



**Keywords:** Oxidative stress; Antioxidants; Reactive intermediates

### Introduction

Oxidative process that is regularly going on in cell is essential for life and death of a cell. The following are the important key points taken into consideration:

1. Production of reactive oxygen species (ROS) and reactive nitrogen species (RNS) by various enzymes and non-enzymatic sources.

2. ROS and RNS are highly reactive and can damage DNA, proteins, and lipids.

3. ROS and RNS are involved in the regulation of cell signaling and gene expression.

4. ROS and RNS are involved in the pathogenesis of various diseases, including cancer, cardiovascular disease, and neurodegenerative diseases.

5. Endogenous antioxidants, such as superoxide dismutase (SOD), catalase (CAT), and glutathione peroxidase (GPx), play a crucial role in neutralizing ROS and RNS.

6. Exogenous antioxidants, such as vitamins C and E, and polyphenols, also play a role in neutralizing ROS and RNS.

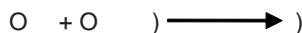
7. Oxidative stress occurs when the production of ROS and RNS exceeds the capacity of the antioxidant defense system.

8. Oxidative stress is a major factor in the development of various diseases.

9. Understanding the mechanisms of oxidative stress and the role of antioxidants is essential for the development of new therapeutic strategies for various diseases.

### Non enzymatic sources

Fenton's & Haber's reactions:  $H_2O_2 + Fe^{2+} \rightarrow \cdot OH + OH^-$  and  $H_2O_2 + Cu^{+} \rightarrow \cdot OH + OH^-$  are non-enzymatic sources of ROS. The dismutation of superoxides forms hydrogen peroxide.



N J U P D I P O E S Q B N D U F B M Y J E E U F B M B O B C N B O F T  
B O U E I V Q T S P E Y O F T N B U B O E Z U R T P M

NADPH oxidase/Respiratory Burst Oxidase1 I B H P D'ZUJF  
oxidase plays an important role in host defenses against invading  
N J D S F C Z H F O F S B V Q D S P \* W J E S T J R O E U V U S B O E J M T  
produces O \* U N V M U J D P O Q Z M P Y D B O R M B N N B C S B O F  
P B D U J V B M D F E O U B F W B F S B I Q P O E O M D E J C P D I S P N F  
C J J D P N Q P T F C E Q I P M Q Q I P Q I B H P D Y J E F B T F  
Q Q Q B O S B D N P O P D Z U F T D F S B S P E I H M T  
J T C P V O B I D F M M V F M S B O F

í">â←ePawTAgRj`NVAUBOD`BaM"jBCE&iii`+%zFL&NzVM8PÚŽİ

ROS Generation During e Intercellular Membrane

Catalytic reactions: 9BOUIJFOYJE BBTMEFI ZBYE BTF  
EJIZE SPPSEPUJZE ISPHF BBTMFQSP EIJZE SPHFOBT F  
USZQU E QPBYQH BBTMFQ S B4EFV S DOBU BMZDM DOH  
9BOUIRJOJEBBTFS NGSEYB OUEFOZE S PHDO QP YJD  
UJT BVOETVHTFOF SB4JF

ROS production in non-phagocytic cells

1IPTQI NNUJG CENFJNTNSBIOFT QIPMJ Q'BT F  
IZE SPWZPHPTQIP MHC OFS BBS BDIJ EBPQJED  
"SBDIJEBPQJED SNITF NBK BSB PTFJTD PTBOPJET  
XIJDJODM QESPTTUBHMSPEUBDZS MN OFYBOFT  
and leukotrienes through the cyclooxygenase and lipoxigenase  
EFQFOE ZOUIFFJSTZOUIFTTJUFQETW PUMWF  
reactive intermediates.

- FVLP UESJFJATFZHTFOF DJNFQMJSBBPFB UV T  
TJHO EMBJCHJP UF\*GTB OEQJE FISSBXUBIDUPS  
"OHJPUF\*OCTEVD Production in smooth muscle cell is  
BMEIPQFOEQORUT QIQMBJQJKBZ

Receptors mediated ROS generation

- JHB OEEVDF4JTHFOF SBCOPEQIBHBDIMJD  
/"%1) P YJE BTBDUJW BUBF EDTMFB SV T DMFRIZ T  
"OHJPUF\*OJEO)5

GBD&P'SJOE V)DFG P S N ECUZCPIQ C JIGSPWIZ.SPT J OF  
QIPTQIBDBT\*WCPZ/OE.(T U J N VJMBUSBTDFVIM VMBS  
VTJ-09QBUIXBQB SJO E&(OTHU J N V3MBUWBT D VMBS

BDJEMEFIZEMPOZMEJBM E FIZ&F IZESPYZ  
OPOFBSUMQ PUBM E FIM E QUES PYJ QSB E P GUT  
BOE 16' " F BDDFQB\$IEG P\$Y JE B'W.S\$SFM E FIZE JD  
TFDPQCESPSEZVD"LBTO E)/ &< >

Oxidation of nucleic Acid/DNA by ROS

304CSFBILP%/" TUSBQES%T" BEEVDU DJT  
DIBSBD QZSFJMFN V P Q B O E B V H F D FURD MTHBST  
BOEB NP JFB \$FFHS EBFQEB OE B V P P JE BFUG P OFT  
BOBS PNTJOLJQIS PUFJZE SPYZH MZEC\$PMTZ MIZM  
VSFVBS FBI ZN JCOFEB UV \$ESUPFEEX DJUBI SUI PYJE BUJPO  
PGCBT QTP MZBE FEJQTI.PTICSI.BCFFZFO UI F Q Q V DMFJ  
SFTVM OF YQHF QEF.QMFP QJFFMOM"VM) ECSP PJMUTI %/"  
PQ% E BQ\$SP QV-EDU T

1 6 ' " S F T J T I E T P M P N F J N D C S B S O F M U Q U F S P Y 3 U E \$ Á J G g i ` 0 " 1 ½ À @ I • \$ v r — ! & ' G g ) r i a B g e — ! & " \$ Á ù ' G g ) r i

Cichorium Intybus, Withania somnifera, Ocimum sanctum, Mangifera indica and Punica granatum are known to have potential antioxidant  
BDUJWJBJFT

Cellular oxidative stress

\* UTQFDVMSBRUNRES FWSJPTVFBISIDUFMUBGHEF BUI  
J S F H V C E S U F B E P U J Z W H Q C F D J F B T D B Y Z H F Q C B S E F T F  
E F S J W B G F W M P T Y M B S P O T U C S O R E M Z O P V S P E 3 0 4  
J O D M T W E Q F T S P I Z E S P O H F S P Y T J E C H M Z B R O Z E S P Y Z M  
J P O T Y J E B T U J S W F B M Q B P E V C Z F F E B D W J U W S P 4 C F O D J F T  
3 / 4 X I J D J O D M O J E U F S C B U W S J J W E S J P D Y O B E P S Y J E O E  
Q F S P Y Z O J G B S W C E S F B D R U P O F P Y M H B O Q U S J D  
P Y J B A T I P X J O F O [ Z N B O O P O F O [ Z N F B U J U J B O S T F  
J O W P J M O A H E F O F S B U J P O

REACTIVE OXYGEN SPECIES
Superoxide anion O <sub>2</sub> <sup>-</sup>
Hydroxyl ion OH <sup>-</sup>
Singlet oxygen O <sup>-</sup>
Peroxyl ROO <sup>-</sup>
Alkoxy RO <sup>-</sup>
Hydrogen peroxide H <sub>2</sub> O <sub>2</sub>
Hypochlorite HOCl
REACTIVE NITROGEN SPECIES
Peroxynitrite ONOO <sup>-</sup>
Nitrogen dioxide NO <sub>2</sub> <sup>-</sup>
Nitrate/ nitrite NO <sub>3</sub> <sup>-</sup> /NO <sub>2</sub> <sup>-</sup>

\* U T O P X O B N U M F P W M B S M B C N Q P S S J B O U M M h T

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