

**The importance of individual
chemical elements
for life**

There are 92 naturally-occurring elements

Table 2.1; Fig. 2.3

**Other mineral *trace elements* are needed
for the body's antioxidant defense system:**

Mn - Manganese

Zn - Zinc

Se - Selenium

Cu - Copper

Needed as mineral cofactors from diet
for body's antioxidant enzymes that have a
crucial role in disease prevention.

**All anti-oxidants in human body are
indirectly (1.) or directly (2.) derived from diet:**

1. Antioxidant proteins manufactured in body = endogenous anti-oxidant
Enzymes

These need mineral cofactors from diet:

Zinc (Zn), selenium (Se), some manganese (Mg) and copper (Cu)

2. Anti-oxidant chemicals exclusively obtained from diet (mostly from plants) =
phytochemicals, like Vitamins C and E and many others

For further reading: list of phytochemicals

- Classic antioxidants: Vitamins C & E
- Essential oils (e.g. herbs, citrus fruit)
& carotenoids (e.g. tomato, corn, eggs)
- Phenolics (in all fruits, herbs, vegetables, spices,
& teas, coffee, red wine, olive oil, mustard/curry)
- Sulfur antioxidants (in onion, garlic & cabbage, broccoli,
Bok Choy, cauliflower, Brussel sprouts)

Radicals and Health

Antioxidants are needed to **detoxify** highly toxic *radicals*
(often **oxygen** radicals also called **reactive oxygen**)

It is now increasingly recognized that **a lack of antioxidants** contributes to
every major human disease and disorder

Where do radicals and reactive oxygen come from??

The human body forms reactive oxygen with “every breath we take”: 5-10% of electron transport in mitochondrial respiration leads to formation of reactive oxygen.

In addition, reactive oxygen is formed:

During detoxification of alcohol and all types of legal/illegal drugs

By environmental factors: Smoking, excess UV radiation, ionizing radiation, heavy metals, asbestos, silica, and other toxins all form reactive oxygen in the human body.

Reactive Oxygen and *Defense*

Living organisms also take advantage of the reactivity of reactive oxygen

Human immune cells actively produce reactive oxygen to kill foreign invaders like bacteria

Or other enemies...

Example: the ***bombadier beetle*** actively produces reactive oxygen to chemically assault its enemies

Fig. 2.1