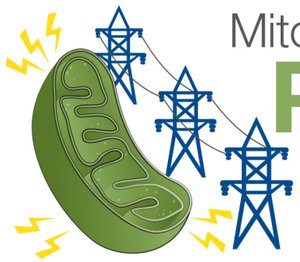
Optimising mitochondrial function: energy and healthy ageing

MITOCHONDRIA are present in **EVERY CELL OF THE BODY** except red blood cells[1]



Mitochondria are the **POWER HOUSES** of the cell

MITOCHONDRIA produce a person's **BODY WEIGHT IN ATP** every day[2]

FATIGUE is the most common unexplained complaint presenting to Australian general practitioners[3]

THE MITOCHONDRIA[1,2,4]

Mitochondria play host to one of the most important processes in your body: **cellular respiration**. Taking in glucose and oxygen, mitochondria produce energy, which they capture and package as energy-rich molecules of adenosine triphosphate (ATP).

In addition to energy production, mitochondria have been implicated in various metabolic and cellular processes including:

- Production of reactive oxygen species (ROS)
- Cell repair
- Cell signalling
- Cell growth
- Ageing

Mitochondria are present in every cell of the body except red blood cells. Therefore, damage to mitochondria can have widespread consequences.

MITOCHONDRIAL DYSFUNCTION[2,4,5]

When the mitochondria fail, less and less energy is generated within the cell resulting in fatigue, memory loss, pain, ageing, cell injury and even cell death. If this process is repeated, whole systems may begin to fail and mitochondrial dysfunction may progress to mitochondrial disease.

Due to the high energy requirements of the brain and muscles, mitochondrial disease typically affects these parts of the body. Other organs which are frequently affected include heart, liver, kidney and lungs and the endocrine system.

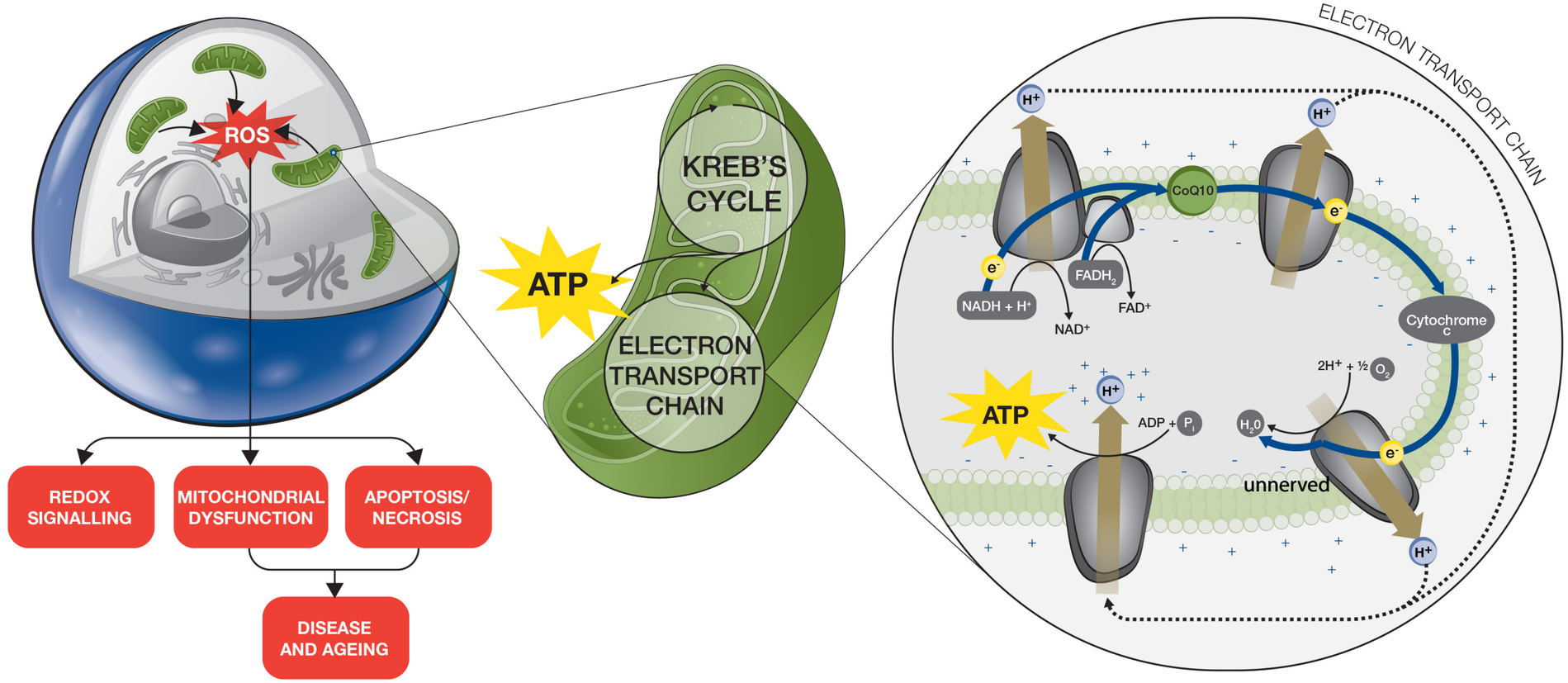
Research suggests damaged mitochondria play a role in an array of degenerative illnesses ranging from diabetes and neurological disorders to heart disease.

MITOCHONDRIAL DAMAGE[2,4,5]

Causes of mitochondrial damage:

- Oxidative stress
- Genetics
- Toxins
- Illnesses
- Stress
- Overeating

WHAT HAPPENS IN THE CELL: ENERGY PRODUCTION AND OXIDATIVE STRESS[2-7]



ROS: Reactive oxygen species; ATP: adenosine triphosphate; ADP: adenosine diphosphate; NADH: nicotinamide adenine dinucleotide; FADH: flavin adenine dinucelotide; e^-: electron; H^+: hydrogen ion; P_i: inorganic phosphate

NUTRITIONAL SUPPORT FOR MITOCHONDRIAL ENERGY PRODUCTION

Coenzyme Q10 (CoQ10)[6,7]

- Essential role in the electron transport chain
- Free radical scavenger
- Deficiency associated with subnormal or pathological mitochondrial damage
- Membrane stabiliser

Magnesium orotate[8,9]

Magnesium

- Critically involved in synthesis of ATP
- Activates ATP

Orotate

- Stimulates synthesis of ATP
- Facilitates transport of magnesium into cell and inner mitochondrial membrane

L-carnitine[10]

- Conjugates fatty acids for transport across the inner mitochondrial membrane
- Modulates oxidation rates of fatty acids
- Transports toxic compounds out of mitochondria
- Supports healthy membrane function
- Reduces mitochondrial decay

Alpha-lipoic acid[11-13]

- Cofactor for several mitochondrial enzymes
- Hydrophilic antioxidant
- Has regenerative effect on mitochondria
- Optimises mitochondrial function and reverses cell ageing

B vitamins[14]

- B1, B2, B3 required in Kreb's cycle and electron transport chain
- Biotin is essential for regulating mitochondrial fatty acid oxidation