Cord Blood 8-Isoprostanes as a Novel Marker of Oxidative Stress and Its Relation to Neonatal Outcome

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Dedication

To

My Family for their warn affection, patience, encouragement, and for always being there when I needed them.

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List of Abbreviations

GA	:	Gestational age
Wt	:	Weight
NEC	:	Necrotizing enterocolitis
NICU	:	Neonatal intensive care unite
Lt	:	Length
No	:	Nitric oxide
Ns	:	Neonatal sepsis
O_2	:	Oxygen
OFC	:	Occiputofrontal circumference
IDM	:	Infant of diabetic mother
OS	:	Oxidative stress
Fig	:	Figure
O_3	:	Ozone
FR	:	Free radicals
LPO	:	Lipid peroxidation
RDS	:	Respiratory distress syndrome
ROM	:	Rupture of membranes
ROP	:	Retinopathy of prematurity

SGA	**:**	Small for gestational age
IsoPs	**:**	Isoprostanes
Wk	**:**	Week
SOD	**:**	Superoxide dismutase
OH	**:**	Hydroxyl radical
ROS	**:**	Reactive oxygen species
RNS	**:**	Reactive nitrogen species
$O^{-}2$	**:**	Superoxide
RO_2	**:**	Peroxyle
H_2O_2	**:**	hydrogen peroxide
$HRO^{-}2$	**:**	Hydroperoxyl
RONOO	**:**	Alkyl Peroxynitrate
GPX	**:**	Glutathione peroxidse
XOR	**:**	Xanthine oxidoreductase
MAD	**:**	Malondialdehyde
GSH	**:**	Glutathione
CS	**:**	Cesarean section
TBARS	**:**	Thiobarbituric acid reactive substance

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Introduction

Newborns are at high risk of oxidative stress and they are very susceptible to free radical oxidative damage due to imbalance between antioxidant and oxidant generating systems. The brain of the term fetus is at higher risk of oxidative stress than that of the preterm fetus, as a consequence of its higher concentration of polyunsaturated fatty acids and the maturity of N-methyl-D-aspartate receptor system at term ***(Buonocore and Perrone, 2001).***

Liu et al. (2004) reported that lipid peroxidation in the fetus increases during normal labor and that umbilical cord plasma lipid peroxide concentrations are higher in situations known to lead to intrapartum hypoxia and much lower after elective cesarean delivery.

Isoprostanes are a family prostaglandin isomers derived from polyunsaturated fatty acids through a free radical catalyzed peroxidation of arachidonic acid ***Buonocore and Perrone, (2006).***

In particular, 8-iso-PGF2, a major isoprostane that is relatively chemically stable and measurable in body fluids is a reliable marker of oxidative stress ***(Pratico, 1999)***.

Rogers et al., (2005) reported that neonates with metabolic acidosis, cord arterial blood isoprostane concentrations and base excess showed a linear relationship, suggesting that oxidative stress plays a role in a significant proportion of cases with hypoxic-ischemic encephalopathy, ***Dalle-Donne et al., 2006)*** added that it is also markedly increased in several pulmonary diseases including acute respiratory distress syndrome and severe respiratory failure.

Aim of the work

This study is designed to evaluate the level of cord blood isoprostanes in relation to mode of delivery, gestational age, Apgar score, anthropometric measurements and cord blood PH.

Oxidative Stress

Definition:

It is defined as excess formation and/or insufficient removal of highly reactive molecules such as reactive oxygen species (ROS) and reactive nitrogen species (RNS) ***(Maritim et al, 2003).***

It is caused by an imbalance between the production of reactive oxygen and a biological system's ability to readily detoxify the reactive intermediates or easily repair the resulting damage ***(Schafer and Buettner, 2001).***

Chemical and biological effects of oxidative stress

In chemical terms, oxidative stress is a large increase in cellular reduction potential, or a large decrease in the reducing capacity of the cellular redox couples, such as glutathione. The effects of oxidative stress depend upon the size of these changes, with a cell being able to overcome small perturbation and regain its original state. However, more severe oxidation can trigger

apoptosis while more intense stresses may cause necrosis ***(Lennon 1991)***.

Oxidative stress plays a role in inflammation, accelerates aging and contributes in a variety of degenerative conditions e.g. cardiovascular disease, atherosclerosis, cancer, cataract, central nervous system disorder, Parkinson's disease, Alzheimer's disease, inflammatory bowel disease rheumatoid arthritis, diabetes, respiratory disease, autoimmune disease, liver diseases kidney diseases, skin conditions and AIDS ***(Galli et al., 2005)***.

Free radical is any atom (e.g. oxygen, nitrogen) with at least one unpaired electron in the outermost shell, and is capable of independent existence ***(Karlsson 1997)***. Most of the radicals of biological importance contain reactive oxygen and these free radicals are called reactive oxygen species (ROS) ***(Parke, 1999).***

A particularly destructive aspect of OS is the production of these ROS as shown in fig. (1)

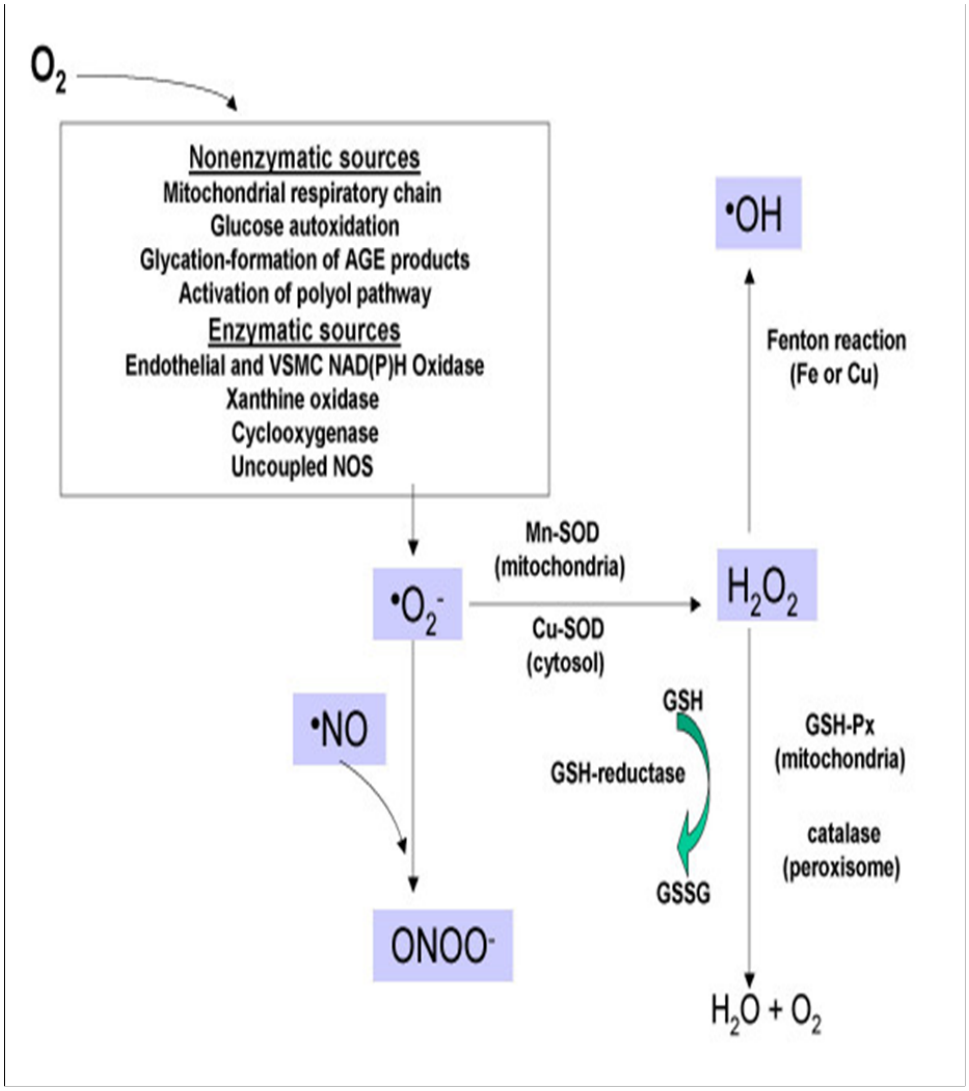

Fig.1: Generation of reactive species ***(Maritim et al, 2003)***.