ANSC (NUTR) 618
LIPIDS & LIPID METABOLISM

Fatty Acid Peroxidation

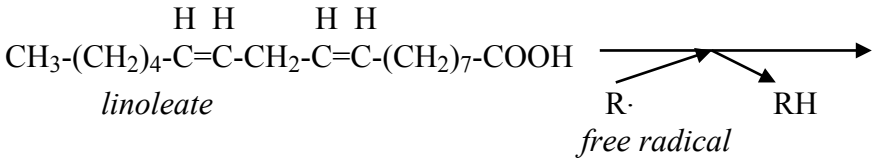
I. Nonenzymatic peroxidation of fatty acids

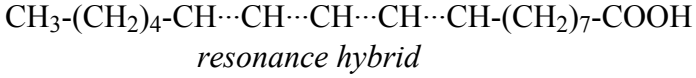
A. General

1. Peroxidation = production of peroxides and their degradation products.
2. Polyenoic acids (PUFA) are susceptible to peroxidation.

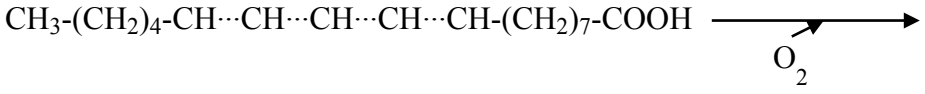
B. Mechanism of peroxidation:

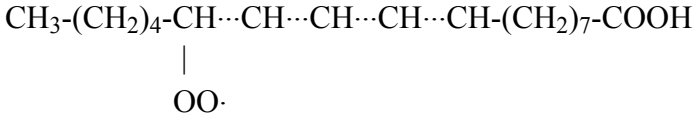
Initiation



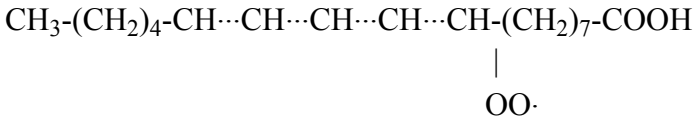


Propagation

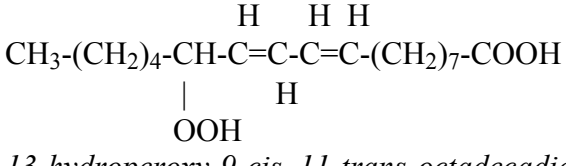




or

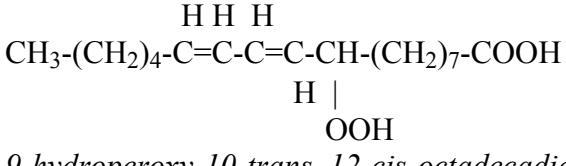


fatty acid free radicals ***(alkyl radicals; R·)***



13-hydroperoxy-9-cis, 11-trans-octadecadienoic acid

or



9-hydroperoxy-10-trans, 12-cis-octadecadienoic acid ***(hydroperoxides; ROOH)***

Termination

R· + **R·** ----------> $\mathbf{R_2}$

or **R·** + $\mathbf{O_2R}$· ----------> $\mathbf{RO_2R}$

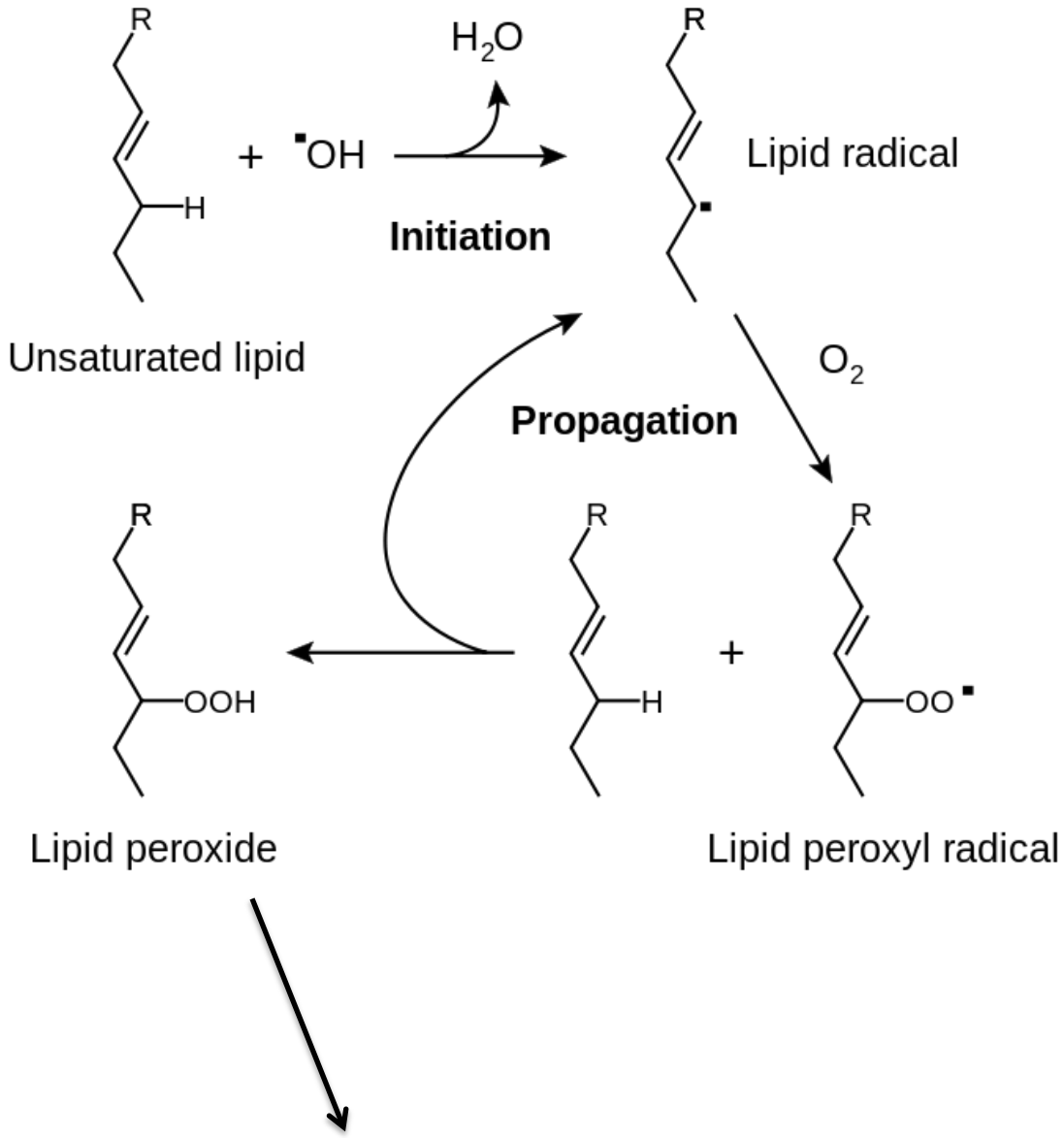
C. Decomposition of fatty acid peroxides

1. Cause of rancidity (warmed-over flavor)
2. Forms aldehydes (homolysis)

ROOH + transition metal ion ($M^{(n+1)+}$)----------> **ROO·** + M^{n+}

ROO· ----------> **RCHO + R'·**

(e.g., malonaldehyde)



Breakdown products (e.g., malonaldehyde)

•OH is a Reactive Oxygen Species, byproducts of normal oxygen metabolism.