



International Institute  
**of Naturopathy**

Education with Vision

Distance Learning  
Program  
**Integrative Nutrition  
and Health Consultant**



Module 4

## Dear Participant

### Welcome to Module 4

This fourth module explores more interesting and valuable information about the very meaningful topic of nutrition and diet.

By going deeper into this subject, you are going to learn why the modern diet makes us ill and which kind of diet is most effective in supporting the human body.

First, let us briefly introduce the different topics that are part of this module's lessons:

#### Mineral Nutrients and Trace Elements

What is the connection between magnesium deficiency and diabetes? Does calcium really promote bone strength? What are the effects of a diet rich in proteins at the onset of osteoporosis?

#### Vitamins

How does vitamin deficiency affect our bodies? Does it make sense to take vitamin supplements?

#### Free Radicals and Antioxidants

Which antioxidants are especially powerful, and in which food items can they be found? Do you know the undercover agent Andi Oxido? Allow us to introduce you.

#### Secondary Plant Compounds

What are the tasks of secondary plant compounds in nature, and how do they affect our bodies? Is there a reason why bitter-tasting foods are probably not your first choice?

#### Enzymes

How do enzymes enter our bodies? Are enzyme supplements actually effective? What about enzymes as therapeutics?

#### Superfoods

Why are certain foods considered superfoods? Why is it that especially green foods are so healthy? Come meet the King of Sprouts!

#### Modern Diet

Industrialized animal farming, conventional agriculture, genetic engineering, banned biocides – all of these developments have consequences. How do spraying agents affect our environment and our bodies?

### **Industrially Processed Foods**

Are synthetic vitamins and mineral substances able to enhance the status of industrially processed food? What are the effects of artificial sweeteners on the metabolism? How do aspartame and glutamate affect our nervous system?

### **Salt**

What are the differences among the types of salt? Why are there aluminum salts and other chemical additives in our table salt? What are the consequences of excessive salt in our bodies?

We wish you a joyful and interesting read as you learn the contents of this module!

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# 1

## Free Radicals

### 1.1. Undercover Agent Andy Oxido

When a thief steals someone's purse in a slum of Colombian metropolis Medellin, it seems quite reasonable that the robbed person gets really angry. Unfortunately, the thief has disappeared, but the robbed person still needs money. So, he (or she) decides to steal the purse from the next best person who, in turn, is now on the lookout for a suitable victim as well. This chain reaction wouldn't stop – if it wasn't for Undercover Agent Andy Oxido! Although he lets himself be robbed of his purse as well, this is only a clever strategy to finally catch the thief and take him to the next police station, thereby eventually stopping the chain reaction of constantly robbing each other's purses. Free radicals act similarly to these Colombian pickpockets.

### 1.2. What Are Free Radicals?

Free radicals are incomplete molecules that are dangerously unstable, as their chemical structure is lacking an electron. Therefore, they are constantly searching for a suitable electron in order to be complete again. In their search for a fitting partner to bind to, free radicals act quite ruthlessly and especially hastily – similar to the Colombian pickpockets.

When a free radical is being formed, it takes only  $10^{-11}$  s (i.e., 0.00000000001 s) before it will attack another arbitrary victim. It steals the needed electron aggressively from the next-best intact molecule available (e.g., molecules of the cell membrane, of the body's own proteins, or of the DNA). This process is also known as *oxidation*. Because the oxidation processes put a considerable burden on the body, at least when exceeding a certain amount, we have coined the term *oxidative stress*.

### 1.3. What Are the Effects of Free Radicals on the Body?

Because the *robbed* molecule is now lacking an electron, it in turn becomes a free radical itself and starts its search for another victim to rob the lacking electron. This is how a dangerous chain reaction comes into existence. High concentrations of free radicals may therefore trigger numerous chain reactions, which eventually contribute to enormous oxidative stress and, thus, to massive damage within the body.

- This process may result in a **limited function of the cell (including cell death)** when free radicals damage the cell membrane or even the mitochondria within the cell, thereby interrupting the energy supply of the cell.

Examples:

- Weakened veins and varicose veins, hypertension, and cardiovascular diseases, resulting from damaged vessel walls;
  - impaired vision and eye diseases, resulting from damaged vessels near the eyes;
  - strokes, resulting from free radicals attacking the vessels within the brain; and
  - decreased ability to concentrate and even the onset of dementia, resulting from damaged nerve cells within the brain.
- **DNA damage**, resulting from an uncontrolled cell division (onset of cancer);

- **Destruction of receptors on the cell's surface:** Receptors are special proteins on the surface of a cell. They are the bouncers of the cell, so to speak, and they decide who may enter the cell and who may not. Substances that are necessary for the proper function of the cell, such as hormones or enzymes, may bind to the receptors and are consequently let into the cell. Most toxins, however, are not able to do so. They lack a fitting "key" for the receptors, and are therefore denied access – as long as the cell is healthy and properly functioning<sup>11</sup>.

- **Deactivation of enzymes:** Because enzymes allow for metabolic processes of all kinds, as well as supporting and accelerating them, the deactivation of enzymes may contribute to certain defective body functions or even to their total failure, which in turn may lead to permanent damage of different kinds.

Of course, free radicals do not contribute to the onset of cancer, diabetes, or dementia in every person. The first hints of increased activity among the free radicals are much more common than these diseases, and they may express themselves in, for example, listlessness, problems with concentration, tiredness, and wrinkled skin. These possible effects and diseases resulting from free radicals show, however, that there is practically no ailment, disease, or illness that doesn't involve free radicals' activity.

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11. In unit 6 of module 1 on the "Pancreas" we talked about the example of insulin resistance in this context. Do you remember? The hormone insulin possesses the key to certain receptors on the cell's surface. When insulin, accompanied by glucose, "knocks" on the receptor's door, the cell opens up and allows the glucose access. Glucose is the fuel for all cells and is therefore extremely vital to them. If the receptors for insulin have been damaged by free radicals, however, suddenly the insulin's key to the cell ceases to fit. Insulin is not being recognized anymore and the cell doesn't open up to let the actually needed glucose in. This is eventually called insulin resistance, a precursor to type 2 diabetes.



6. Why do seasonal organically produced vegetables that are harvested at noon during the summer exhibit the lowest nitrate content?

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7. Why should water that is used in the preparation of baby food be extremely poor in nitrate?

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8. Under what circumstances is nitrate being converted into carcinogenic nitrosamines?

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9. Which products are safer for human health: Those that are certified according to the EU Eco Regulations or those that are certified according to the regulations of specialized certification organizations? Please briefly explain your answer.

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