Role of Brown seaweed extract in modulation of COX-2 mediated inflammatory cascade in gamma irradiated rats

A Thesis

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Presented by

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Ghada Azoz Mohamed

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List of Abbreviations

γ	Gamma
BSWE	Brown Sea Weed Extract
CAT	Catalase
CO	Carbonyl
COX-1	Cyclooxygenase 1
COX-2	Cyclooxygenase2
DNA	Deoxyribonucleic acid
e NOS	Endothelial Nitric Oxide Synthase
ELISA	Enzyme-Linked Immuno Sorbent Assay
g	Gram (0.001kg)
GPX	Glutathione peroxidase
GSH	Glutathione
GSSG	Oxidized glutathione
Gy	Gray
h	Hour
H	Hydrogen Radical
H2O2	Hydrogen peroxide
4-HNE	4-hydroxynonenal
HNE	Hydroxynonenal
i NOS	Inducible Nitric Oxide Synthase
IFN- α	Interferon alpha
IL-1B	Interleukin-1B

List of Abbreviations (Cont.)

IL-6	Iinterleukin-6
INOS	Inducible nitric oxide synthase
IR	Ionizing Radiation
LC-PUFA	Long Chain Polyunsaturated fatty acid
LOX	Lipooxidase
LPS	Lipo poly saccharide
M	Molar
m	Minute
mAU	milli-Absorbance Units
MCP-1	Adipocytokines like protein-1
MCP-1	Adipocytokines Like Protein-1
MDA	Malondialdehyde
mg	Milligram (0.001 gram)
Ml	Milliliter (0.001 liter)
n NOS	Neuronal Nitric Oxide Synthase
NAD+	Nicotinamide Adenine Dinucleotide (oxidized)
NADH	Nicotinamide Adenine Dinucleotide (reduced)
NADPH	Adenosine dinucleotide phosphate
NO	Nitric Oxide
NOS	Nitric oxide synthase

List of Abbreviations (Cont.)

O2	Superoxid Radical
OH	Hydroxyl Radical
PGD2,	Prostaglandin D2
PGE2	ProstaglandinE2
PGE2	Prostaglandin E2
PGF2α	Prostaglandin F2alpha,
PGG2	Prostaglandin G2
PGH	Prostaglandin H
PGI2	Prostaglandin I2
PUFA	Polyunsaturated fatty acid
RNA	Ribonuclic acid
RNS	Reactive Nitrogen Species
ROS	Reactive Oxygen Species
SOD	Superoxide Dismutase
TBARS	Thiobarbituric Acid Reactive Substances
TNF- α	Tumor Necrosis Factor- Alpha
TXA2	Thromboxane A2
TXA2	Thromboxane
XDH	Xanthine Dehydrogenase
XO	Xanthine Oxide
XOR	Xanthine Oxidoreductase system

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Role of Brown seaweed extract in modulation of COX-2 mediated inflammatory cascade in gamma irradiated rats

Abstract

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Key words: Brown seaweed extract, Cyclooxygenase-2, Alpha-Tumor Necrosis Factor, Prostaglandin E2, Thiobarbituric acid, Xanthine Oxidoreducta sesystem, Superoxide Dismutase, Catalase, nitric oxide and Glutathione**.**

A variety of plants and seaweeds have been traditionally used in oriental folk medicine to treat inflammation induced by many environmental factors particularly that associated with serious inflammatory diseases. The present study was undertaken to examine the impact of brown seaweed extract (BSWE) from marine algae in the regulation of inflammatory responses induced by exposure to gamma radiation (ɣ- radiation). Rats were categorized into 5 groups as follow: Group (1): normal control group, (C) included rats neither treated nor irradiated, rats of this group were received orally an equivalent volume of distilled water (vehicle of BSWE) during the period of BSWE administration. Group (2): Irradiated group, (R) rats were exposed to 4 fraction doses

of gamma radiation (2 Gy every 3 days) and received orally an equivalent volume of distilled water during the period of BSWE administration. Group (3): (BSWE), rats were received 27 mg/kg/day aqueous extract of brown seaweed orally along period of the experiment. Group (4): (BSWE + R) This group includes rats received 27 mg/kg/day aqueous extract of brown seaweed orally for 7days before gamma irradiation, and the administration of the extract was extended during radiation exposure period (14 days). Group (5): (BSWE, R) rats of this group were received several doses of aqueous extract of brown seaweed via oral tube as group 3 and exposed to gamma irradiation as group 2 starting from the zero time of the experiment. The data obtained pointed to significant amelioration in the level of Cyclooxygenase-2 (COX-2), Tumor Necrosis Factor alpha (TNF-α) and ProstaglandinE2 (PGE2) even in group 4 or in group 5 when compared with irradiated rats in addition to remarkable amelioration in the redox status thiobarbituric acid (TBARS), Xanthine Oxidoreductase system (XOR), Superoxide Dismutase (SOD), Catalase (CAT), nitric oxide (NO), and Glutathione (GSH). It could be concluded that seaweed extract could be has a beneficial role in controlling COX-2 mediated inflammation and that may be partly due to its capability in adjusting cellular redox tone.

Introduction

Inflammation is part of the body's immune response. It happened when something harmful or irritating affects a part of the body and there is a biological response to try to remove it. The signs and symptoms of inflammation, specifically acute inflammation, revealed that the body is trying to heal itself. Inflammation does not mean infection, even when an infection causes inflammation. Infection is caused by a bacterium, virus or fungus, while inflammation is the body's response to it including the local reactions and the destruction changes; the destruction was affected by brown seaweed extract and the responses that lead to repair and healing **(Firestein., 2011).** Thus, inflammation is a fundamental pathologic process consisting of a dynamic complex of histological apparent, infiltration, cellular infiltration and mediator release occurred in affected blood vessels and adjacent tissues, also, in abnormal stimulation caused by physical, chemical, or biologic agent **(Vijayalakshmi *et al.*, 2015)**. Ionizing Radiation (IR) induces beneficial, as well as possible harmful effects to human population, representing one of the most important physical causes of inflammatory responses **(Little., 2003)**.