

Noxae

Oxidative stress:

Hypoxia/hyperoxia, toxins, infection, radiation, hypernutrition, *etc.*

Pro-oxidants \rightleftharpoons Anti-oxidants

1. **Reactive oxygen intermediates**
ROI-producing enzymes and their substrates
Free radicals



2. **Development of lipid peroxidation**



3. **Damage to cellular membranes**
(morphological and biochemical)
 - Release of Fe^{2+} and Cu^{2+}
 - Release of haemoproteins



4. **Disruption of liver cell functions**
 - Reduction in detoxification capacity
 - Reduction in energy metabolism
 - Rise in lysosomal enzymes
 - Formation of eicosanoids
 - Disruption of genetic expression, *etc.*

5. **Intracellular Ca^{2+} enhancement**

Evidence of pathological laboratory values

6. **Liver cell death/necrosis**

7. **Liver insufficiency**