

LABORATORY REPORT

Account Number: 123456

Dr. John Smith
123 Main St
Anytown, USA

Name: Jane Doe

Gender: Female

DOB: 07/13/1945

Accession Number: J16360

Requisition Number: 171736

Date of Collection: 09/25/2009

Date Received: 09/26/2009

Date Reported: 10/07/2009

Summary of Deficient Test Results

Micronutrient analysis (WBC) determined the following deficiencies:

Vitamin B12
Spectrox

Biotin

Vitamin D

Lipoic Acid

SAMPLE

John F. Crawford, Ph.D.
Laboratory Director

CLIA# 45D0710715

OVERVIEW OF TEST PROCEDURE

1. A mixture of lymphocytes is isolated from the blood.
2. These cells are grown in a defined culture medium containing optimal levels of all essential nutrients necessary to sustain their growth in cell culture.
3. The T-lymphocytes are stimulated to grow with a mitogen (phytohemagglutinin) and growth is measured by the incorporation of tritiated (radioactive) thymidine into the DNA of the cells.

The growth response under optimal conditions is defined as 100%, and all other growth rates are compared to this 100% level of growth.

For example – we remove vitamin B6 from the medium and stimulate the cells to grow by mitogen stimulation. Growth is measured by DNA synthesis and the rate of growth is dependent only upon the functional level of vitamin B6 available within the cells to support growth. For Vitamin B6 a growth rate of at least 55% of the growth rate observed in the optimal (100%) media is considered normal. Results less than 55% are considered to indicate a functional deficiency for Vitamin B6. Each nutrient has a different reference range that was established by assaying thousands of apparently healthy individuals.

BREAKING DOWN THE REPORT

1. TEST RESULT (% CONTROL)

This column represents the patient's growth response in the test media measured by DNA synthesis as compared to the optimal growth observed in the 100% media.

2. FUNCTIONAL ABNORMALS

An interpretation is provided for those nutrients found to be deficient.

3. REFERENCE RANGE

This column represents how this patient's result compares to thousands of patients previously tested. A patient's result is considered deficient when it is less than the reference range.

4. GRAPHS

The abnormal range of results is noted in the blue area. Abnormal results are indicated in red. The gray cross hatch area is a representation of the range of test results found in a random selection of subjects.

SPECTROX® – TOTAL ANTIOXIDANT FUNCTION

SPECTROX® is a measurement of overall antioxidant function. The patient's cells are grown in the optimal media, stimulated to grow, and then increasing amounts of a free radical generating system (H₂O₂) are added. The cell's ability to resist oxidative damage is determined. The increasing levels of peroxide will result in diminished growth rates in those patients with poor antioxidant function capacity.

INDIVIDUAL ANTIOXIDANT LEVELS

In the tests for individual antioxidants, it is determined which specific antioxidants may be deficient and thus affecting the SPECTROX® antioxidant function result. For these tests, the patient's cells are preincubated with one of the nutrient antioxidants, i.e. selenium, and then the Spectrox® test is repeated to determine if the addition of selenium improves the patient's antioxidant function. This process is repeated for each individual antioxidant.

Antioxidants tested with this process:

Glutathione, Cysteine, Coenzyme-Q10, Selenium, Vitamin E, and Alpha Lipoic Acid

Repletion Suggestions

- | | |
|-------------------------------|---|
| 1. Vitamin B12 (Cobalamin) | 300 mcg daily (methylcobalamin or adenosylcobalamin) |
| 2. Biotin | 1000 mcg daily |
| 3. Vitamin D (Ergocalciferol) | 1000 IU daily of Cholecalciferol
(Vitamin D3-1-alpha 25-dihydroxyvitamin D) |
| 4. Total Antioxidant Function | Based on SpectroX and individual Antioxidant tests:

* Glutathione: 600 mg daily of N-Acetylcysteine (NAC)

* Cysteine: The daily dose of N-Acetylcysteine (NAC) listed for Glutathione is usually sufficient for Glutathione and/or Cysteine repletion.

* Vitamin E: 200 IU daily of mixed tocopherols

* Selenium: 50 mcg daily

* Coenzyme Q10: 30 mg daily of CoQ10 Take each dose with a meal

* Lipoic Acid Deficient: 200 mg daily

* Vitamin C: 250 mg daily |

SAMPLE

Please note: Supplementation is usually required for four to six months to effect the repletion of a functional deficiency in lymphocytes

Suggestions for supplementation with specific micronutrients must be evaluated and approved by the attending physician. This decision should be based upon the clinical condition of the patient and the evaluation of the effects of supplementation on current treatment and medication of the patient.

Micronutrients	Patient Results (% Control)	Functional Abnormals	Reference Range (greater than)
<u>B Complex Vitamins</u>			
Vitamin B1 (Thiamin)	98		>78%
Vitamin B2 (Riboflavin)	61		>53%
Vitamin B3 (Niacinamide)	97		>80%
Vitamin B6 (Pyridoxine)	68		>54%
Vitamin B12 (Cobalamin)	13	Deficient	>14%
Folate	44		>32%
Pantothenate	27		>7%
Biotin	30	Deficient	>34%
<u>Amino Acids</u>			
Serine	54		>30%
Glutamine	58		>37%
Asparagine	52		>39%
<u>Metabolites</u>			
Choline	27		>20%
Inositol	72		>58%
Carnitine	60		>46%
<u>Fatty Acids</u>			
Oleic Acid	75		>65%
<u>Other Vitamins</u>			
Vitamin D (Ergocalciferol)	78	Deficient	>83%
Vitamin A (Retinol)	78		>70%
Vitamin K2	61		>30%
<u>Minerals</u>			
Calcium	46		>38%
Zinc	53		>37%
Copper	50		>42%
Magnesium	57		>37%
<u>Carbohydrate Metabolism</u>			
Glucose-Insulin Interaction	58		>38%
Fructose Sensitivity	51		>34%
Chromium	53		>40%
<u>Antioxidants</u>			
Glutathione	57		>42%
Cysteine	48		>41%
Coenzyme Q-10	91		>86%
Selenium	80		>74%
Vitamin E (A-tocopherol)	92		>84%
Alpha Lipoic Acid	81	Deficient	>81%
Vitamin C	63		>40%
<u>SPECTROX™</u>			
Total Antioxidant Function	64.0	Deficient	>65%

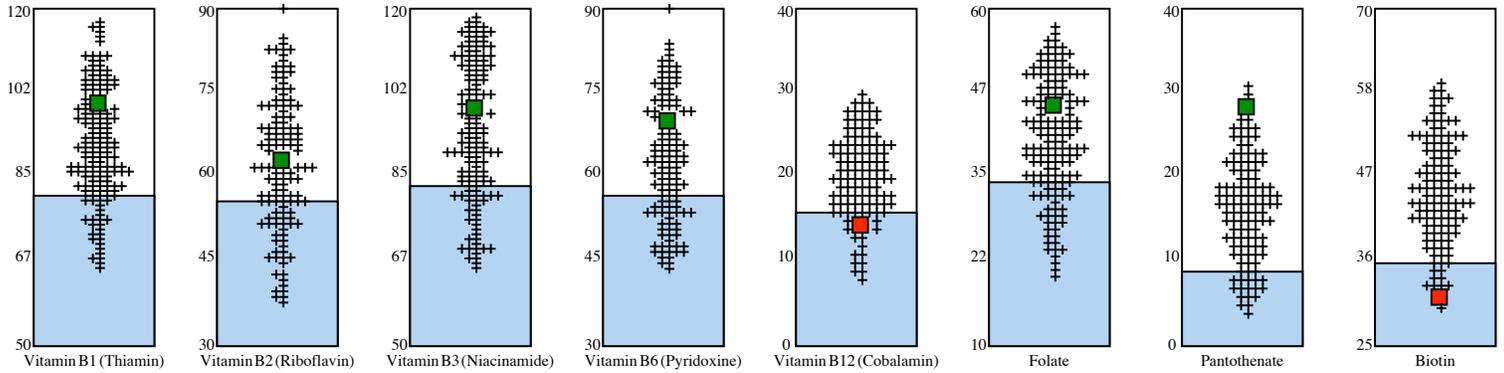
SAMPLE

The reference ranges listed in the above table are valid for male and female patients 12 years of age or older.

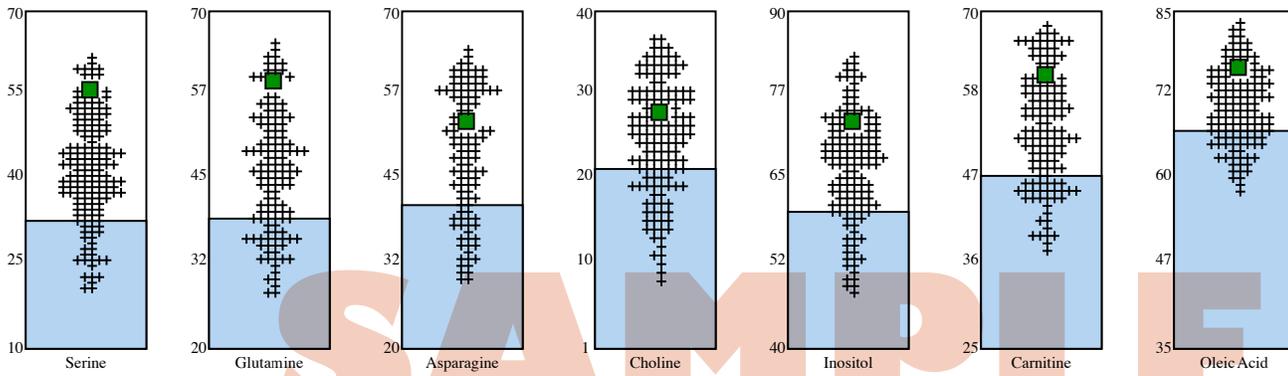
■ Adequate
■ Deficient
 Values in this area represent a deficiency and patient may require nutrient repletion or dietary changes

Accession Number: J16360
Jane Doe

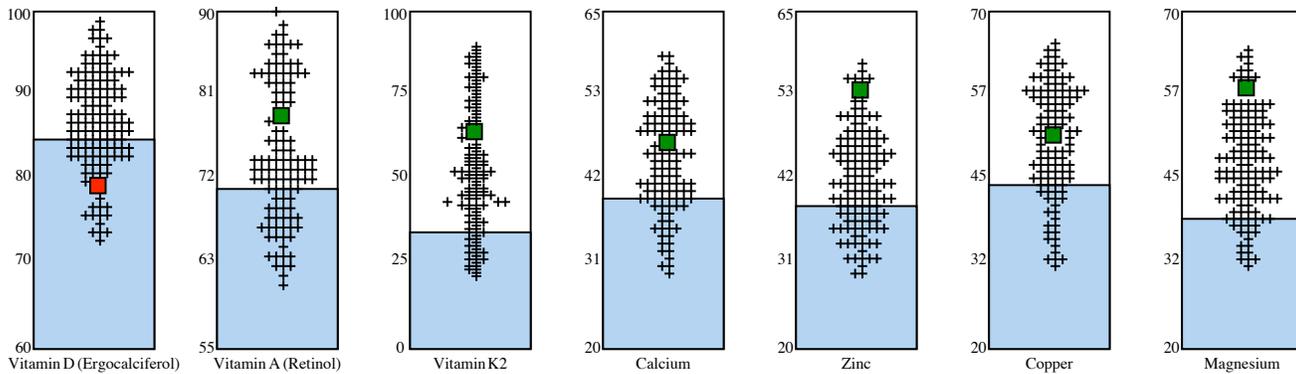
B Complex Vitamins



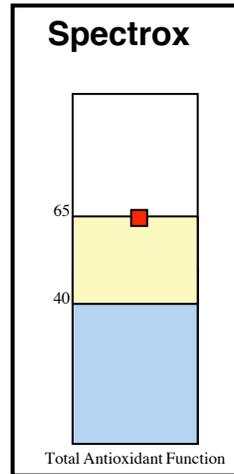
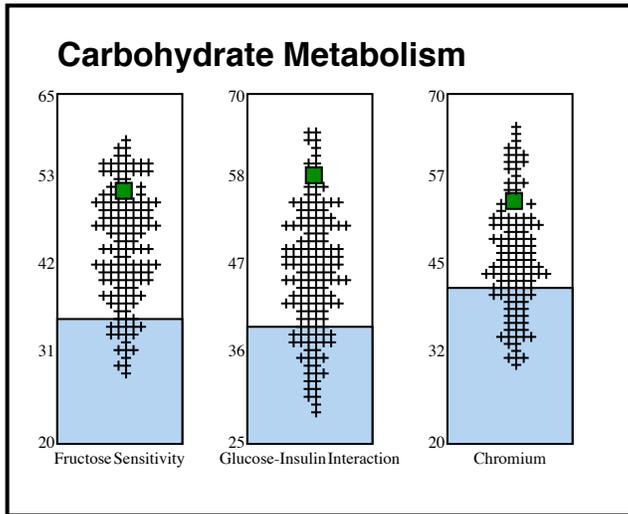
Amino Acids & Metabolites



Other Vitamins & Minerals



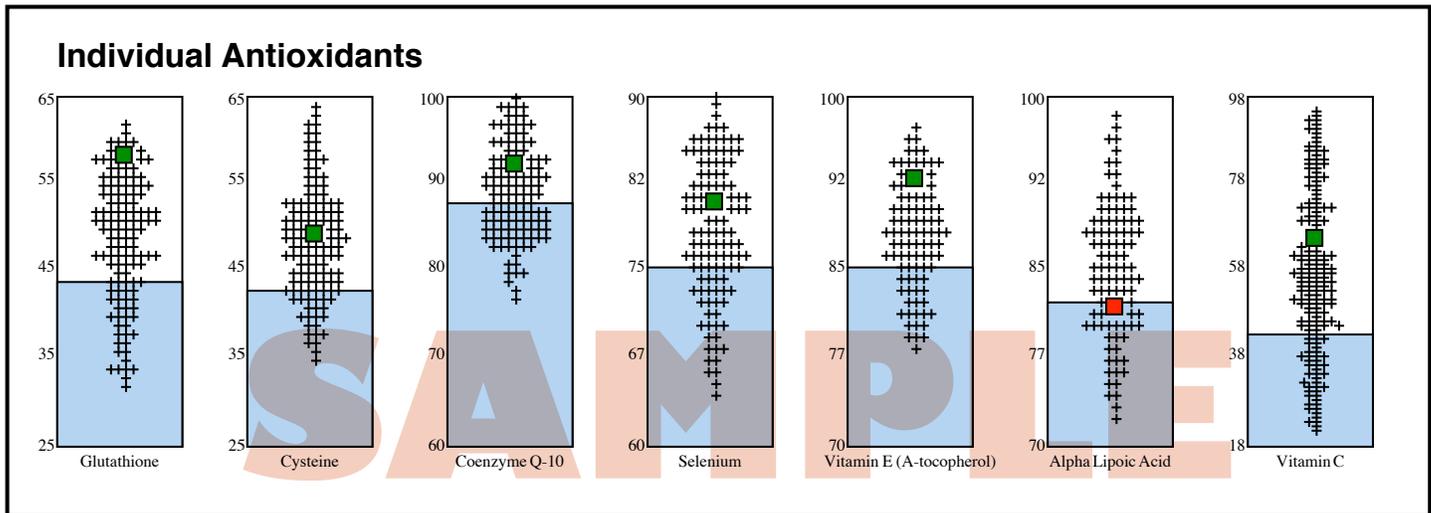
■ Adequate
■ Deficient
 Values in this area represent a deficiency and patient may require nutrient repletion or dietary changes



A Spectrox value above 65%- indicates a desirable status for apparently healthy individuals. Since antioxidants are protective nutrients, the most desired status would be the greatest ability to resist oxidative stress.

A Spectrox value between 40% and 65%- indicates an average antioxidant function for apparently healthy individuals. An average status means the ability to resist oxidative stress similar to the majority of persons. However, average status is not ideal, nor is it clearly deficient.

A Spectrox value below 40%- indicates a deficient antioxidant function resulting in a decreased ability to resist oxidative stress or an increased antioxidant load.





SUPPLEMENTAL INFORMATION

Name: Jane Doe
Gender: Female DOB: 07/13/1945
Accession Number: J16360

Date Received: 09/26/2009
Date Reported: 10/07/2009
Requisition Number: 171736

Account Number: 123456

Dr. John Smith
123 Anywhere, Any Suite
Any State
USA

Vitamin B12 (Cobalamin)

Status:

The patient's lymphocytes have shown a deficient status for vitamin B12 (Cobalamins).

Function:

Vitamin B12 is required to form blood and immune cells, and support a healthy nervous system. A series of closely-related compounds known collectively as cobalamins or vitamin B12 are converted into active forms methylcobalamin or 5-deoxyadenosylcobalamin. Methylcobalamin interacts with folate metabolism, preventing folate derivatives from being trapped in unusable states. Adenosylcobalamin is involved in the metabolism of odd-chain fatty acids and branched-chain amino acids.

Deficiency Symptoms:

Deficiency symptoms of vitamin B12 are both hematological (pernicious anemia) and neurological. A megaloblastic anemia may occur because the effects of the vitamin B12 deficiency on folate metabolism. Shortness of breath, fatigue, weakness, irritability, sore tongue, decrease in blood cell counts (red, white and platelets) are all clinical signs of a vitamin B12 deficiency. Neurological symptoms are manifested as a progressive neuropathy, with loss of position sense and ataxia. If vitamin B12 repletion is not initiated, permanent neurological damage, including degeneration of nerves and spinal cord can result. Recent evidence suggests that mental symptoms of depression and fatigue are detectable before anemia develops. Vitamin B12 is necessary to prevent accumulation of homocysteine, a toxic metabolic byproduct linked to cardiovascular disease and connective tissue abnormalities. Hypochlorhydria and gastrointestinal disturbances are frequently associated with vitamin B12 deficiency.

Repletion information:

Dietary sources for cobalamins are strictly from animal foodstuffs. Vitamin B12 is not found in plant foodstuffs. Dietary supplements can also contain vitamin B12

The 1989 RDA for vitamin B12 is 2.0 ug for adults. No toxic effects of oral vitamin B12 intake have been demonstrated, even in doses over 1000 ug daily.

Since the absorption and intracellular activation of oral vitamin B12 are frequently difficult, consideration should be given to injectable forms of vitamin B12. Some patients may require more frequent or larger doses than usual before repletion occurs.

Biotin

Status:

The patient's lymphocytes have shown a deficient status for Biotin.

Function:

Biotin is required for proper metabolism of fats and carbohydrates. Biotin-dependent enzymes catalyze the addition of carboxyl groups (COO-) from bicarbonate, for use in fatty acid biosynthesis, gluconeogenesis, lipogenesis, propionate metabolism, and leucine catabolism.

Deficiency Symptoms:

Symptoms of biotin deficiency include erythematous exfoliative dermatitis, thinning hair, fatigue, irritability, mild depression, somnolence, muscle pains, anorexia, nausea, mild anemia. Infants with seborrheic dermatitis, Leiner's disease or alopecia may indicate a biotin deficiency, along with symptoms of ketoacidosis, poor feeding, vomiting, lethargy, coma, and developmental retardation. Dietary symptoms include fatigue, dry skin, body hair loss, nausea, loss of appetite, and mild depression.

Those at risk for biotin deficiency include: persons consuming excessive amounts of raw egg whites, inherited disorders of biotin metabolism, extended total parenteral nutrition (biotin-free), loss of enteric gut microflora from antibiotic therapy or altered gut motility, pregnant and lactating women, antiepileptic drug therapy, alcoholics, trauma (burns and surgery), elderly, malabsorption (especially achlorhydria).

Repletion Information:

Dietary intake of foods rich in Biotin should be increased. Do not eat raw egg whites.

Nutritional Supplements	Liver
Egg Yolks	Nutritional Yeast
Royal Jelly	Legumes
Rice Bran	Whole Grains
Fish	

The estimated adequate daily dietary intake for biotin is 30-100 mcg for adults. No adverse effects have been noted in humans ingesting up to 2000 mcg daily for long time periods.

Vitamin D (ergocalciferol)

Status:

The patient's lymphocytes have shown a deficient status for vitamin D.

Function:

Vitamin D is the principle regulator of calcium homeostasis in the body. It is essential for skeletal development and bone mineralization. Vitamin D is a prohormone with no hormone activity. It is converted to a molecule that has biological activity. The active form of the vitamin is 1,25-dihydroxyvitamin D, usually referred to as vitamin D3. It is synthesized in the skin from 7-dehydrocholesterol via photochemical reactions requiring UV light (sunlight). Inadequate exposure to sunlight contributes to vitamin D deficiency. Vitamin D deficiency in adults can lead to osteoporosis. This results from a compensatory increase in the production of parathyroid hormone resulting in bone resorption. Increasing evidence is accumulating that vitamin D may also contribute to antioxidant function by inhibiting lipid peroxidation. The mechanism of the antioxidant effect is unknown. Vitamin D is also needed for adequate blood levels of insulin. Vitamin D receptors have been identified in the pancreas.

Deficiency Symptoms:

Osteoporosis results from an imbalance between bone resorption and bone formation. Decreased vitamin D levels result in decreased production of the active vitamin form, vitamin D3. Vitamin D enhances the efficiency of calcium absorption. Chronic vitamin D deficiency results in decreased calcium absorption and secondary hyperparathyroidism.

Vitamin D3 has been found to have anticarcinogenic activity, inducing apoptosis in many types of cancer cells. It has also been useful in the treatment of psoriasis when applied topically. Vitamin D appears to demonstrate both immune-enhancing and immunosuppressive effects.

Repletion Information:

Supplemental vitamin D is available as vitamin D2 (ergocalciferol) or vitamin D3 (cholecalciferol). Vitamin D3 is considered to be the more biologically active form of the vitamin and at this time is the form most recommended for repletion. The Food and Nutrition Board of the Institute of Medicine has recommended the following tolerable upper limit intake levels for vitamin D:

Infants (0 - 12 Months)	1000 IU/day
Children (1 thru 18 years)	2000 IU/day
Adults	4000 IU/day

The RDA for vitamin D remains at 400 IU, however, it is recognized that approximately 30% of US adults are vitamin D deficient. Dosages greater than 5000 IU per day may be associated with multiple effects including anorexia, nausea and vomiting. The prolonged ingestion of excessive doses of vitamin D may lead to hypercalcemia and result in metastatic calcification of soft tissues, including kidney, blood vessels, heart and lung tissues.

Alpha Lipoic Acid

Status:

The patient's lymphocytes have shown a deficient status for lipoic acid.

Function:

Lipoic Acid is a sulfur-containing vitamin-like substance that is an important cofactor in energy-producing reactions in the production of cellular energy (ATP). Lipoic acid has been referred to as a "universal antioxidant" because it is soluble in both fat and water. It is capable of regenerating several other antioxidants back to their active reduced states, including vitamin C, vitamin E, glutathione and coenzyme Q10. Alpha lipoic acid has several potential actions for the type 2 (non-insulin-dependent) diabetic. It reduces glycosylation reactions (attachment of sugar moieties to protein) and facilitates healing of diabetic nerve damage. Biochemical reactions utilizing lipoic acid occur within the mitochondria, where it functions critically in its antioxidant capacity.

Deficiency Symptoms:

Several studies demonstrate that individuals infected with HIV have a compromised antioxidant defense system. Blood antioxidants are decreased and peroxidation products of lipids and proteins are increased. These changes deplete glutathione levels and this often compromises cell-mediated immune function and progression of AIDS. Alpha lipoic acid supplementation increases vitamin C and glutathione. T-lymphocyte production and T helper/suppressor cell ratios are increased. Patients with compromised immune symptom performance may benefit by supplementation with alpha lipoic acid.

In patients with diabetic neuropathy resulting from antioxidant deficiency, lipoic acid improves blood flow to peripheral nerves, decreases lipid and protein peroxidation, and may stimulate the regeneration of nerve fibers. There is growing evidence that lipoic acid has beneficial effects in slowing atherosclerotic processes and the neurodegenerative effects of Alzheimer's. Experimental studies in animal models show that a deficiency of lipoic acid results in reduced muscle mass, failure to thrive, brain atrophy and increased lactic acid production.

Repletion Information:

Lipoic acid is available in tablets and capsules. Because of its unique solubility properties it is easily absorbed and assimilated. It is generally available as a racemic mixture of D- and L-forms of alpha lipoic acid. Patients with diabetes or glucose intolerance are cautioned that supplemental alpha lipoic acid may lower blood glucose levels and adjustments in antidiabetic drug therapy may be necessary to avoid hypoglycemia. Doses of up to 600 mg/day have been well tolerated.

SPECTROX™ (Total Antioxidant Function)

Function:

The function of antioxidants is to protect biomolecules from oxidative damage. SPECTROX measures the net ability of antioxidant and repair mechanisms of each individual's own cells, giving a total assessment of antioxidant function.

Oxidative Stress:

Each person's cells and tissues are constantly subjected to highly reactive and unstable molecules termed *free radicals*, causing oxidative stress. These hostile molecules are a normal byproduct of life and are produced by the metabolism of oxygen, immune system cells, numerous enzyme reactions essential for metabolism, and environmental sources (smoke, ionizing radiation, air pollution, chemicals, toxic heavy metals and oxidized (rancid) fats. Some of the more common free radicals are superoxide, hydroxyl, singlet oxygen, and peroxides. By their chemical nature, free radicals, although short-lived, promote a chain reaction of radical formation, followed by a wake of chemically altered damaged biological molecules. Research is continuing to find that much biological damage and diseases are induced and/or mediated by injury from free radicals.

Cellular Antioxidants:

Protection of deleterious effects from free radicals is found in a diverse range of molecules termed *antioxidants*. Free radicals and their chain reaction byproducts can be neutralized and converted to less harmful products (quenched) by antioxidants. Antioxidants are enzymes (superoxide dismutase, catalase, glutathione peroxidase), essential nutrients (carotenoids, vitamin C, vitamin E, cysteine, selenium) or a wide variety of endogenous compounds (glutathione, sulfhydryl groups, thioredoxin, lipoic acid, coenzyme Q₁₀, urate, bilirubin) or dietary compounds (mannitol, bioflavonoids, phenolic acid derivatives, proanthocyanidins¹⁰). Antioxidants interact in a complex manner with recharging and overlapping, redundant functions. Cells also possess extensive mechanisms to repair damaged biomolecules, which appear protective in a total antioxidant function test.

The clinical correlation of antioxidant status to health remains under investigation. Research evidence in humans has indicated that deficient intakes or levels of nutrient antioxidant are associated with higher risks of arthritis, cancer, cardiovascular disease, cataracts and many other degenerative diseases. Also, higher intakes of nutrient antioxidants are associated with a lower incidence of chronic degenerative diseases. Encouraging studies have also shown that intervention with antioxidant nutrient supplements have therapeutic benefits in humans. Thus, strong scientific evidence illustrates that antioxidants help to prevent chronic degenerative diseases and may help to restore health.