

REVELAR™ AND THE REVELAR SCORE

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The Revelar device has been created to measure the balance between the production of free radicals in an individual's body, and the body's ability to neutralize those free radicals at any given point in time—a condition called “oxidative stress.” In a perfectly healthy body, free radicals are made moment by moment through normal cellular processes, but are quickly neutralized, thus preventing them from accumulating. If this balance is not perfect, and the body's neutralization systems become compromised, excessive free radicals are made. When an over-production of free radicals occurs (and neutralization of them is inadequate) oxidative stress results, which can lead to cellular damage, and in turn to degenerative diseases. The increasing interest in free radicals, in both the lay and scientific communities, has made the market ripe for a tool that monitors the link between free radicals, oxidative stress, and disease. The Revelar system is noninvasive, easy to use, and based on established laboratory science. It helps people make educated lifestyle decisions that may improve their health. Additionally, it can be used to determine the type and amount of nutritional supplementation an individual takes to potentially decrease their risk of disease.

An aldehyde is the evidence left behind after oxidative stress has occurred and free radicals have caused damage. This paper discusses Revelar's measurement of aldehydes—high levels being bad and low levels being good—as well as the relationship between aldehyde levels and various disease states. The goal of Revelar is not only to provide an aldehyde (or free radical) score, but also to establish what that score means. Pulse's Science Advisory Board (SAB) is exploring a number of different areas to establish a meaningful aldehyde scale, and will incorporate that learning into materials, both printed and online.

There is substantial clinical evidence linking elevated free radical levels with various health concerns and disease states, ranging from vascular damage to forms of cancer. Several serum tests, particularly the thiobarbituric acid reactive substances test (TBARS), have been clinically shown to serve as reasonable measures of oxidative stress. The Revelar test, utilizing exhaled breath condensate (EBC) to measure many different reactive aldehydes, compares closely with the gold standard TBARS test. This is critical because it validates the science behind Revelar. Given the breakthrough nature of this technology, more tests will need to be done in order to accumulate data from populations representing different age-groups, disease-states, and other relevant demographics. This will allow Pulse to continue to develop a clear picture of what a Revelar score means and how it is translated into the lifestyle component of the product.

Revelar 1.0 will incorporate the very latest of this clinical research and future versions of Revelar will reflect new findings as the science becomes more sophisticated.

Free Radicals And Disease States

Extensive scientific research has shown that oxidative stress is associated with most degenerative disease states as well as the process of aging. Multiple scientific journals document that oxidative stress is linked to hypertension, neurodegenerative disorders such as Alzheimer's disease, diabetes, heart disease, cancer, and premature aging. In the June 20, 2002, *New England Journal of Medicine*, James R. Sowers, MD discusses the science that helps us understand the causes of blocked arteries around the heart and certain forms of kidney disease. Dr. Sowers presents strong evidence of what happens to healthy organs when free radicals do their damage.¹

In another example from the February 9, 2006 *NEJM*, Gregory J del Zoppo, MD discusses that free radicals are generated very early after the onset of ischemia in stroke, which creates a cascade of events that lead to further nerve damage. Consuming antioxidant supplements is a viable way individuals can defend themselves from the over-production of free radicals.

1 Sowers, James R. 1999-2001

Finally, in the April 3, 2003 NEJM, Robert M. Friedlander, MD shows that free radicals are one of three main signals which cause the release of certain damaging cellular agents. The affects of these agents can lead to neurodegenerative disorders including Huntington's disease, Alzheimer's disease and Parkinson's disease. Protection against these disorders through adequate antioxidant protection is discussed.²

Protecting Yourself From These Disease States

An article by Ravindra Pratap Singh, et al. discusses the mechanisms of free radical production and their pivotal role in neurodegenerative disease promotion. Dr. Singh suggests that an imbalance between oxidants and natural defenses against them is a key area of focus for neurodegenerative disease prevention.³ Judith A. Berliner, Ph.D. in the July 7, 2005 NEJM reports that while elevated cholesterol is a well-recognized risk factor for atherosclerosis, oxidized LDL also plays an important role in this disease process. She reports that certain free radicals accumulate under conditions of oxidative stress including viral infections and inflammatory conditions. The infectious and inflammatory components of atherogenesis as well as the role of oxidative stress in disease promotion are increasingly well recognized and accepted.⁴

The relationship between free radicals and diabetic complications is outlined in an article by Yildiz Atamer, et al. in the Turkish Journal of Medical Sciences, May 8, 1995. The article reviews multiple mechanisms of measuring lipid peroxidation, which is the process of electrons being stolen from healthy cells by free radicals, leaving lipid peroxides after oxidative stress in the form of new free radicals. Atamer relates excess levels of lipid peroxides to individuals with diabetic retinopathy as compared to diabetics without retinopathy and non-diabetic controls. The results indicate that the presence of these free radicals is very significant in the progression of diabetes as well as its complications.⁵

What these and other scientists are discovering, is that monitoring oxidative stress (and its relationship to degenerative disease development) is vitally important, and that this process will be used increasingly to improve doctors' ability detect and treat these diseases.

The AREDS Study

Scientists have long debated whether taking vitamin and/or mineral supplements could help prevent, treat or cure certain eye conditions. A recent study, the Age-Related Eye Disease Study (AREDS), sought to answer this question, and has given us some (but not all) of the answers. In the study, scientists looked at the effects of zinc and antioxidants, and a combination of both, on patients with cataracts, and on those with varying stages and types of age-related macular degeneration (AMD). They also studied patients without evidence of cataract or AMD to determine if zinc and/or antioxidants can prevent the development of these conditions.

The results showed high levels of antioxidants and zinc can reduce the risk of vision loss from advanced AMD by about 19% in high-risk patients (those with intermediate AMD or advanced AMD in one eye but not the other).

The doses used in the study were:

- Vitamin C 500 mg
- Vitamin E 400 IU
- Beta-carotene 15 mg or 25000 IU
- Zinc 80 mg, as zinc oxide
- Copper 2 mg, as cupric oxide

General Science Of Free Radical Detection

The ability to measure free radicals and oxidative stress has previously been limited to invasive blood testing done by medical laboratories. The Revelar device is a breakthrough technology in that it is the first home-based test that allows an

2 del Zoppo, Gregory J. 553-555

3 Singh, Ravindra Pratap, 218-25

4 Berliner, Judith A. 9-11

5 Marnett, L.J. 181-182:219-222

individual to instantly and non-invasively measure oxidative stress. Tests to date have measured a single by-product of oxidative stress such as MDA, thereby limiting their sensitivity. Revelar is unique in that it measures the net effect of oxidative stress by looking at a much larger group of aldehydes including MDA, formaldehyde, salicylaldehyde, butyraldehyde, hexanal, nonanal, 2-furaldehyde, propionaldehyde, octanal, decanal, acrolein, heptaldehyde, pentanal, acetone, 4-hydroxyhexanal, 4-hydroxynonenal.

Free Radical Detection And Revelar

Revelar utilizes colorimetric detection to determine the presence of aldehydes. In addition to this scientifically accurate method of detection, Revelar has an enhanced, more sensitive and standardized method of obtaining EBC. The Revelar method is the result of a proprietary chemical reaction, in which aldehydes will react to Pulse's powder reagent. This chemical reaction causes the reagent to change colors—red in the presence of aldehydes, and yellow in the absence of aldehydes. Revelar interprets this color change and assigns it a numerical score, allowing for a specific and accurate result. Even more notable is that unlike traditional methods of obtaining EBC measurements, which can take 10-20 minutes in a lab using expensive equipment, Revelar's proprietary IP delivers accurate results within one minute.

The Revelar reagent not only produces a sensitive aldehyde reading, but also a means to obtain a standardized EBC sample. By measuring the aldehydes in the exhaled breath condensate, and by providing a way for this to be done non-invasively, Revelar offers individuals a simple, sensitive and accurate measurement of free radical damage and oxidative stress in the body.

Lifestyle Factors

Multiple lifestyle factors affect free radical levels in the body and will therefore have a profound effect on oxidative stress. These include:

- Lack of sleep
- Exposure to cigarette smoke
- Poor diet
- Excessive alcohol consumption
- Drug use
- Lack of exercise (or too much vigorous exercise)
- Exposure to environmental toxins and pollution

Sleep

Sleep is a critical healing and reparative process required by the body for good health. The most reparative sleep (with optimal hormone production and free radical reduction) occurs during the hours of 10PM-6AM. In fact, melatonin made during quality sleep serves as a powerful antioxidant to reduce free radical levels. As a result, the optimal time to capture a Revelar score is after 8 hours of quality sleep, between 10PM-6AM.

Smoking

Cigarette smoke contains numerous oxidizing substances that can lead to different diseases. Because of this, many studies have focused on oxidative stress as a probable factor in cigarette smoke related atherogenesis and cancer.⁶ Given all other health factors, persons who have never smoked should start with a lower baseline Revelar score than those who have smoked or those who have stopped smoking. However, the cessation of smoking combined with adherence to the Revelar lifestyle will cause a decrease in the Revelar score, and an increase in that person's overall health and well-being.

Diet

Diet plays a pivotal role in our body's attempt to prevent oxidative stress. Consumption of a variety of colorful vegetables with each meal will result in lower Revelar scores. Fruit is also a good source of antioxidants—the brighter the color, the higher the antioxidant content. However, individuals who are overweight, or have insulin resistance or diabetes should choose vegetables instead of fruit because they offer the same antioxidant protection with lower sugar content.

⁶ Atamer, Yildiz, pp. 143-148

Additionally, being sufficiently hydrated allows for optimal Revelar scores that can be consistently reproduced. Pulse recommends consuming eight- 8oz glasses of water daily to reach a healthy level of baseline hydration.

Excessive omega-3 fatty acids (from fish or flax seed oil) can raise lipid peroxides because these oils are highly unsaturated and are more likely to become oxidized in the presence of free radicals. Omega- 3 and omega-6 supplementation (safflower, sunflower, corn or soybean oil) can also increase lipid peroxides (in the absence of other supporting antioxidants) due to their high degree of unsaturation. The more saturated a fat is chemically, the more stable that fat will be against peroxidation from free radical exposure.

Eating large amounts of damaged fats (old or rancid foods) or eating fats that are chemically damaged in manufacturing (partially hydrogenated vegetable oil or trans fats) can also cause free radical damage. Additionally, preservatives and pesticides in foods will increase Revelar scores because of their ability to increase oxidative stress. A diet rich in whole, organic and freshly prepared foods (rather than fast and packaged foods) will lead to lower Revelar scores.

Supplements containing iron or copper can increase Revelar scores in individuals whose total antioxidant status is deficient.

In other words, adding more antioxidant-rich foods and limiting intake of antioxidant depleting substances improves Revelar scores.

Medication

Prescriptions and over-the-counter medications can also affect Revelar readings. Ideally, the initial Revelar reading should be obtained in the absence of prescription or over-the-counter medications. However, if the individual is on prescription medication, they should not discontinue use without a physician's recommendation. Instead, the medication should be documented with each Revelar reading. All readings can be compared only to other readings while on the same medication.

Exercise

Moderate exercise is an optimal part of a healthy lifestyle and an integral part of the Revelar system. However, it is important to note that exercise demands greater energy, and can temporarily put the body into a stress-like state. In fact, vigorous or strenuous exercise can actually create oxidative stress and therefore increase a person's Revelar score. The type and duration of exercise will determine the amount of free radicals produced. A simple way to look at it is, the greater the intensity and length of exercise, the more significant the rise in Revelar scores. For example:

Increase:

Long periods of aerobic exercise
Heavy weights (Large muscle groups, high reps)

Decrease:

Walking
Light weights (Small muscle groups, low reps)

Following exercise, the body uses antioxidants to clear away excess free radicals. As a result, the body is able to gain the healthy benefits of exercise without any long-term harmful effects. Additionally, supplementation with soy protein and antioxidants prior to exercise can help lessen the number of free radicals produced during exercise. For the most accurate results Pulse recommends taking Revelar readings before and after exercise. Thus, a regular routine of moderate exercise (and using antioxidant supplementation in conjunction with your exercise program) is highly recommended and can reduce free radical levels and Revelar scores.

Environmental Toxins

Environmental toxins and chemicals contribute to free radical production and increase the risk of oxidative stress. Gasoline exhaust (from automobiles and other machinery) is a known environmental pollutant that can have negative effect of an individual's health. High levels of exhaust and pollution (found in large cities or industrial areas) can contribute to elevated Revelar scores. Chemicals used for cleaning or gardening can also create free radicals in our body, and lead to higher Revelar scores. Exposure to some of these environmental pollutants is often unavoidable. However, our inevitable exposure to them necessitates supplementing with antioxidants in order to help the body eradicate free radicals effectively.

Pre-existing Disease States

Health conditions associated with inflammation (asthma, arthritis) or other metabolic imbalances (diabetes, hemolytic conditions, renal, heart or neurologic disorders, Wilson's disease, or hemochromatosis) will raise Revelar scores. Managing these diseases in a healthy way will improve Revelar scores and therefore an individual's overall health.

Establishing a Baseline

The key to understanding the Revelar reading is in establishing the Initial Baseline Score. A person in perfect free radical balance (i.e. with no excessive oxidative stress) would have a Revelar score close to zero. The higher the Revelar score, the higher the risk of disease promotion and propagation. Because of differences in physiology from one person to the next, it is important that the user measure their Revelar score against their own Revelar scores and not the Revelar scores of others. Once a baseline score is established, the goal is to lower that score, and manage lifestyle choices so that the score continues to go down. A user should always take note of any rise in their Revelar score—regardless of how high or low the baseline score is at the beginning— and view that as a cause for action.

Conclusion

Whether free radicals are created internally or introduced through lifestyle, our body needs internal neutralization systems (antioxidants) to help mitigate their damage. If these systems become inefficient, problems occur. When excessive free radicals accumulate and overrun the neutralization process, these damaged cells seek out healthy electrons, essentially “converting” them into free radicals.

Consuming antioxidant nutrients (i.e., Vitamin E, lipoic acid and coQ10) can quench free radicals and protect healthy cells from free radical attack. If antioxidant supplementation isn't adequate, lipid peroxidation results and free radical proliferation can proceed unchecked, resulting in increased risk of disease and acceleration of the aging process. It is only through effective supplementation and adherence to the guidelines outlined in this document (the Revelar Lifestyle Program) that optimal health can be achieved.

No one can guarantee perfect health or unlimited longevity, but with proper supplementation and use of the Revelar device and Lifestyle Program, everyone has the potential to prevent certain diseases and to mitigate the effects of aging.

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