralize this excess.

Measurement of the ability of antioxidant ingredients and products to scavenge free radicals is extremely valuable. This is distinct from the measurement of the concentration of individual ingredients with claimed antioxidant properties. Moreover, measurement of the functional ability of antioxidants may demonstrate synergistic effects of ingredients in formulations.

Antioxidants can lose their ability to scavenge free radicals and other reactive species by such factors as exposure to light, heat, sonication, manufacturing processes, gamma irradiation, inappropriate drying – or just age. And the antioxidant capacity of ingredients from natural sources can in addition be affected by variations in cultivation, harvesting, storage time and conditions.

In the range of ABEL® (Analysis by Emitted Light) assays based on the light-emitting protein Pholasin® the material to be tested is challenged with different free radicals and oxidants. From the results the functional antioxidant scores can be calculated as ABEL®-RAC (Analysis By Emitted Light - Relative Antioxidant Capacity) scores in terms of weight, dose and cost for each of the challenges. Individual ingredients as well as finished products can be tested for batch to batch uniformity as well as shelf life. The assays can be used on water and oil-soluble ingredients and products and are especially suited to the testing of both nutraceuticals and cosmetics.

Using the ABEL® assays and ABEL®-RAC scores manufacturers, whether they use natural or synthetic ingredients or both, can formulate their products based on a knowledge of the functional activity of a certain weight of material. They can also optimise their purchasing and give their customers their complete assurance of the quality of their products throughout their stipulated life time.

Free Radicals and Oxidative Stress

Free radicals and other reactive oxygen containing species (ROS) are continually produced in the body and are continually destroyed by antioxidants[1]. However, when ROS production gets out of control oxidative stress occurs. This is especially noticeable at sites of inflammation where billions of ROS-producing white blood cells accumulate. When this happens, these reactive chemical species, together with enzymes released from granules within the white blood cells, injure or even kill cells, damage DNA and attack enzymes and other compounds. There are however other occasions, during the course of normal cell respiration for example, when free radicals and ROS are produced as by-products of cellular metabolism. And here again, in the absence of sufficient quantities of appropriate antioxidants, oxidative stress and