17 – Quais as fontes produtoras de radiciais livres mais conhecidas?

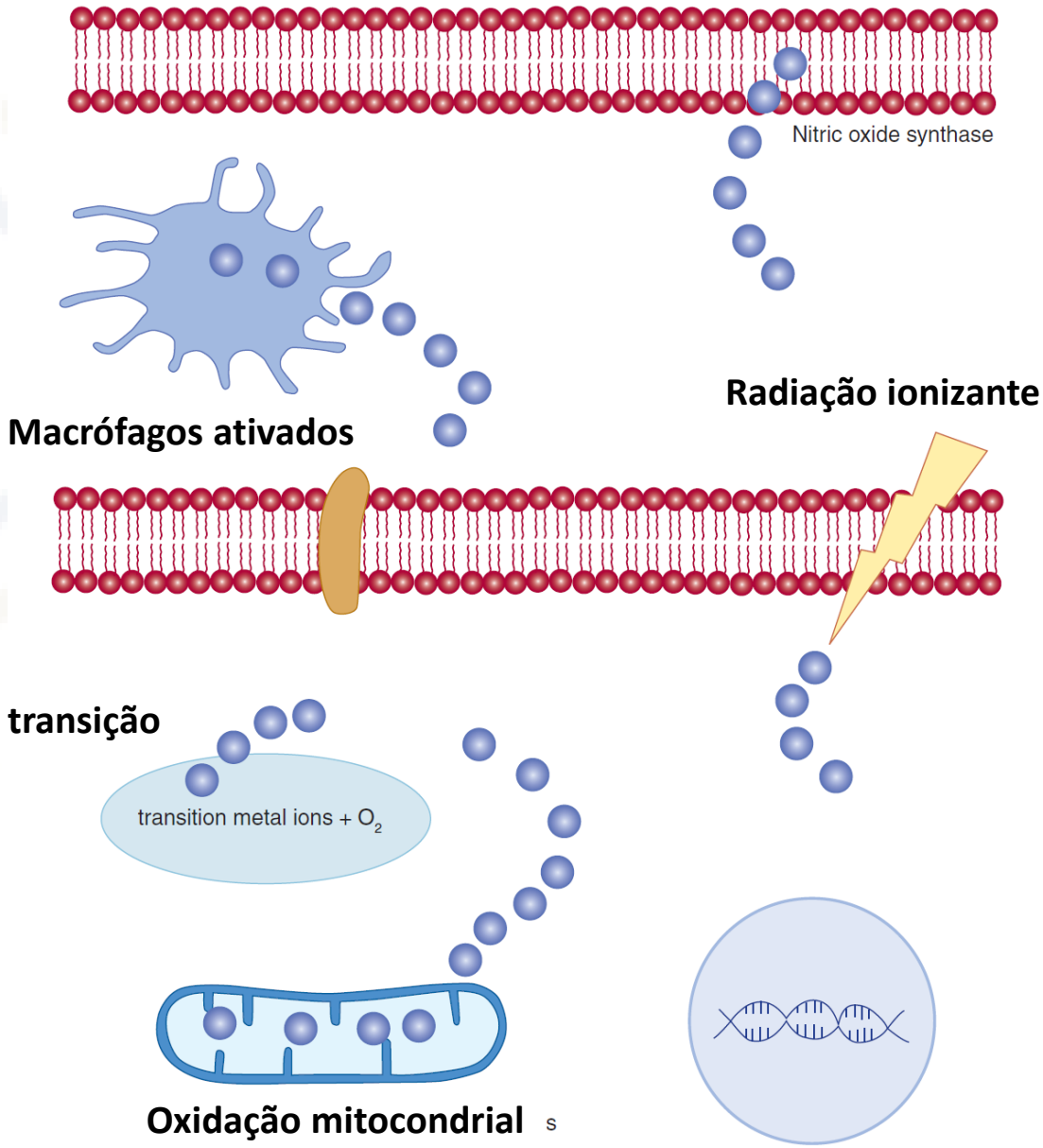
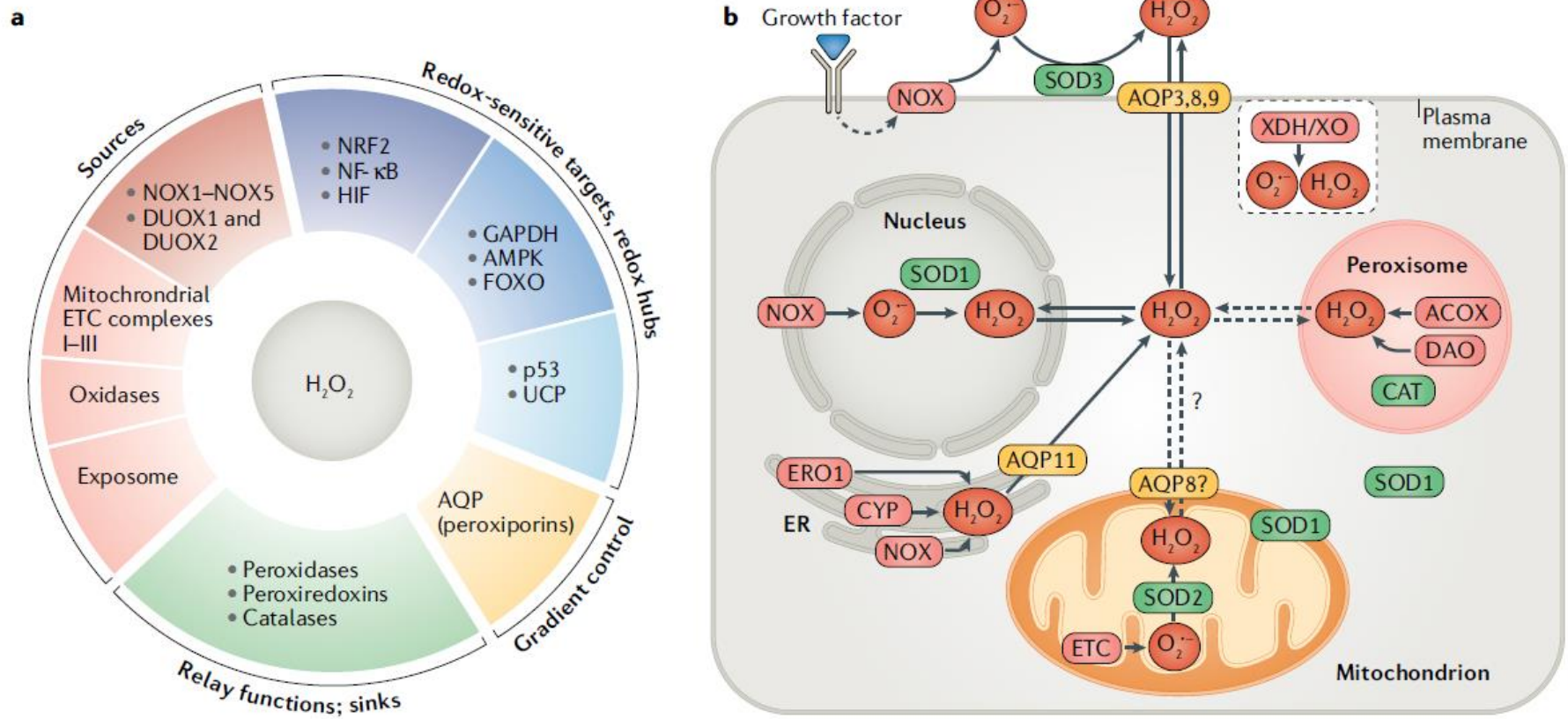


FIGURE 45–2 Sources of radicals.

Harper illustration – Biochemistry.

17 – Quais as fontes produtoras de radiciais livres mais conhecidas?



Sies & Jones, 2020. Mol Cell Biology. 21:363

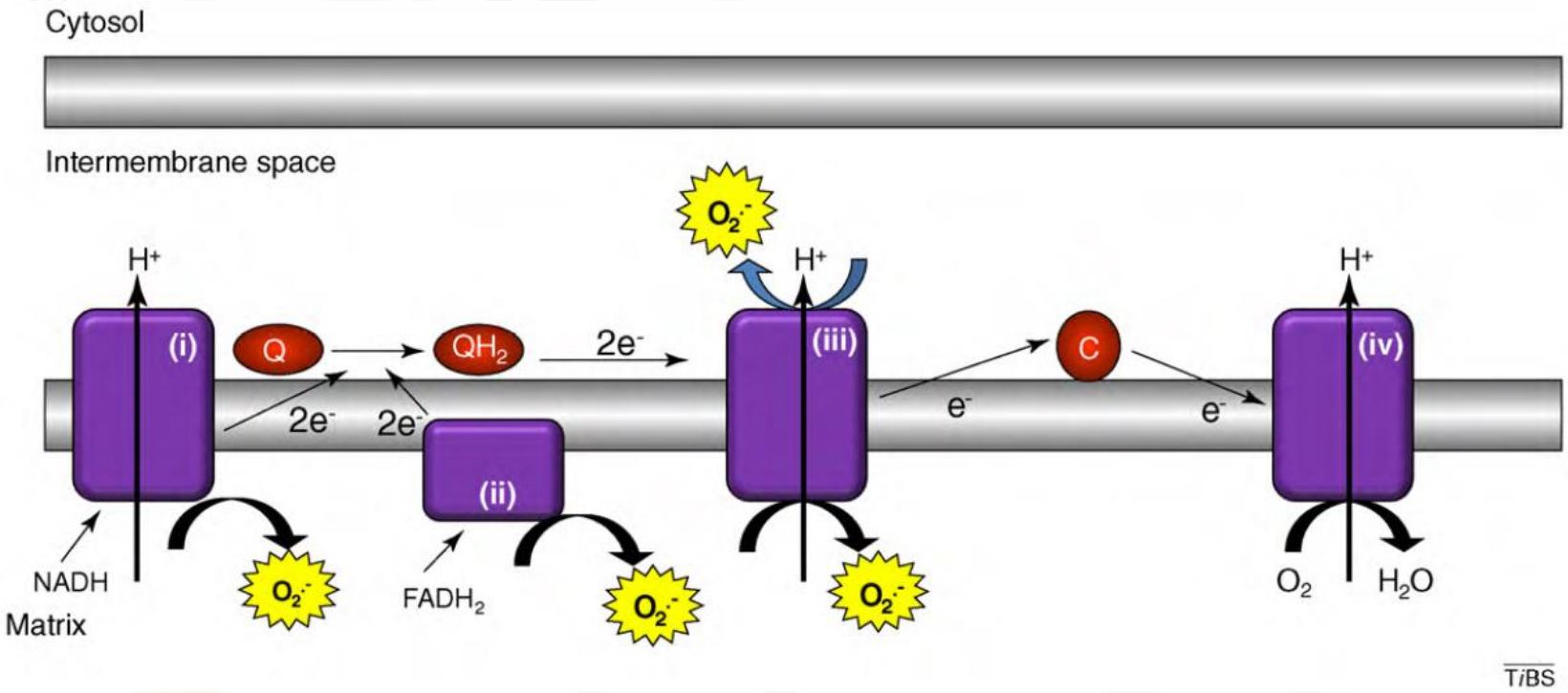
17 – Quais as fontes produtoras de radiciais livres mais conhecidas?

Name	Protein abbreviation	Location	Product[a]
Aldehyde oxidase	AOX1	C	H_2O_2
Amine oxidase (flavin-containing) A	AOFA	M	H_2O_2
Amine oxidase (flavin-containing) B	AOFB	M	H_2O_2
D-Amino acid oxidase	OXDA	Px	H_2O_2
L-Amino acid oxidase	OXLA	L	H_2O_2
D-Aspartate oxidase	OXDD	Px	H_2O_2
Amiloride-sensitive amino oxidase (copper containing)	AOC1	S	H_2O_2
Cytochrome P450 3A4	CP3A4	ER	$O_2^{\cdot-}/H_2O_2$
Cytochrome P450 2D6	CP2D6	ER	$O_2^{\cdot-}/H_2O_2$
Cytochrome P450 2E1	CP2E1	ER, M	$O_2^{\cdot-}/H_2O_2$
Cytochrome P450 4A11	CP4AB	ER	$O_2^{\cdot-}/H_2O_2$
ERO1-like protein-α	ERO1A	ER	H_2O_2
ERO1-like protein-β	ERO1B	ER	H_2O_2
FAD-linked sulfhydryl oxidase ALR	ALR	C, M, S	H_2O_2
Hydroxyacid oxidase 1	HAOX1	Px	H_2O_2
Hydroxyacid oxidase 2	HAOX2	Px	H_2O_2
Membrane primary amine oxidase	AOC3	PM	H_2O_2
Peroxisomal N^1-acetylspermine/spermidine oxidase	PAOX	Px, C	H_2O_2
Peroxisomal acyl-CoA oxidase 1	ACOX1	Px	H_2O_2
Peroxisomal acyl-CoA oxidase 3	ACOX3	Px	H_2O_2
Peroxisomal sarcosine oxidase	SOX	Px	H_2O_2
Prenylcysteine oxidase 1	PCYOX	L	H_2O_2
Prenylcysteine oxidase-like	PCYXL	S	H_2O_2
Protein-lysine 6-oxidase	LYOX	S	H_2O_2
Pyridoxine 5′-phosphate oxidase	PNPO	C	H_2O_2
Retina-specific copper amine oxidase	AOC2	PM, C	H_2O_2
Spermine oxidase	SMOX	C, N	H_2O_2
Sulfhydryl oxidase 1	QSOX1	G	H_2O_2
Sulfhydryl oxidase 2	QSOX2	N, PM, S	H_2O_2
Sulfite oxidase, mitochondrial	SUOX	M	H_2O_2
Xanthine dehydrogenase/oxidase	XDH	C, PM, S	H_2O_2
NADPH oxidase 1	NOX1	PM	$O_2^{\cdot-}$
NADPH oxidase 2	NOX2 (also known as CY24B)	PM	$O_2^{\cdot-}$
NADPH oxidase 3	NOX3	PM	$O_2^{\cdot-}$
NADPH oxidase 4	NOX4	ER, PM, N	H_2O_2
NADPH oxidase 5	NOX5	ER	$O_2^{\cdot-}$
Dual oxidase 1	DUOX1	PM	H_2O_2
Dual oxidase 2	DUOX2	PM	H_2O_2
Superoxide dismutase [Cu–Zn]	SOD1	C, N, M	H_2O_2
Superoxide dismutase [Mn], mitochondrial	SOD2	M	H_2O_2
Extracellular superoxide dismutase [Cu–Zn]	SOD3	PM, S	H_2O_2

[a]Enzymes have been characterized in terms of $O_2^{\cdot-}$ and H_2O_2 production, but the analytical methods used are often unable to discriminate the primary product owing to dismutation of $O_2^{\cdot-}$ to produce H_2O_2. Other proteins, such as other cytochrome P450 enzymes and haemoglobin, produce $O_2^{\cdot-}$ or H_2O_2 but are not included because the rates are typically low. Enzymes generating lipid peroxides are included in Supplementary Table 1. C, cytoplasm; ER, endoplasmic reticulum; G, Golgi apparatus; L, lysosome; M, mitochondria; N, nucleus; PM, plasma membrane; Px, peroxisome; S, secreted.

Sies & Jones, 2020. Mol Cell Biology. 21:363

17 – Quais as fontes produtoras de radiciais livres mais conhecidas?



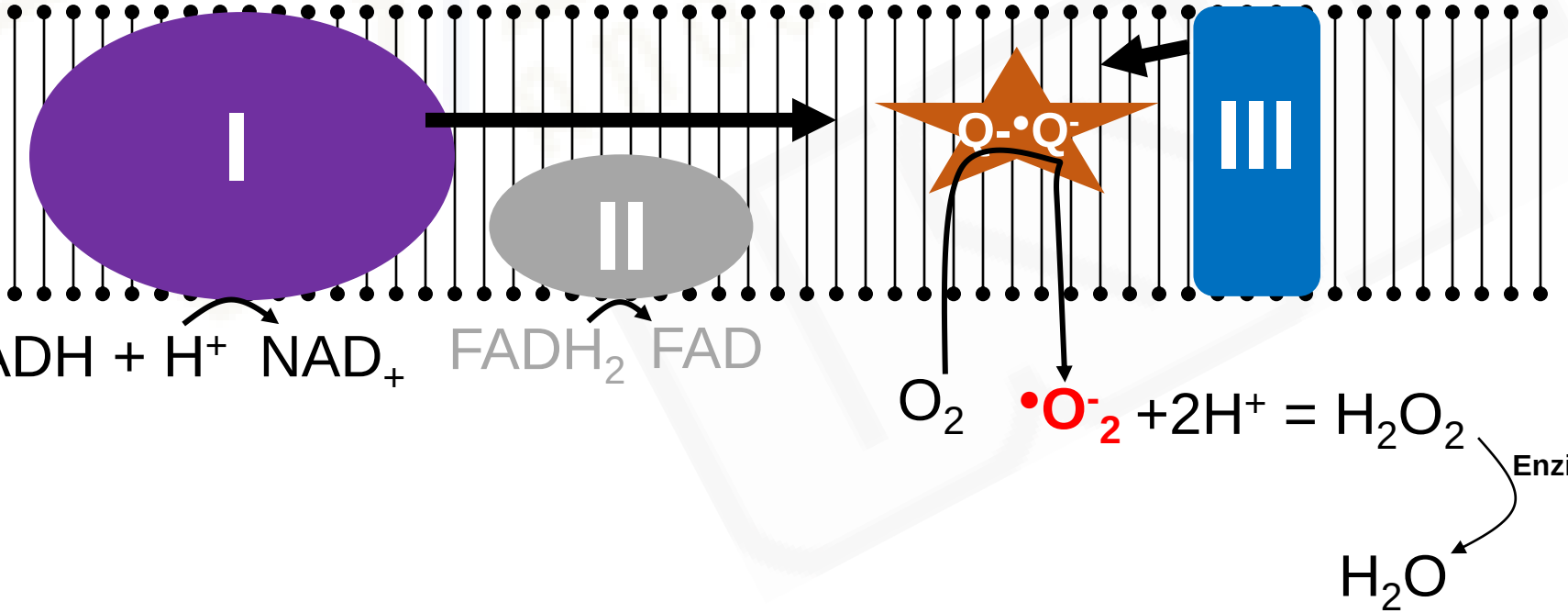
Chandel et. al., 2019 – Trends in Biochemical Sciences. 35(9).

1- Complexo I transfere elétron para ubiquinona através do intermediário $^{\bullet}Q^{-}$.

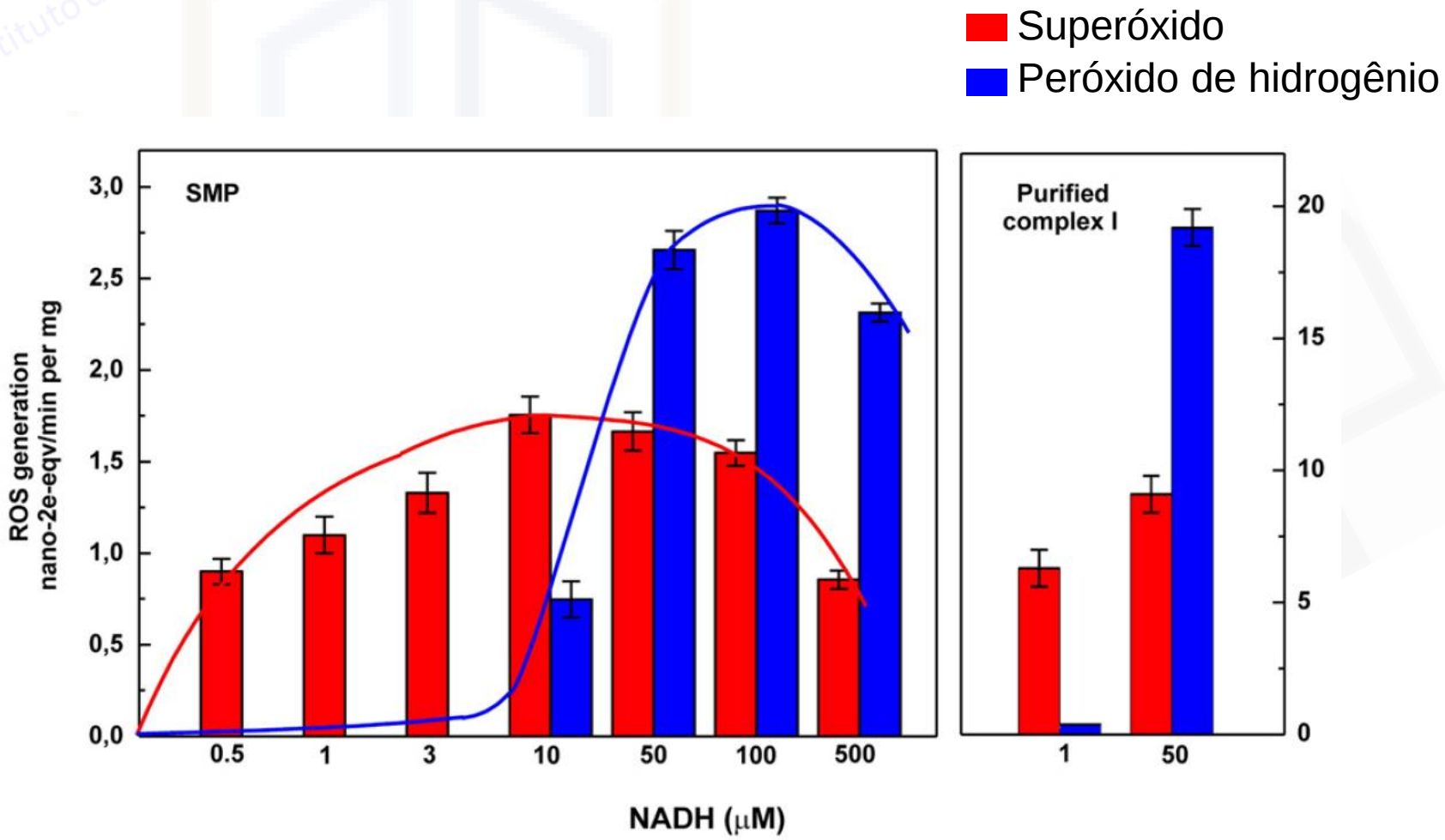
2- A passagem dos elétrons de QH2 para citocromo bL através do Complexo III involve o intermediário $^{\bullet}Q^{-}$

3- O intermediário $^{\bullet}Q^{-}$ pode doar o elétron para O_2, formando o $^{\bullet}O^{-}_{2}$

4- O $^{\bullet}O^{-}_{2}$ juntamente com prótons resulta na formação de H_2O_2

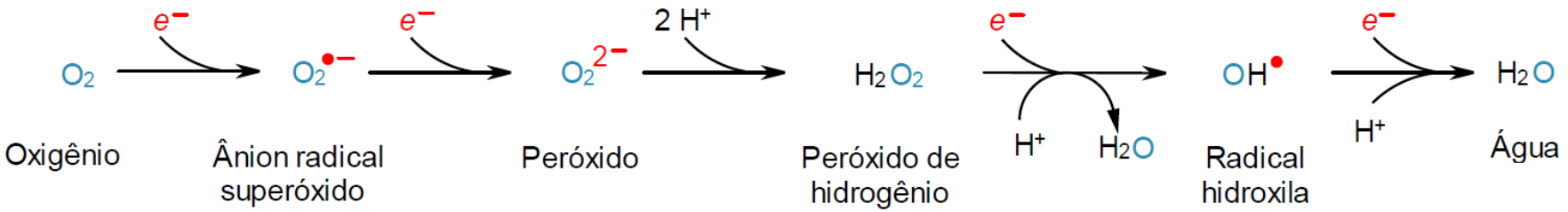


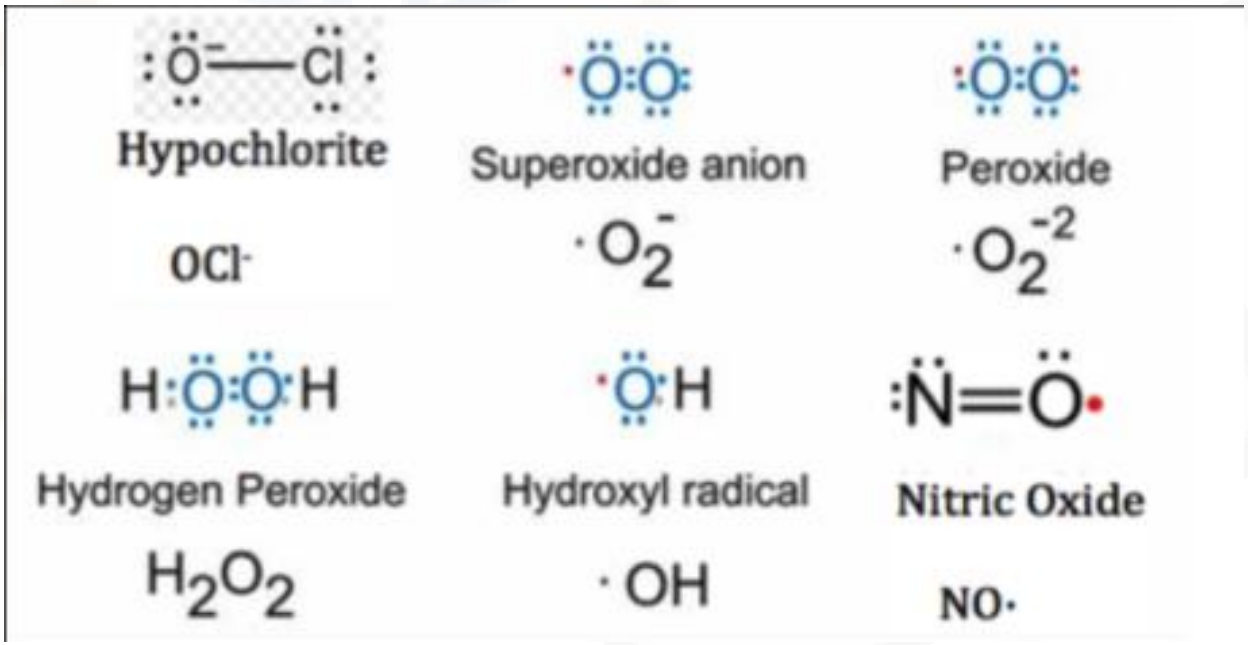
Geração de ROS pelo Complexo I é NADH concentração dependente



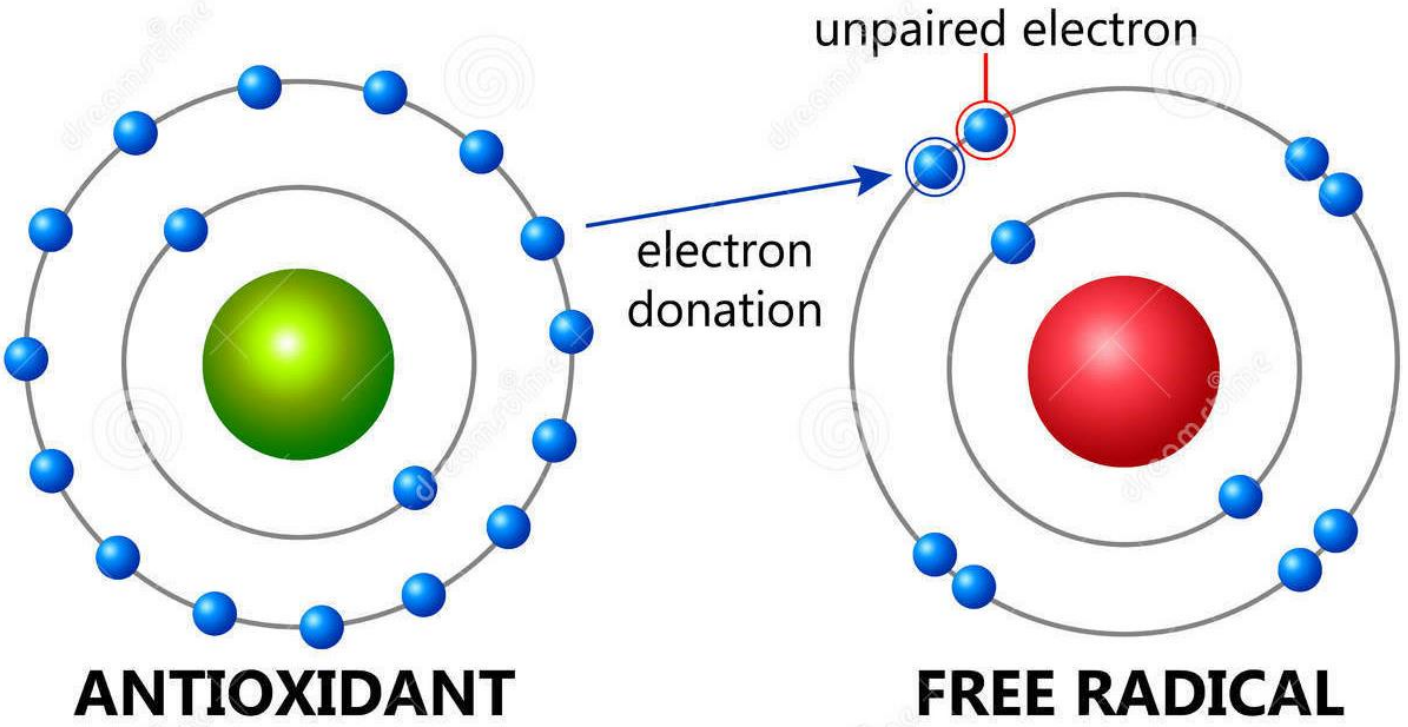
Vinogradov & Grivennikova, 2016 – BBA 1857:863-871.

18 – O que caracteriza um radical livre?





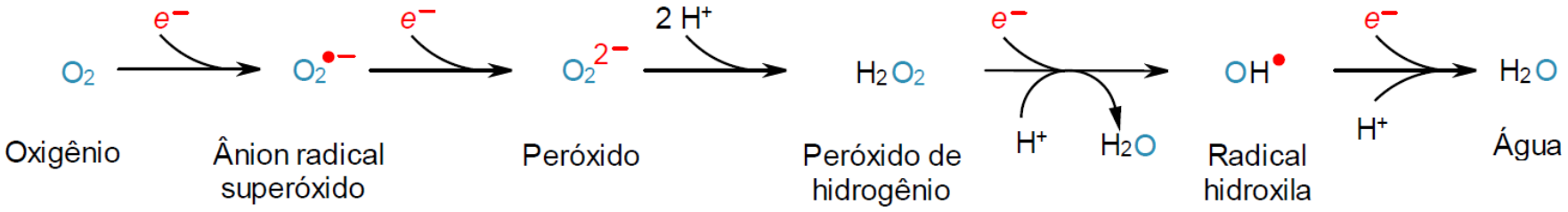
18 – O que caracteriza um radical livre?



chemically reactive unpaired electron + electron donation:
stable electron pair is formed, free radical is neutralised

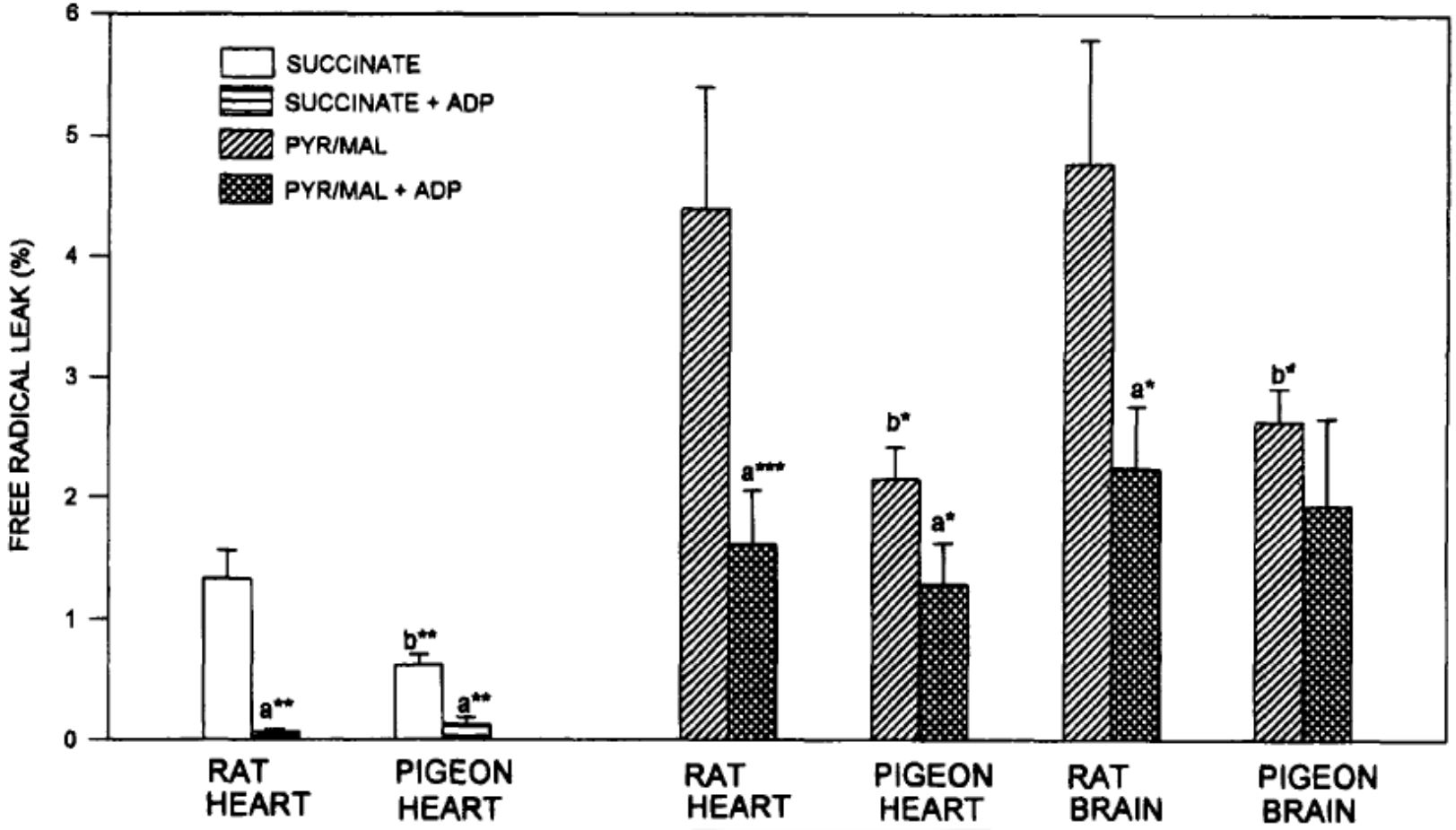
19 – Ordenar as seguintes reações que descrevem a formação da água a partir do oxigênio e identificar as espécies que são consideradas radicais livres:

( ) $OH^{\bullet} + e^{-} + H^{+} \rightarrow H_2O$
( ) $O_2^{\bullet -} + e^{-} + 2H^{+} \rightarrow H_2O_2$
( ) $O_2 + e^{-} \rightarrow O_2^{\bullet -}$
( ) $H_2O_2 + e^{-} \rightarrow OH^{-} + OH^{\bullet}$



20 – Em que circunstâncias são formados os radicais livres de oxigênio?

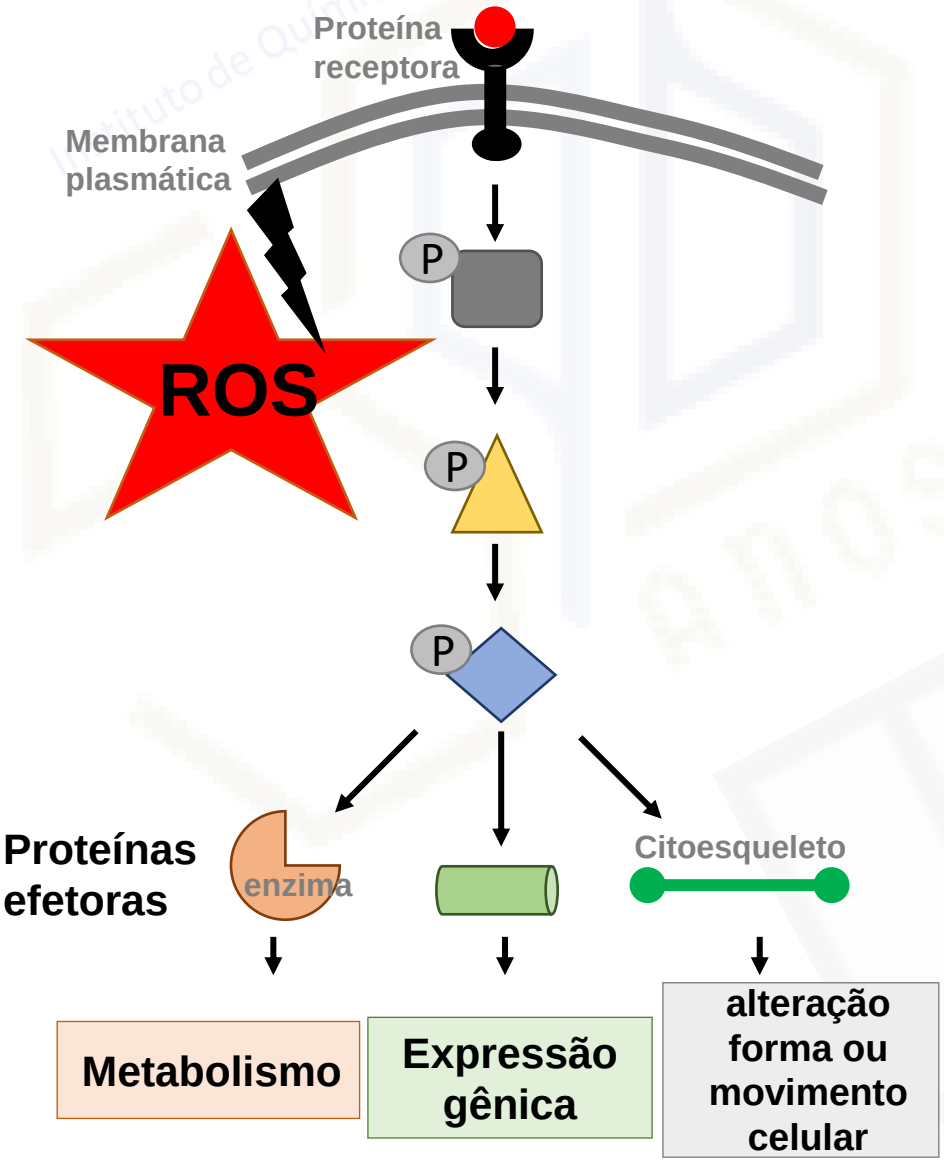
Falta de ADP



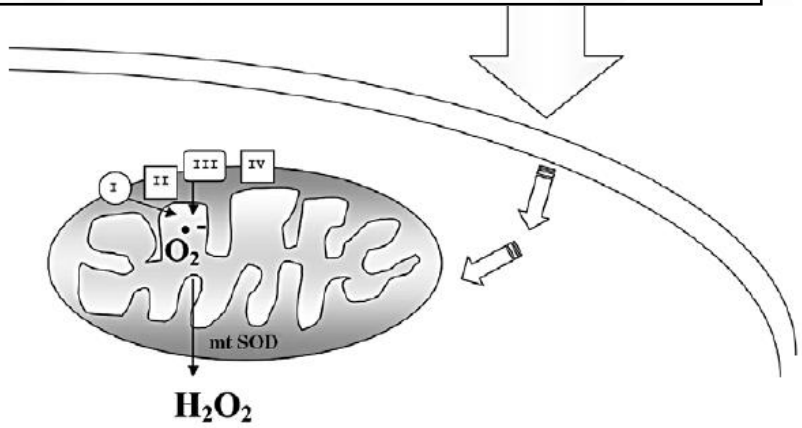
Herrero & Barja, 1997 – J Bioen Biom. 29(3).

21 – Dê exemplos dos efeitos maléficos e benéficos dos radicais livres para o organismo.

Sinalização celular

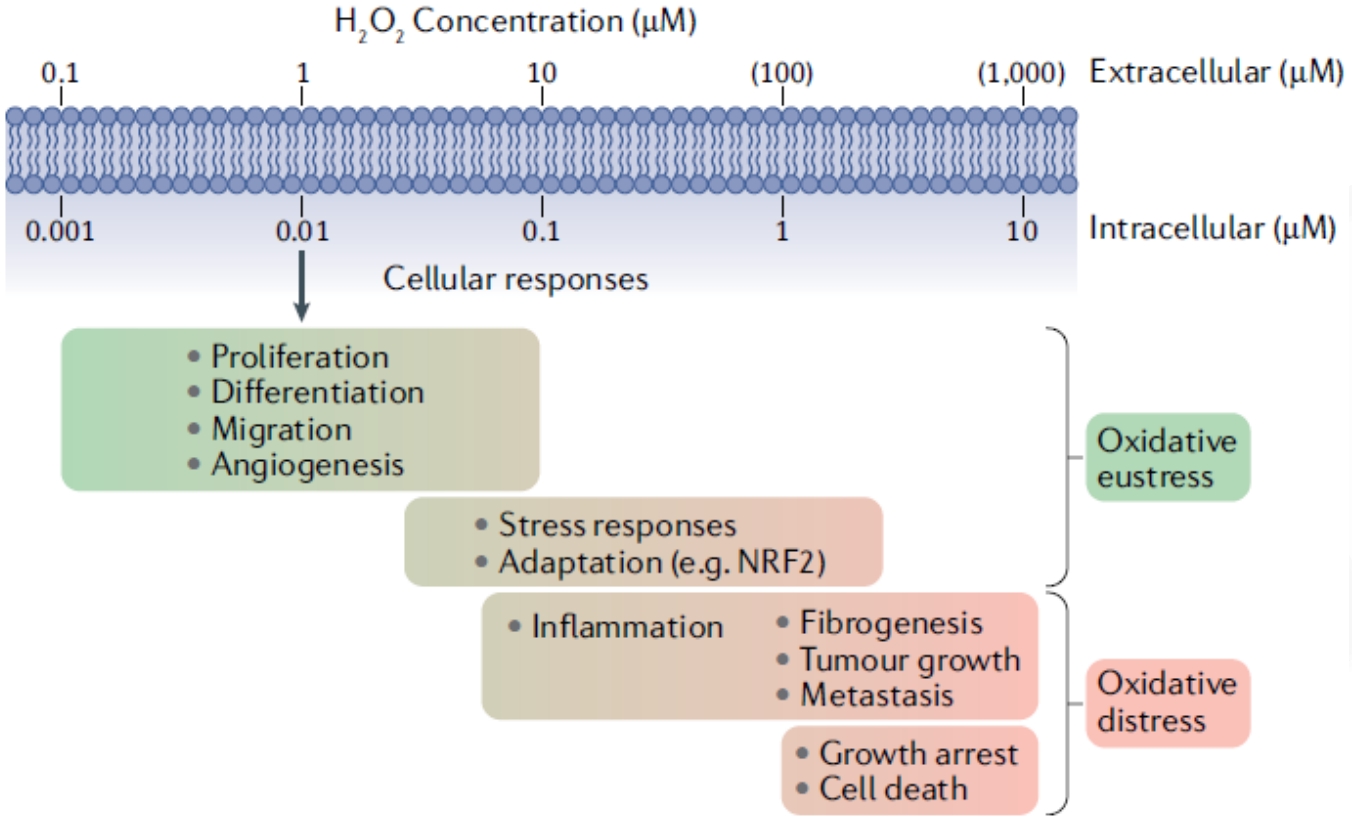


Sinalização integrina
Apoptose
p53
Hipóxia
TNF-alpha
Ras oncogênica (ativação oncogênica)



Chiarugi & Buricchi 2007 – Antioxidants & Redox sign 9:1-24.

21 – Dê exemplos dos efeitos maléficos e benéficos dos radicais livres para o organismo.



Sies & Jones, 2020. Mol Cell Biology. 21:363

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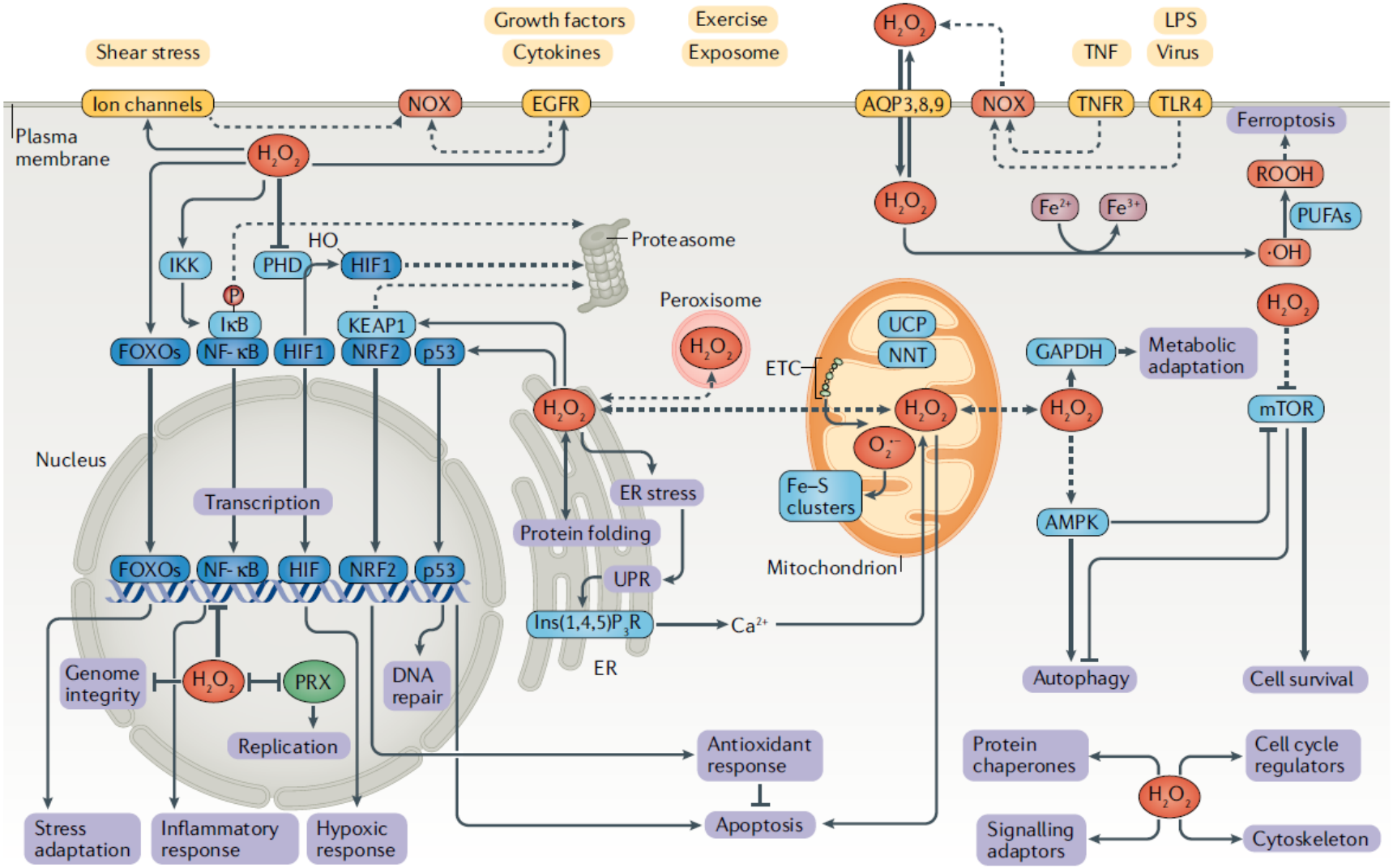

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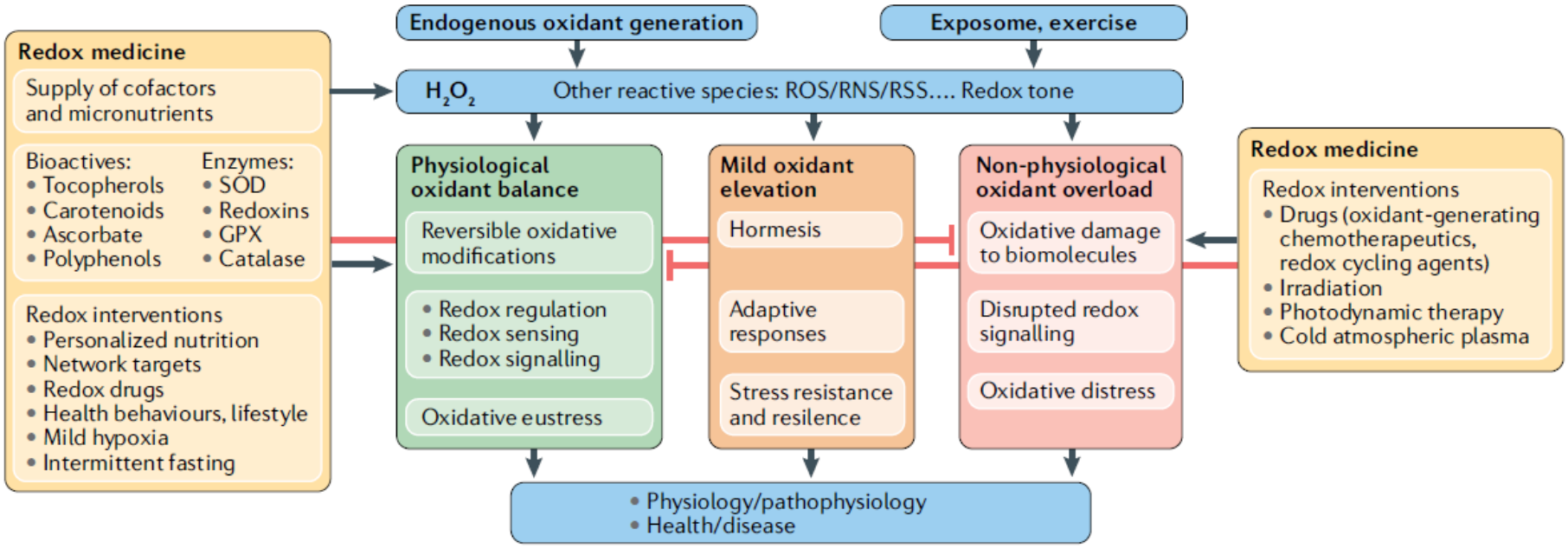

Sies & Jones, 2020. Mol Cell Biology. 21:363

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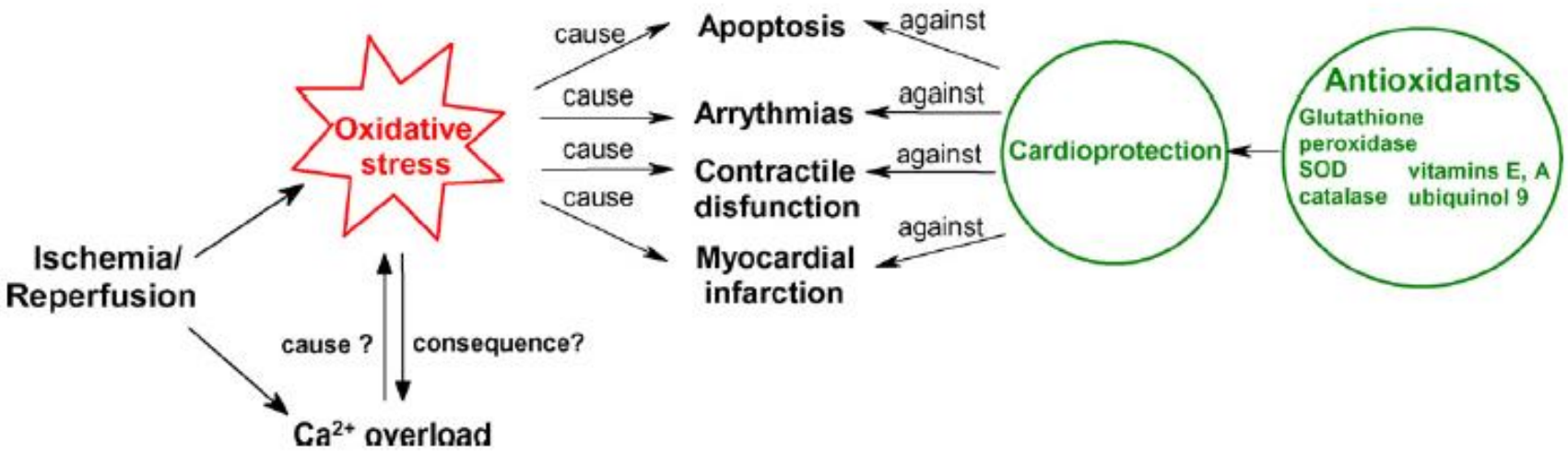

Fig. 5. Effect of oxidative stress and antioxidants in pathophysiology of ischemia-reperfusion injury in the heart.

Valko et al., 2007 – Int J Bioch Cell Biol. 39:44-84

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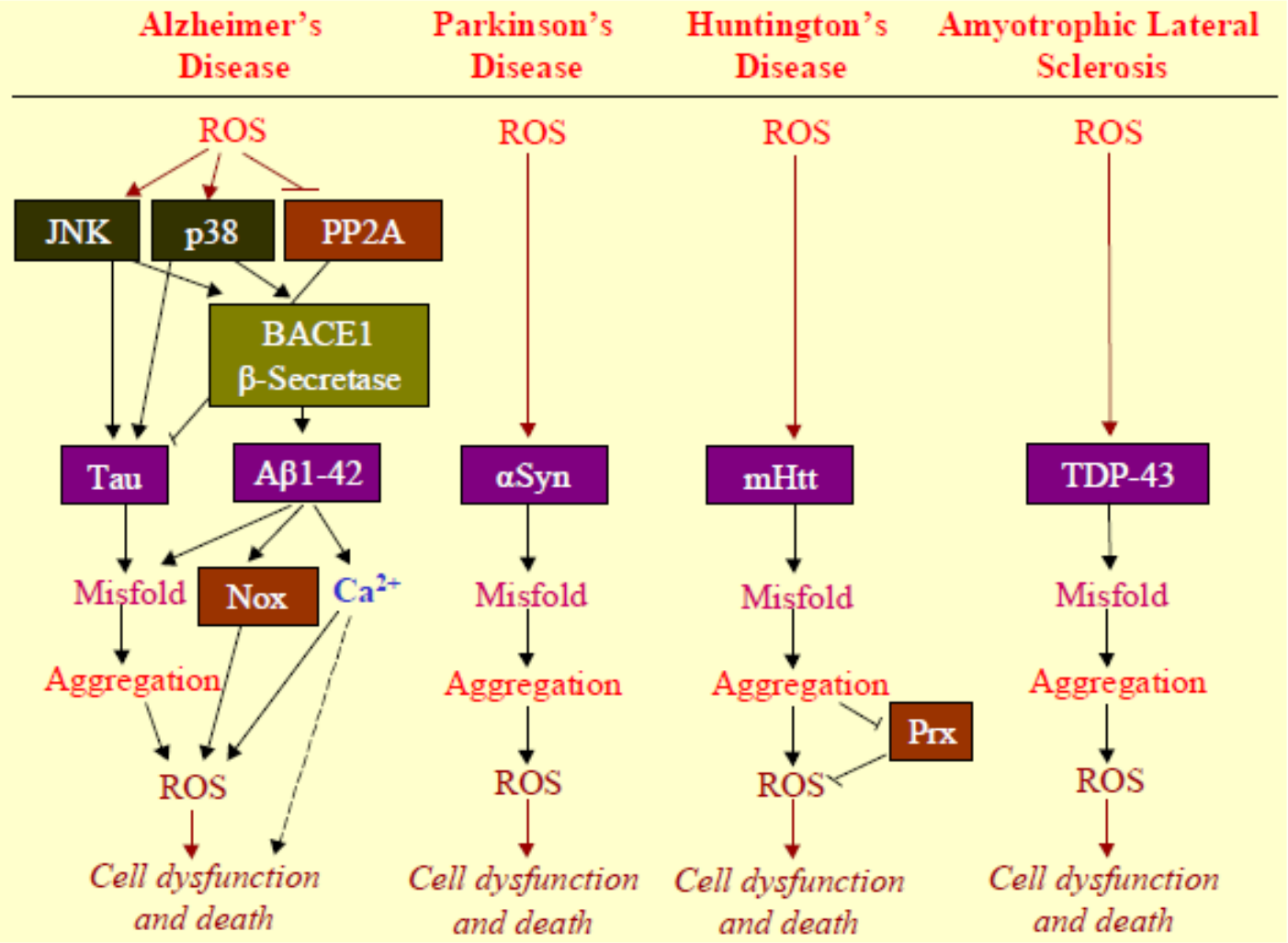

Li et al., 2013 – Int J Mol Sci. 14:24438-24475.

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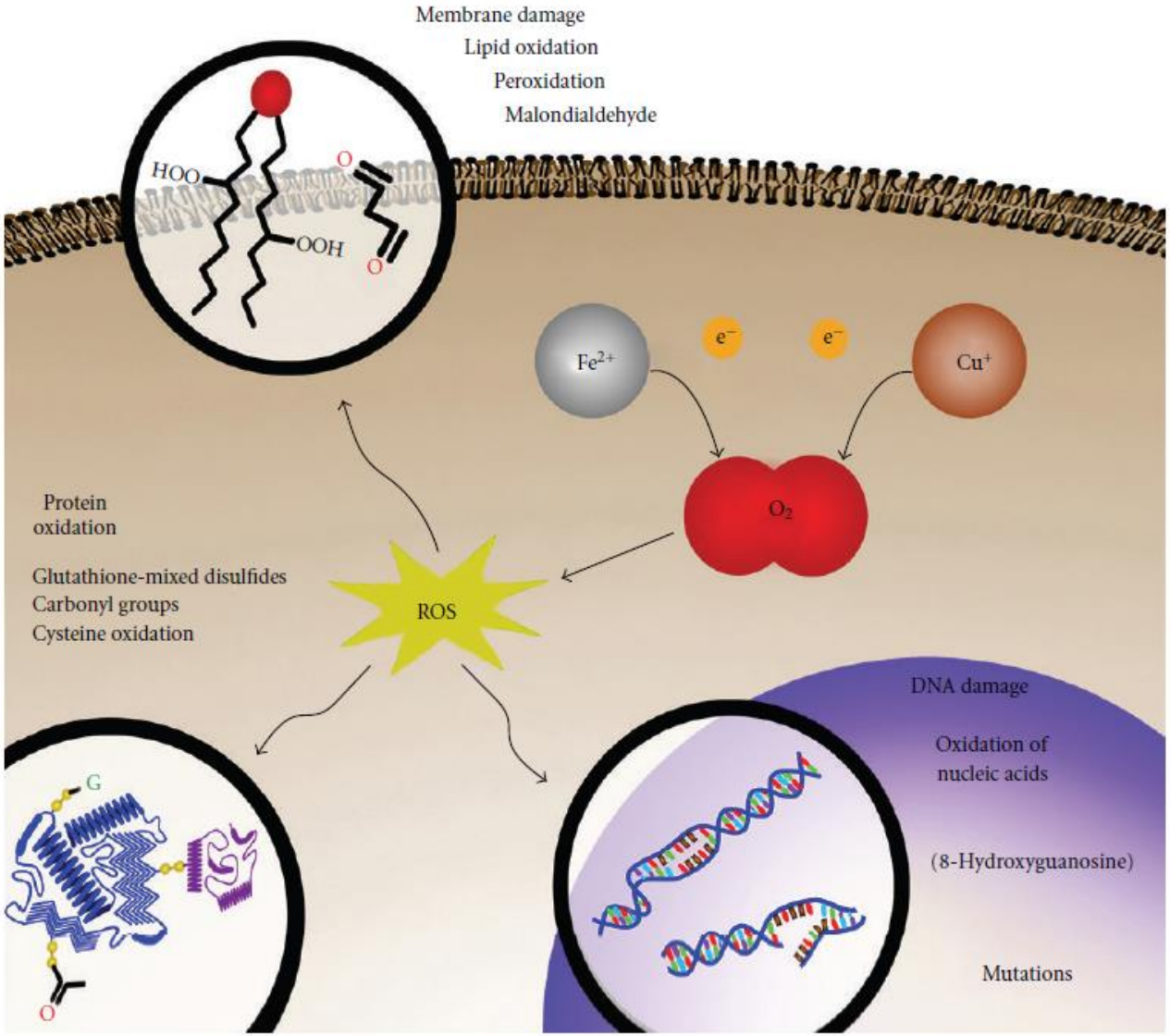

FIGURE 2: Oxidative damages induced by transition metals. Iron and copper can reduce oxygen leading to ROS generation and subsequent oxidation of proteins, lipids, and nucleic acids.

Melo et al., 2011 – Oxid. Med Cell Long. doi:10.1155/2011/467180.

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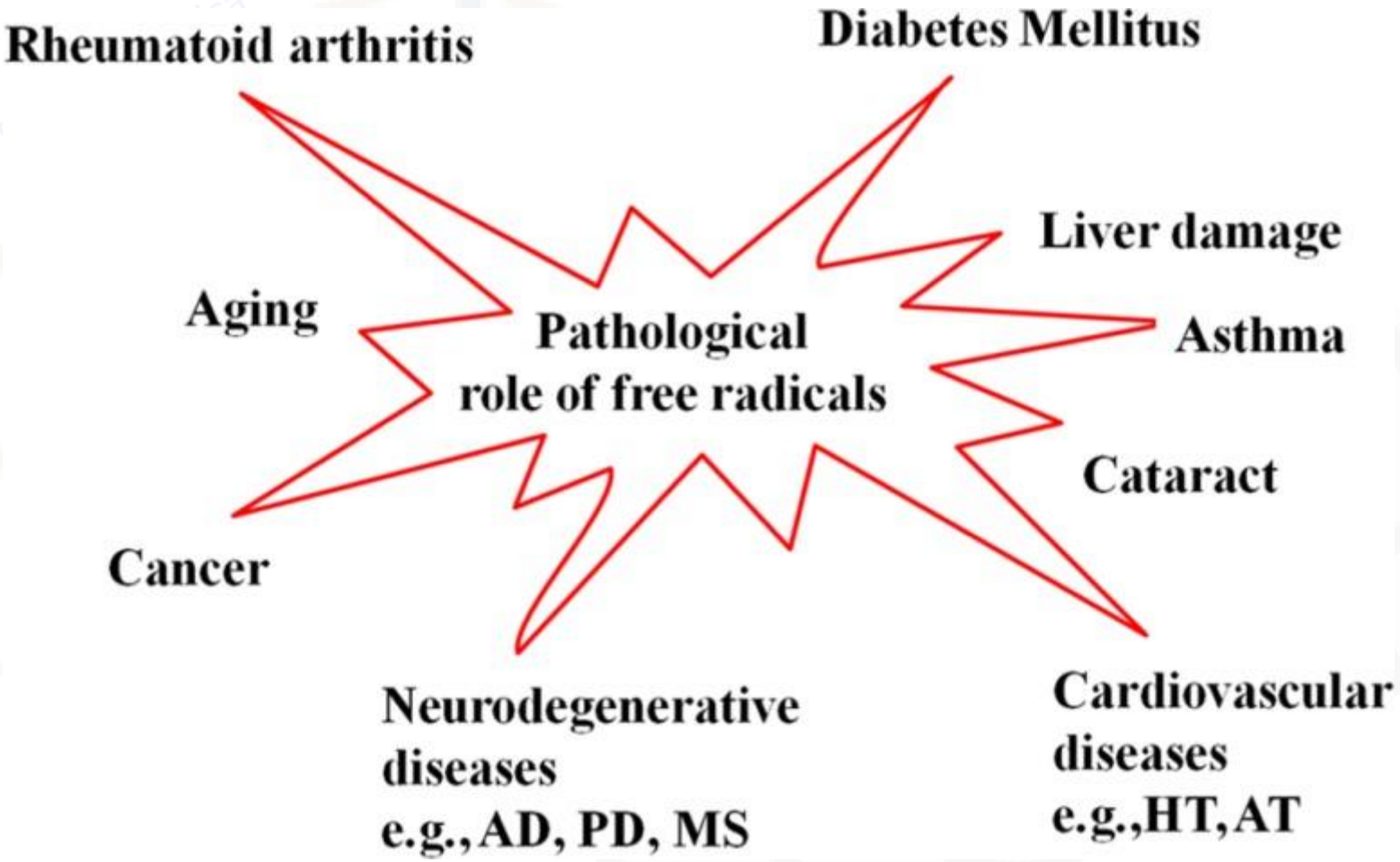

Phaniendra et al., 2015 – Ind J Clin Biochem. 30(1):11-26.

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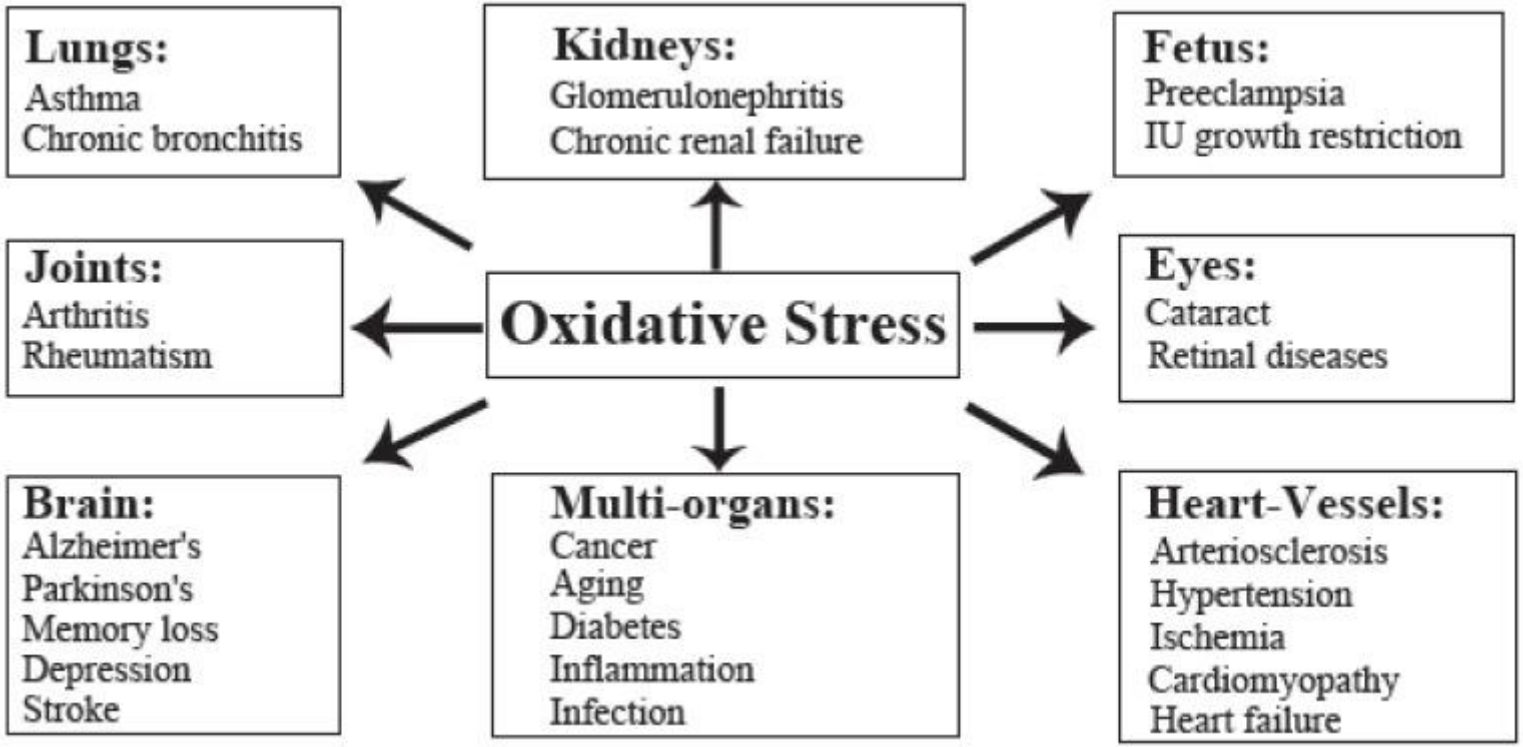


Pham-Huy et al., 2008 – Int J Biomed Sci. 4(2):89-96.

22 – Citar os mecanismos de defesa e descrever a sua ação sobre os radicais livres.

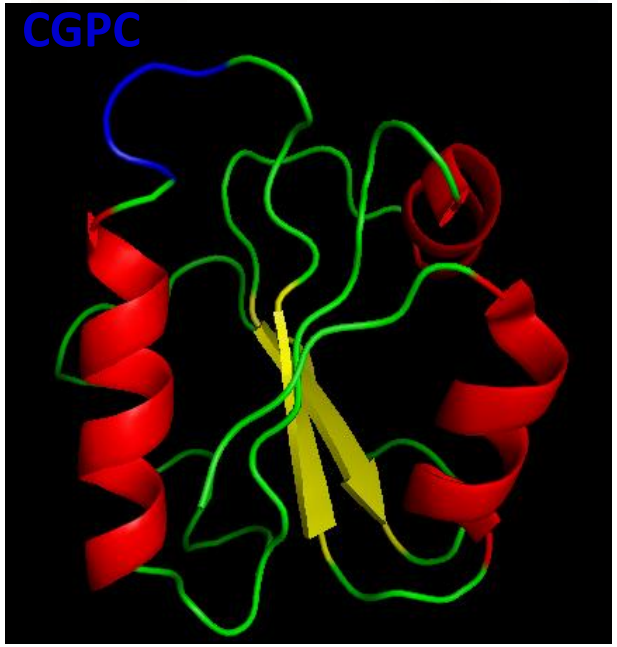
superóxido dismutase

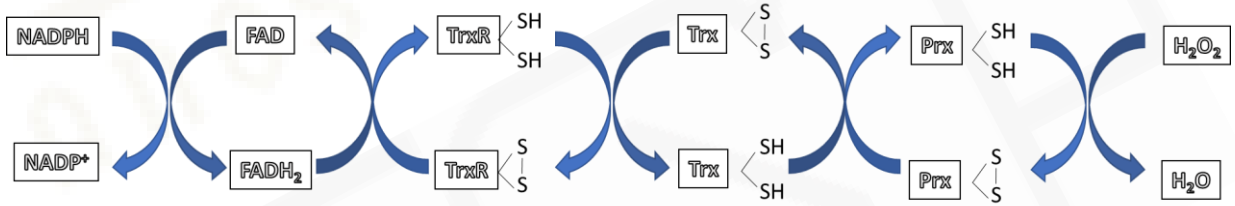
$$O_2^{\bullet -} + O_2^{\bullet -} + 2\,H^+ \longrightarrow O_2 + H_2O_2$$

catalase

$$2\,H_2O_2 \longrightarrow O_2 + 2\,H_2O$$

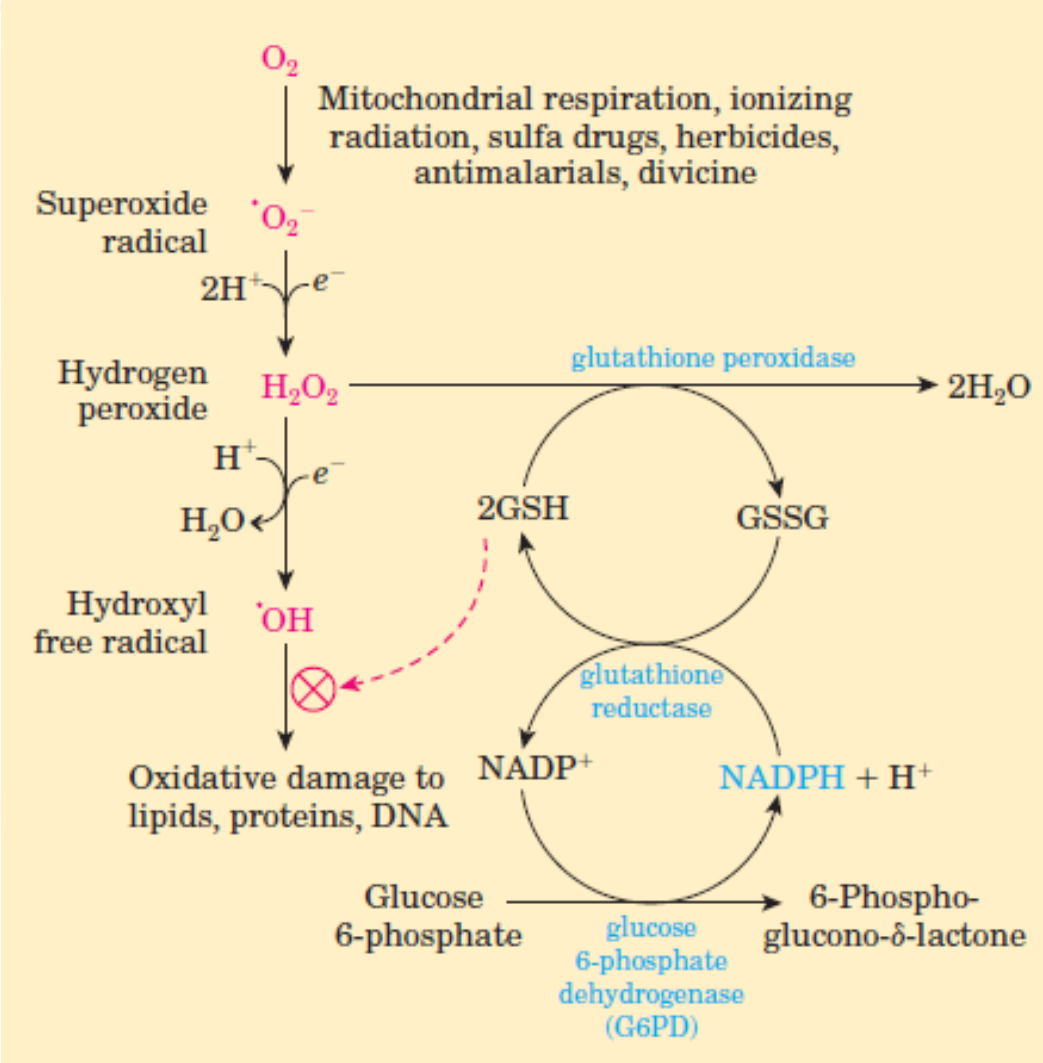
Tioredoxina





22 – Citar os mecanismos de defesa e descrever a sua ação sobre os radicais livres.

Papel de NADPH e glutationa na proteção das células contra os radicais livres:



Lenhinger-Biochemistry, 4th, 2005

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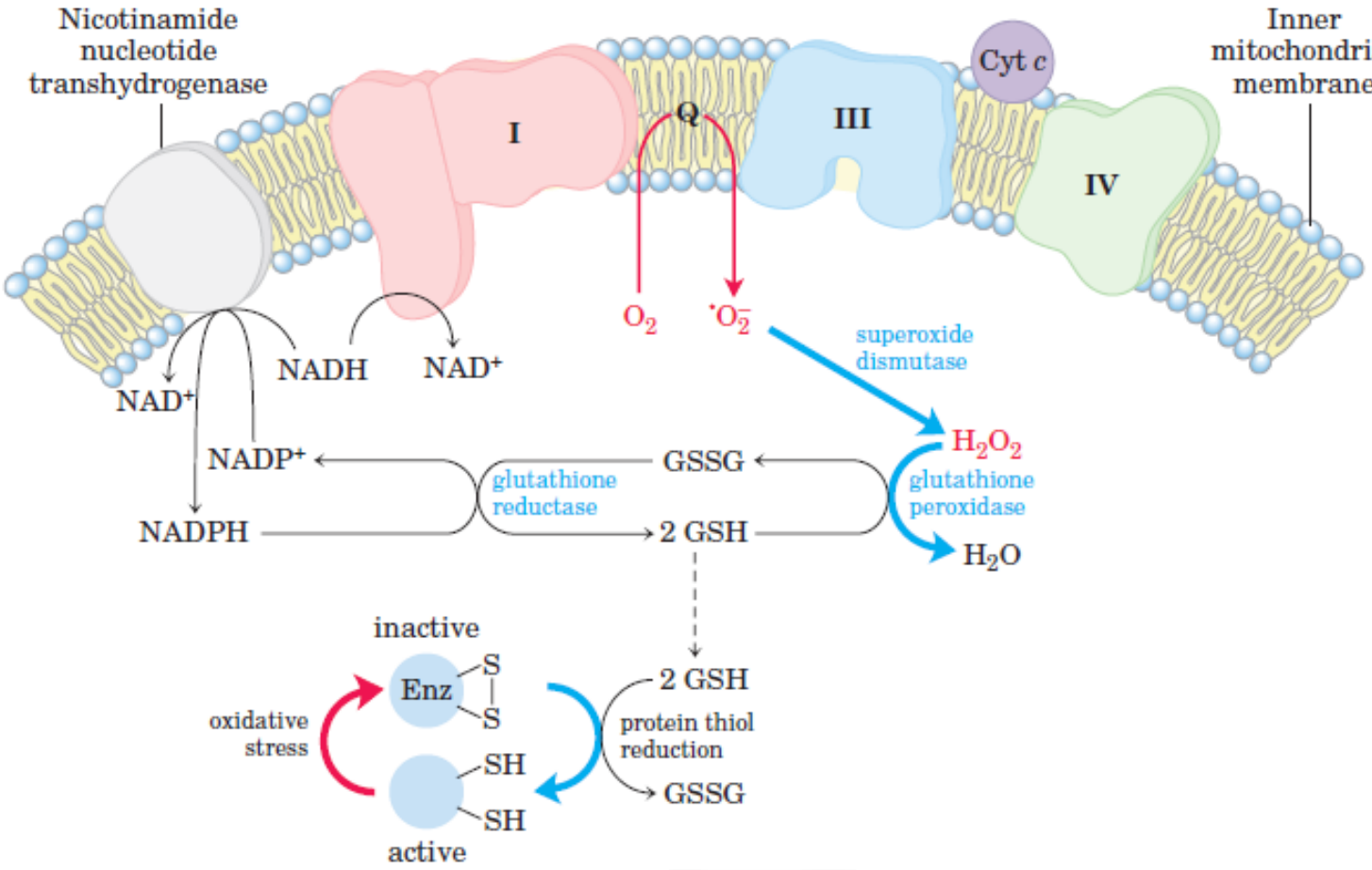

Lenhinger-Biochemistry, 4th, 2005