



*Review: Supplement*

# Theories and molecular basis of vascular aging: a review of the literature from VascAgeNet group on pathophysiological mechanisms of vascular aging

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**Table S1.** Reactive oxygen and nitrogen species, radicals and nonradicals, their formation, characteristics and detoxification.

Species	Formula	Half life	Formation	Characteristics	Detoxification
Superoxide	$O_2^{\bullet -}$	$10^{-6}$ s	$O_2 + e^- \rightarrow O_2^{\bullet -}$ $O_2 + Fe^{2+} \rightarrow Fe^{3+} + O_2^{\bullet -}$ (auto-oxidation) $O_2^{\bullet -} + O_2^{\bullet -} + 2H_2O$ (Cu,Zn,Mn-SOD) $\rightarrow H_2O_2 + O_2$	Highly unstable, signaling function, synaptic plasticity	SOD (enzymatic), Vit C (non-enzymatic)
Hydrogen peroxide	$H_2O_2$	Stable	$O_2^{\bullet -} + O_2^{\bullet -} + 2H_2O$ (Cu,Zn,Mn-SOD) $\rightarrow H_2O_2 + O_2$	Cell toxicity, signaling function, generation of other ROS	CAT (enzymatic)
Hydroxyl radical	$OH^{\bullet}$	$10^{-10}$ s	$Fe^{2+} + H_2O_2 \rightarrow Fe^{3+} + OH^{\bullet} + OH^-$ (Fenton reaction) $O_2^{\bullet -} + H_2O_2 \rightarrow O_2 + OH^{\bullet} + OH^-$ (Haber-Weiss reaction)	Free radical, highly reactive, very reactive agent	Vit E (non-enzymatic)
Alkoxyl radical	$RO^{\bullet}$	$10^{-6}$ s	$ROOH + Fe^{3+} \rightarrow RO^{\bullet} + Fe^{2+}$ $ROOH + HO_2^{\bullet} \rightarrow RO^{\bullet} + O_2$	Free radical, reaction product of lipids	Vit C
Peroxyl radical	$ROO^{\bullet}$	17 s	Protonation of $O_2^{\bullet -}$	Free radical, reaction product of lipids	$\beta$ -carotene
Hypochlorite anion	$OCl^-$	Stable (min)	$H_2O_2 + Cl^-$ (MPO) $\rightarrow OCl^- + OH^{\bullet}$ from activated neutrophils at the site of inflammation	Reactive oxygen species, reactive chlorine species, enzymatically generated by myeloperoxidase	Vit C
Singlet oxygen	$^1O_2$	$10^{-5}$ s	$HOCl + H_2O_2 \rightarrow ^1O_2 + H_2O + Cl^-$	Induced/excited oxygen molecule, radical and non-radical form	$\beta$ -carotene
Nitric oxide	$^{\bullet}NO$	s	$L\text{-Arg} + O_2 + NADPH$ (NOS) $\rightarrow$ L-Citrulline + $^{\bullet}NO + NADP^+$	Environmental toxin, endogenous signal molecule	$O_2^{\bullet -}$
Peroxynitrite	$ONOO^{\bullet}$	$10^{-3}$ s	$O_2^{\bullet -} + ^{\bullet}NO \rightarrow OONO^{\bullet}$	Highly reactive reaction intermediate of $O_2^{\bullet -}$ and $^{\bullet}NO$	GPx
Nitrogen dioxide	$NO_2^{\bullet}$	s	$HONO \rightarrow NO_2^{\bullet}$	Highly reactive radical, environmental toxin	$\gamma$ -Tocopherol
Nitrogen oxides	$NO_x$	s	$NO + O_2 + H_2O \rightarrow NO_3^- + NO_2^{\bullet}$ $^{\bullet}NO + e^- \rightarrow NO_2^{+}$ nitrosonium cation $^{\bullet}NO - e^- \rightarrow NO^{\bullet}$ nitroxyl anion $NO_2^{+} + NO^{\bullet} \rightarrow N_2O + OH^{\bullet}$ etc.	Environmental toxins including NO and $NO_2^{\bullet}$ derived from combustion process	Some bacteria

CAT: catalase; GPx: glutathione peroxidase; NO: nitric oxide; SOD: Superoxide dismutase, Vit: vitamin.