

# Anti-inflammatory, Proresolving and Chemopreventive Effects of Docosahexaenoic Acid

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Director & Professor



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College of Pharmacy, Seoul National University  
Seoul, South Korea**



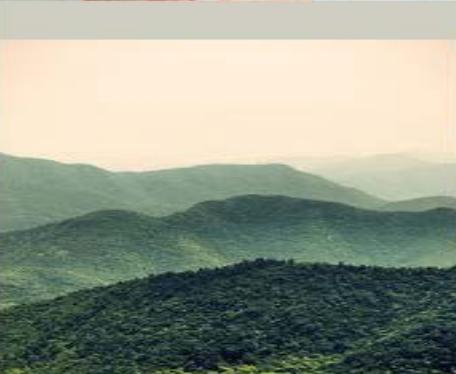
## APNNO

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The science of nutrigenomics and nutrigenetics is important because of its great potential to improve health at the individual, genetic-subgroup and population level. The application of this science in the Asia-Pacific region is still in its infancy and the knowledge base is small. The great cultural and genetic diversity in the Asia-Pacific region makes the task of improving knowledge in these fields even more challenging. There is therefore a need to bring together researchers and health professionals into a collaborative framework to foster this novel field of science and develop proper tools for its translation into practice.

## MISSION

- Promote the science of nutrigenomics and nutrigenetics in the Asia-Pacific region.
- Facilitate communication and collaboration amongst researchers, clinicians and nutrition industry working in this field in our region.
- Organisation of the biennial Asia-Pacific Nutrigenomics & Nutrigenetics conference.

## VISION

- A thriving and collaborative nutrigenomics and nutrigenetics research community in the Asia-Pacific region
- Consumers have a better understanding of the science of nutrigenomics and nutrigenetics and how it could be used to benefit their health and well-being
- Health professionals are properly educated and accredited to utilise nutrigenomics and nutrigenetics science responsibly and appropriately in their practice
- Nutrition Industry is better informed to provide safe and effective products appropriate for personalised nutrition



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# The 1<sup>st</sup> Biennial Conference of Asia Pacific Nutrigenomic & Nutrigenetics Organization (APNNO 2016)



## APNNO 2016 BIENNIAL CONFERENCE

December 5-6, 2016  
Hilton Hotel in Gyeongju, South Korea



Abstract Submission: Oct. 31  
Registration: Oct. 31

<http://www.apnno.com/biennial-conference>





# APNNO 2016

## BIENNIAL CONFERENCE

Nutrigenomics and Nutrigenetics  
for Disease Prevention and Optimal Health

December 5-6, 2016

Hilton Hotel in Gyeongju, South Korea



# 염증 (炎症)

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# TIME

ROUGH JUSTICE IN CHINA  
MEL GIBSON'S SEARCH FOR JESUS

MARCH 1, 2004

## THE SECRET KILLER

■ The surprising link between **INFLAMMATION** and  
**HEART ATTACKS, CANCER, ALZHEIMER'S** and other diseases  
■ What you can do to fight it



9 771064 030005

## INFLAMMATION

The silent killer staring us in the face

## The FIRES Within

Inflammation is the body's first defense against infection, but when it goes awry, it can lead to heart attacks, colon cancer, Alzheimer's and a host of other diseases

Illustration for TIME by Brian Stauffer

HEALTH

By CHRISTINE GOODMAN  
With DAVID KOMARSKY  
Illustration by BRIAN STAUFFER

W

hat's been

the buzzword

of the year?

It's inflam-

mation.

# Inflammation and metabolic disorders

Gökhan S. Hotamisligil<sup>1</sup>

Journal of Nutrition & Metabolism (2012)

*Review Article*

## Inflammation as a Link between Obesity and Metabolic Syndrome

Faloia Emanuela, Michetti Grazia, De Robertis Marco, Luconi Maria Paola,  
Furlani Giorgio, and Boscaro Marco

DOI: 10.1111/j.1471-0528.2006.01004.x  
[www.blackwellpublishing.com/bjog](http://www.blackwellpublishing.com/bjog)

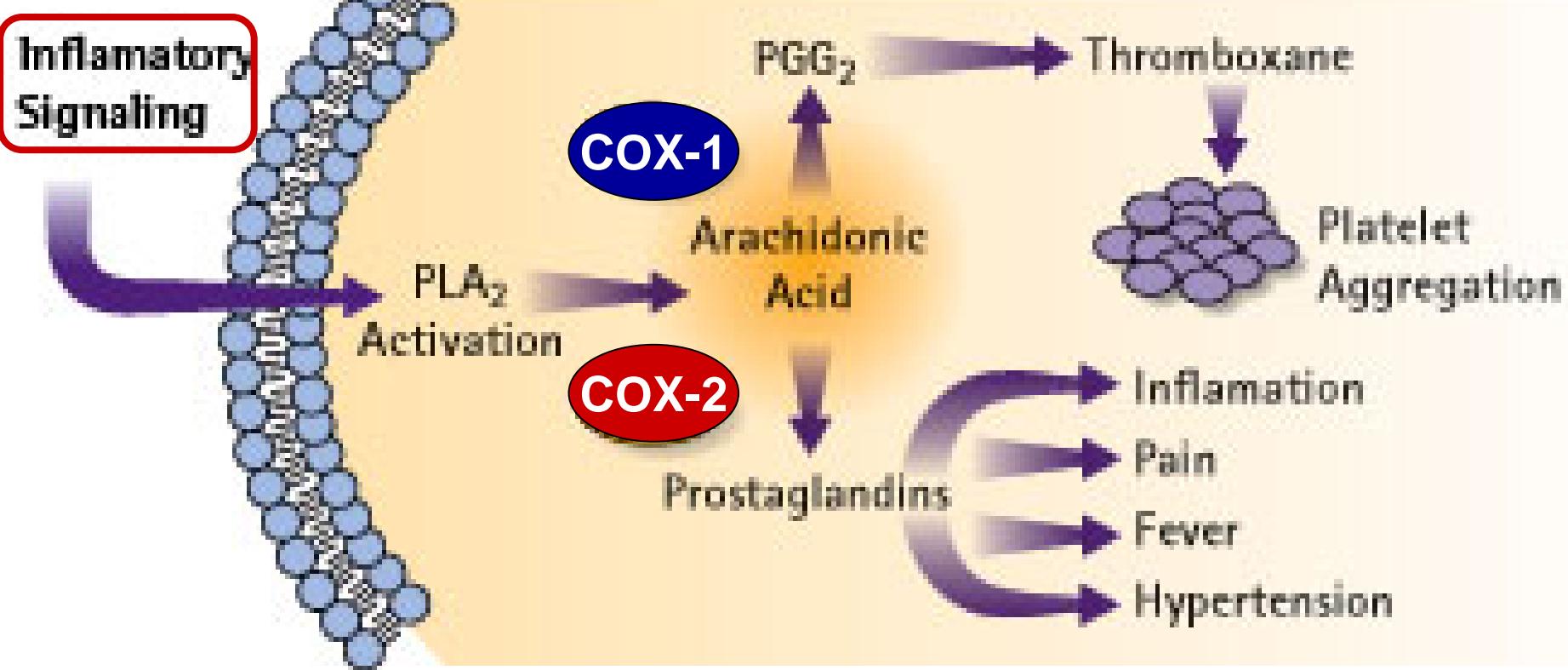
© RCOG 2006 BJOG An International Journal of Obstetrics and Gynaecology

Rev



**Is obesity an inflammatory illness? Role of low-grade inflammation and macrophage infiltration in human white adipose tissue**

R Cancello, K Clément



## RESEARCH ARTICLE

# Increased Levels of COX-2 and Prostaglandin E<sub>2</sub> Contribute to Elevated Aromatase Expression in Inflamed Breast Tissue of Obese Women

Kotha Subbaramaiah<sup>1</sup>, Patrick G. Morris<sup>2</sup>, Xi Kathy Zhou<sup>3</sup>, Monica Morrow<sup>4</sup>, Baoheng Du<sup>1</sup>, Dilip Giri<sup>5</sup>, Levy Kopelovich<sup>6</sup>, Clifford A. Hudis<sup>1,2</sup>, and Andrew J. Dannenberg<sup>1</sup>

## The effect of body weight on altered expression of nuclear receptors and cyclooxygenase-2 in human colorectal cancers

Barbara Delage<sup>1</sup>, Anne Rullier<sup>2</sup>, Maylis Capdepont<sup>3</sup>, Eric Rullier<sup>3</sup> and Pierrette Cassand<sup>\*1</sup>

Journal of Lipid Research Volume 46, 2005

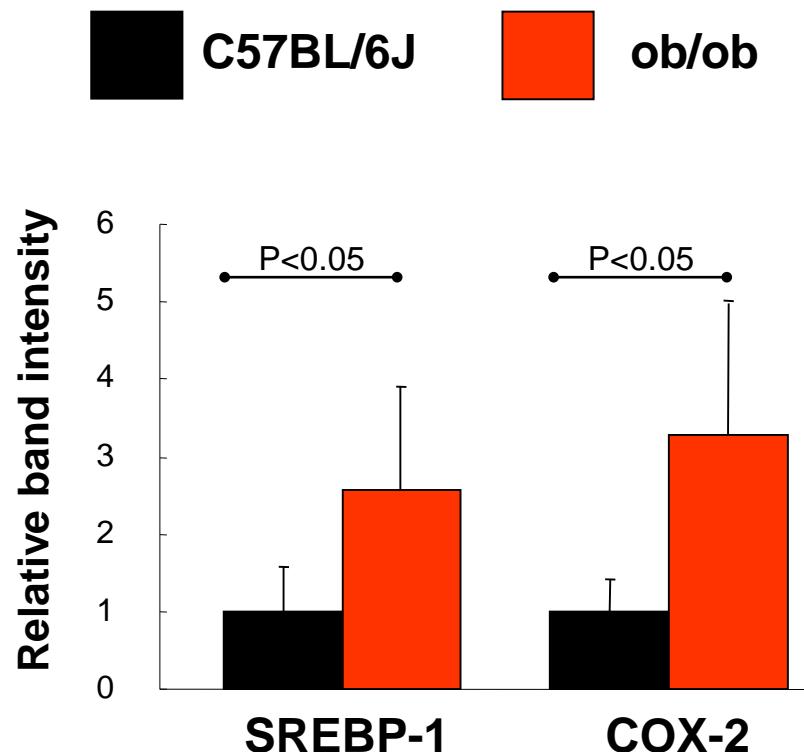
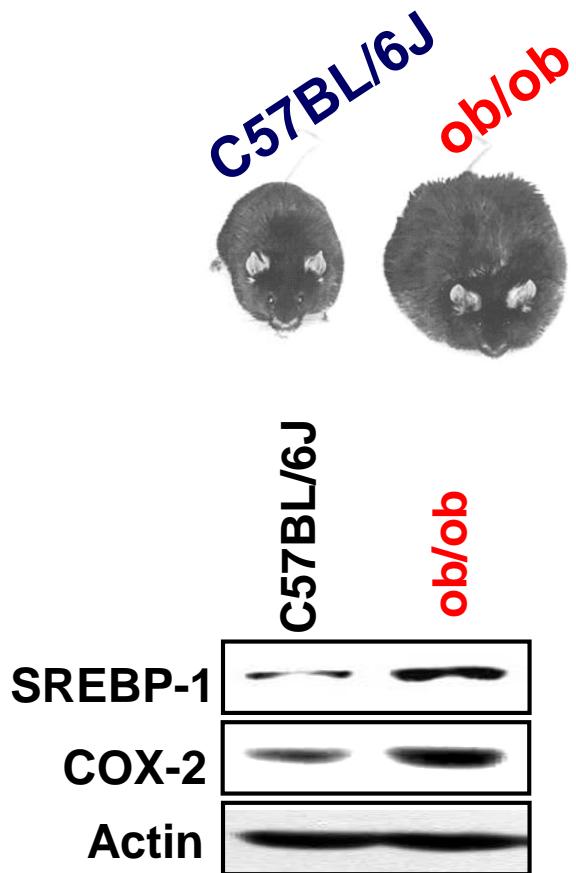
## The sterol response element binding protein regulates cyclooxygenase-2 gene expression in endothelial cells

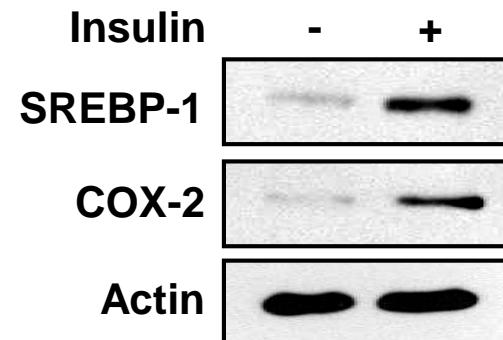
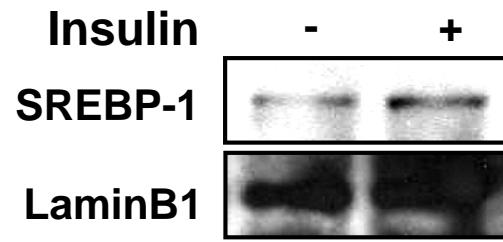
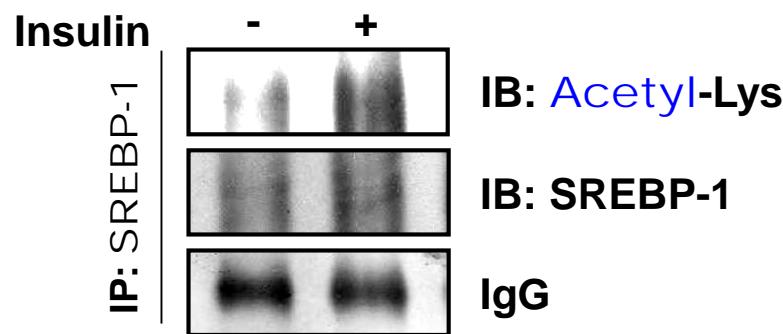
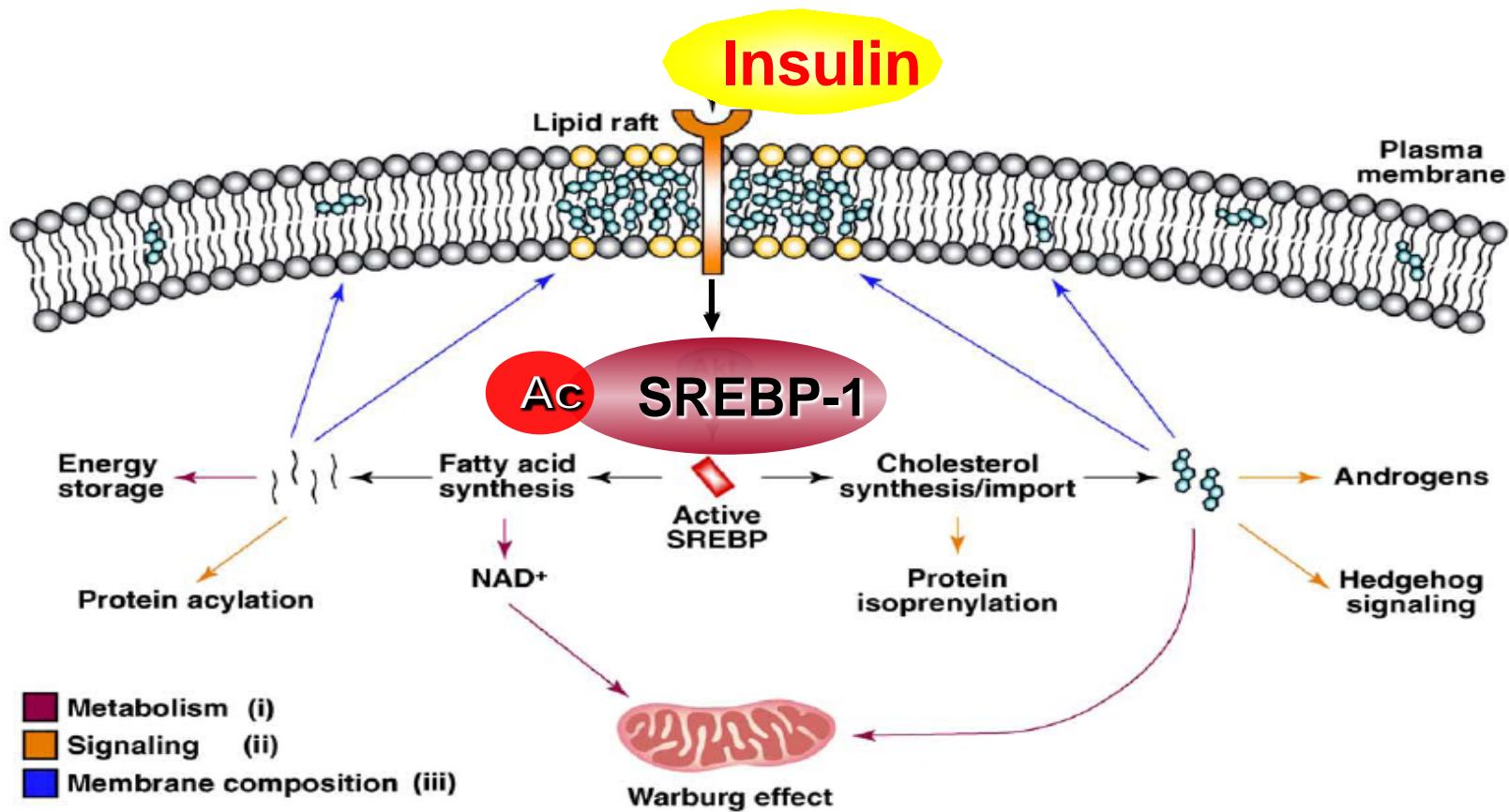
Layton Harris Smith,<sup>\*</sup> Matthew S. Petrie,<sup>†</sup> Jason D. Morrow,<sup>§,\*\*\*</sup> John A. Oates,<sup>§,\*\*\*</sup> and Douglas E. Vaughan<sup>1,†,§</sup>

### **Sterol-regulatory element-binding protein 1 (SREBP1)**

- a transcription factor that regulates genes related to lipogenesis
- SREBP1 is upregulated under conditions of obesity.
- SREBP1 may play a role in proliferation of various tumor cells.

# Expression levels of SREBP-1 and COX-2 were elevated in the colon of obese *ob/ob* mice





## Review Article

# Functional Food Targeting the Regulation of Obesity-Induced Inflammatory Responses and Pathologies

Shizuka Hirai,<sup>1</sup> Nobuyuki Takahashi,<sup>1</sup> Tsuyoshi Goto,<sup>1</sup> Shan Lin,<sup>1</sup> Taku Uemura,<sup>1</sup> Rina Yu,<sup>2</sup> and Teruo Kawada<sup>1</sup>



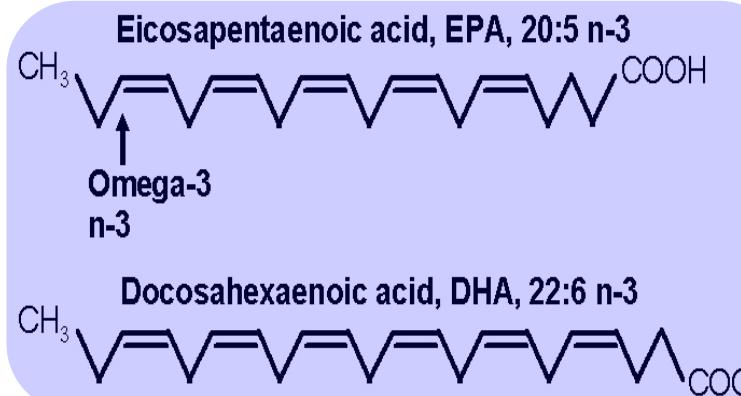
Most Effective Anti-Inflammatory

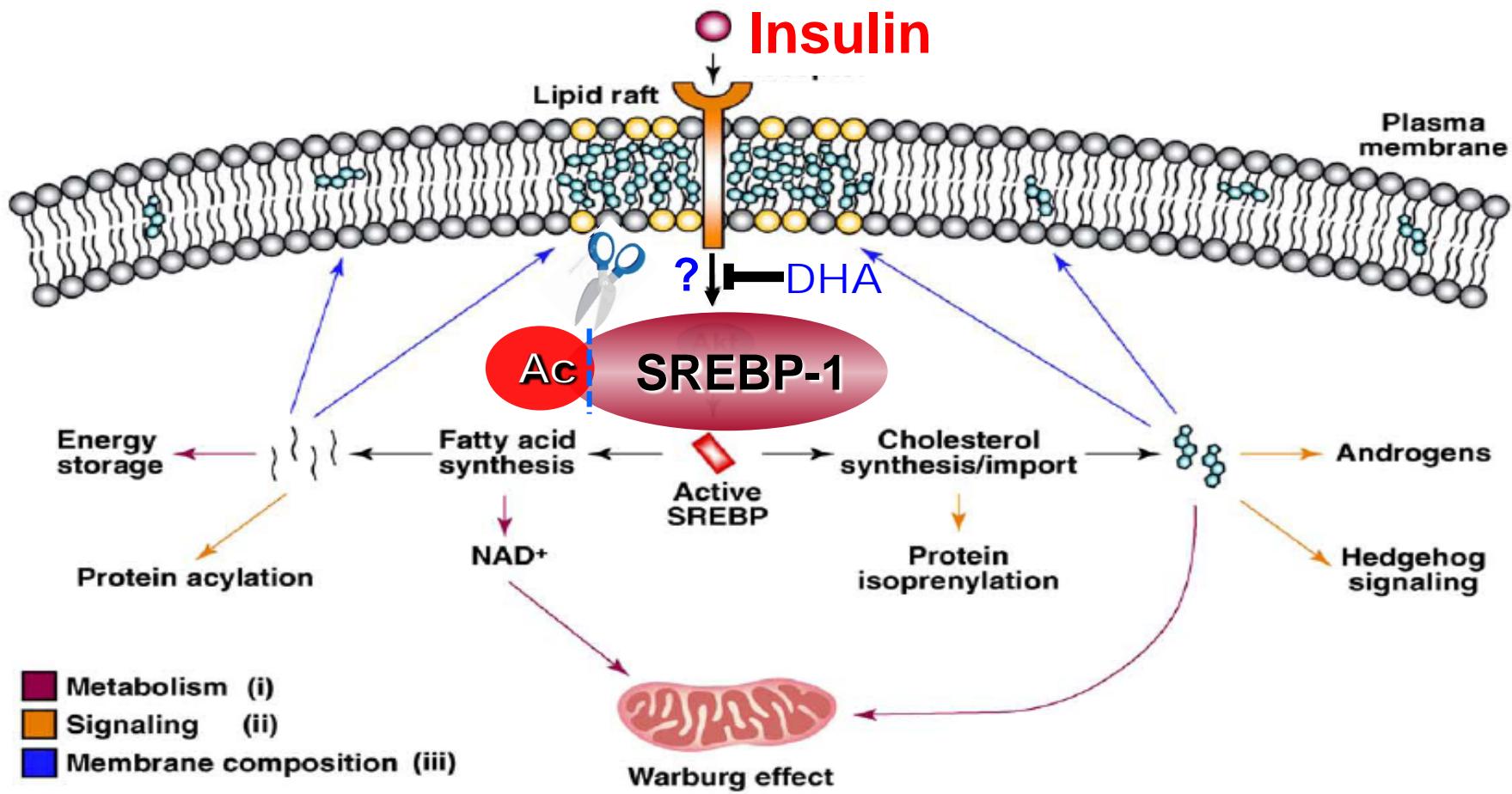
# FISH OIL

The Natural ANTI-INFLAMMATORY

- Unveil the epidemic of silent, insidious chronic inflammation.
  - Discover a safe, effective alternative to dangerous pharmaceutical anti-inflammatories.
  - Learn how fish oil supplements can help prevent cancer, Alzheimer's disease, heart disease, and many other health conditions!

JOSEPH C. MAROON, M.D.,  
and JEFFREY BOST, P.A.C.





Review

Cell  
PRESS

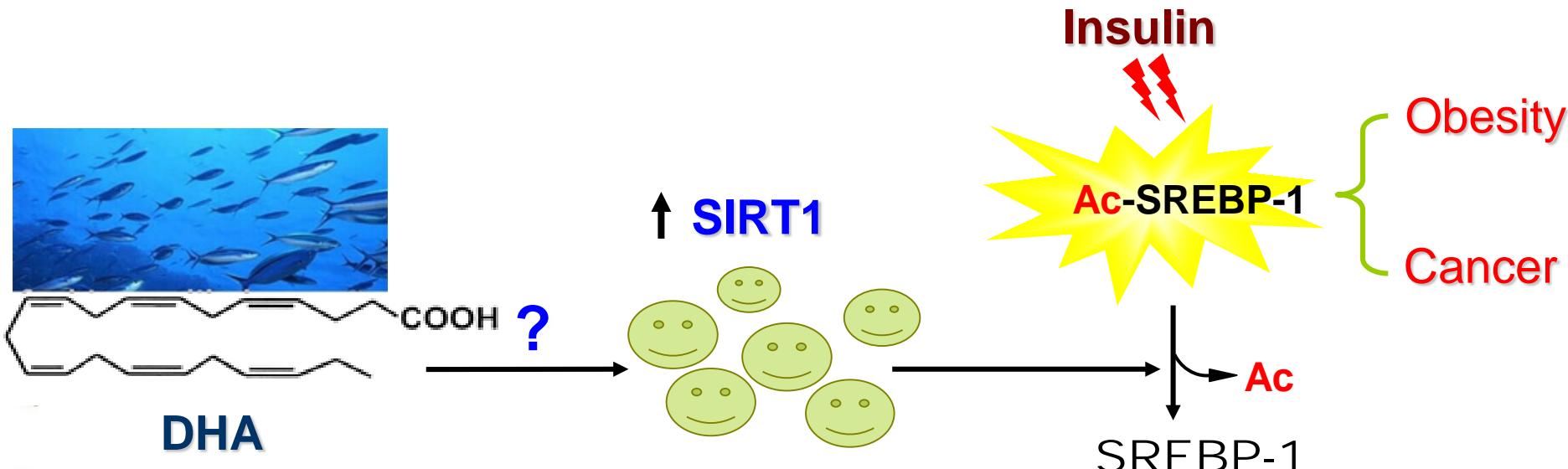
## Histone deacetylases as regulators of inflammation and immunity

Melanie R. Shakespear, Maria A. Halili, Katharine M. Irvine, David P. Fairlie and Matthew J. Sweet

The University of Queensland, Institute for Molecular Bioscience and Australian Infectious Diseases Research Centre, Queensland 4072, Australia

# SIRT1 (Class III HDACs)

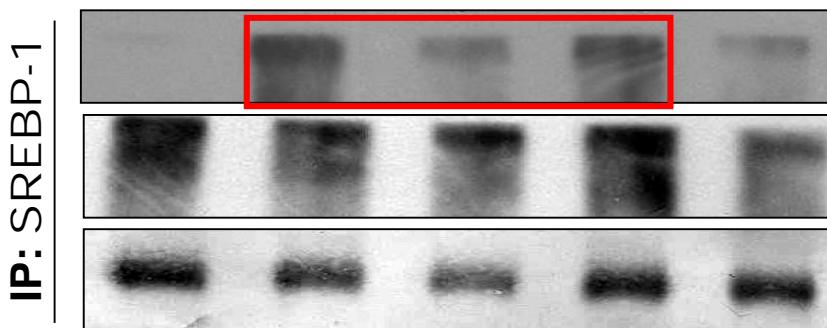
- human ortholog of the yeast Sir2 (silent information regulator 2)
- also known as Sirtuin
- function: histone/non-histone deacetylase (NAD<sup>+</sup>-dependent)
- roles: Anti-diabetes, anti-aging, metabolic regulation



# DHA inhibited insulin-induced acetylation of SREBP1 through upregulation of SIRT1

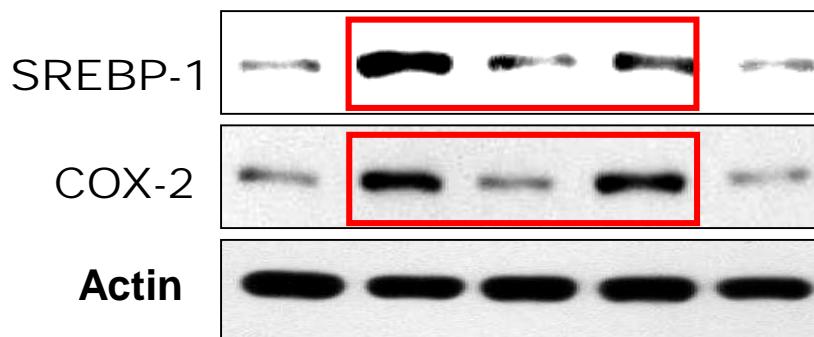
NAM	-	-	-	+	-
DHA	-	-	+	+	+
Insulin	-	+	+	+	-

Nicotinamide (NAM):  
SIRT1 inhibitor



Sirtinol	-	-	-	+	-
DHA	-	-	+	+	+
Insulin	-	+	+	+	-

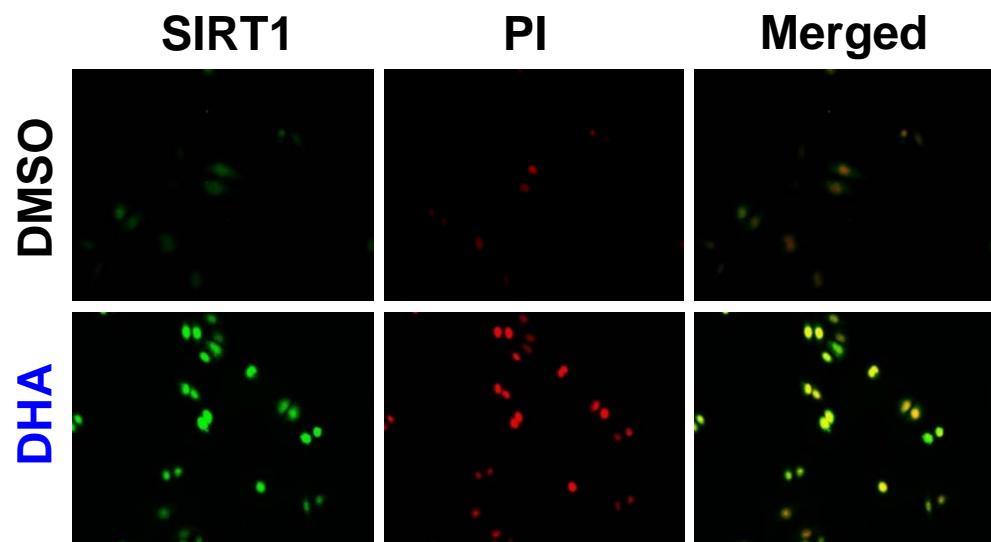
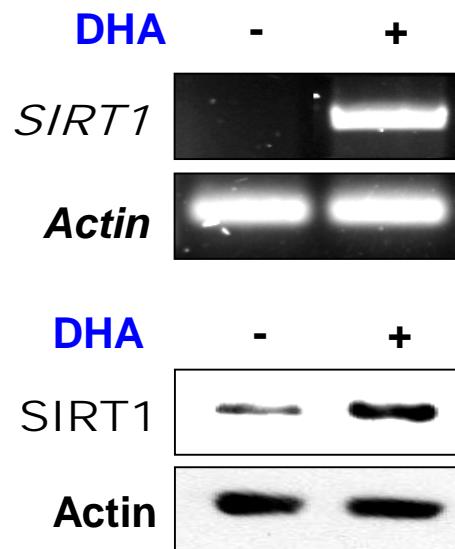
Sirtinol: SIRT1  
inhibitor





Docosahexaenoic acid inhibits insulin-induced activation of sterol regulatory-element binding protein 1 and cyclooxygenase-2 expression through upregulation of SIRT1 in human colon epithelial cells

Na-Young Song<sup>a</sup>, Hye-Kyung Na<sup>b</sup>, Jeong-Heum Baek<sup>c,\*</sup>, Young-Joon Surh<sup>a,d,e,\*\*</sup>





Contents lists available at SciVerse ScienceDirect

# Free Radical Biology & Medicine

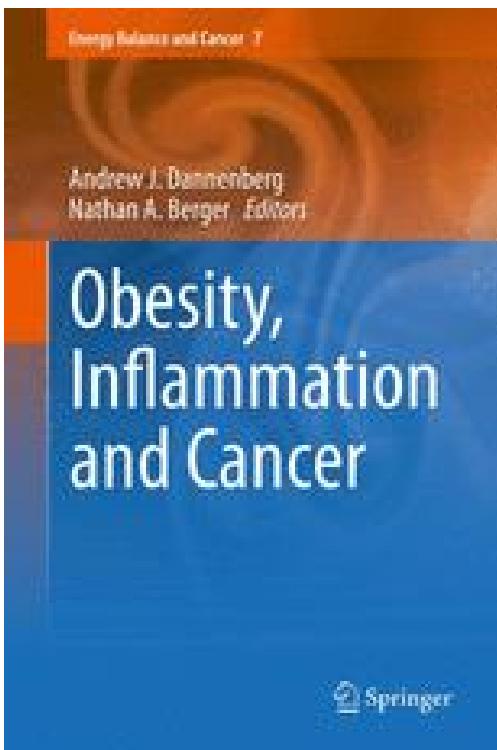
journal homepage: [www.elsevier.com/locate/freeradbiomed](http://www.elsevier.com/locate/freeradbiomed)



Review Article

## Emerging avenues linking inflammation and cancer

Joydeb Kumar Kundu <sup>a</sup>, Young-Joon Surh <sup>b,c,d,\*</sup>



Being overweight or obese  
**'linked to 10 common cancers'**

# OVERWEIGHT, OBESITY AND CANCER: EPIDEMIOLOGICAL EVIDENCE AND PROPOSED MECHANISMS

Eugenia E. Calle\* and Rudolf Kaaks†

## REVIEWS



Table 1 | **Obesity-related cancers**

Type of cancer	Relative risk* with BMI of 25–30 kg/m <sup>2</sup>	Relative risk* with BMI of ≥ 30 kg/m <sup>2</sup>	PAF (%) for US population‡	PAF (%) for EU population§
Colorectal (men)	1.5	2.0	35.4	27.5
Colorectal (women)	1.2	1.5	20.8	14.2
Female breast (postmenopausal)	1.3	1.5	22.6	16.7
Endometrial	2.0	3.5	56.8	45.2
Kidney (renal-cell)	1.5	2.5	42.5	31.1
Oesophageal (adenocarcinoma)	2.0	3.0	52.4	42.7
Pancreatic	1.3	1.7	26.9	19.3
Liver	ND	1.5–4.0	ND¶	ND¶
Gallbladder	1.5	2.0	35.5	27.1
Gastric cardia (adenocarcinoma)	1.5	2.0	35.5	27.1

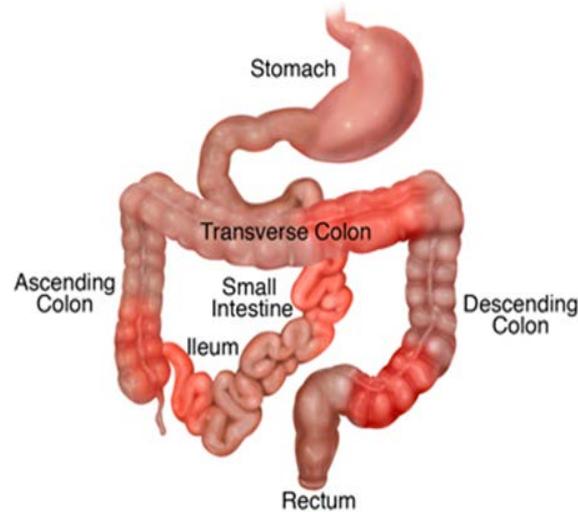
REVIEW

# Inflammatory bowel disease and intestinal cancer: a paradigm of the Yin–Yang interplay between inflammation and cancer

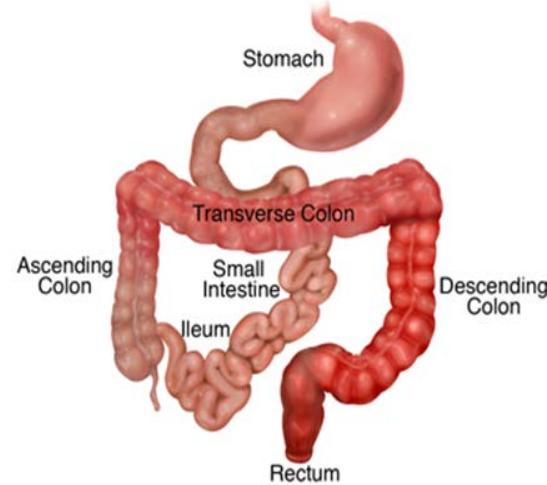
S Danese<sup>1</sup> and A Mantovani<sup>2</sup>



Crohn's Disease



Ulcerative colitis



REVIEW ARTICLE

*Annals of Gastroenterology* (2016) 29, 37–43

## Inflammatory bowel disease: can omega-3 fatty acids really help?

Sandra Maria Barbalho<sup>a</sup>, Ricardo de Alvares Goulart<sup>b</sup>, Karina Quesada<sup>c</sup>, Marcelo Dib Bechara<sup>d</sup>, Antonely de Cássio Alves de Carvalho<sup>e</sup>

## ORIGINAL ARTICLE

# Effects of diet-induced obesity on colitis-associated colon tumor formation in A/J mice

S-Y Park<sup>1</sup>, J-S Kim<sup>2</sup>, Y-R Seo<sup>3</sup> and M-K Sung<sup>1</sup>



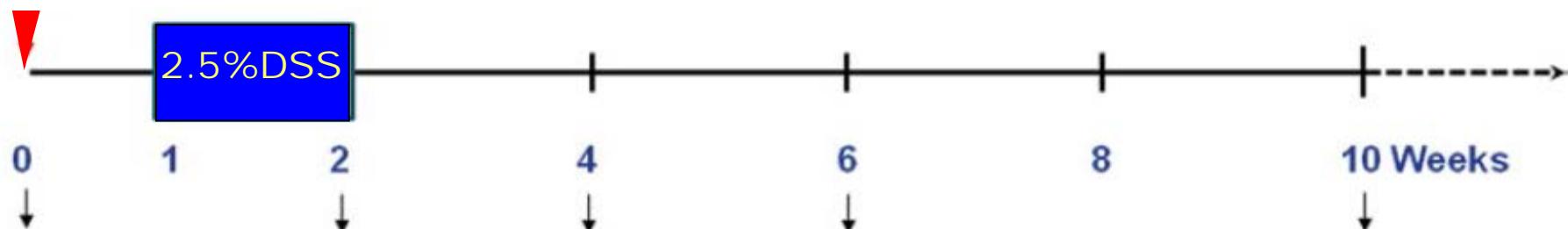
ICR: male, 5 weeks old

AOM(10 mg/kg bodyweight, i.p.)

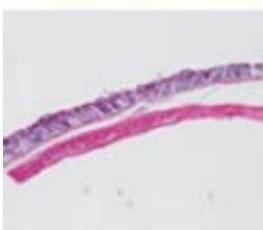
2.5% DSS in drinking water for 7 days

▼ Azoxymethane (AOM)      ■ Dextran sodium sulfate (DSS)

AOM



Normal



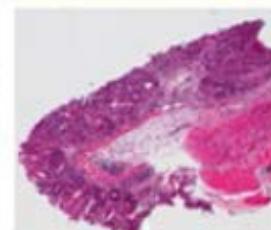
Inflammation



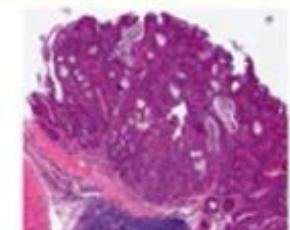
Dysplasia



Adenoma



Adenocarcinoma



# Effects of increase in fish oil intake on intestinal eicosanoids and inflammation in a mouse model of colitis

Nabil Bosco<sup>1†</sup>, Viral Brahmbhatt<sup>1†</sup>, Manuel Oliveira<sup>1†</sup>, Francois-Pierre Martin<sup>1,4</sup>, Pia Lichti<sup>2</sup>, Frederic Raymond<sup>1,4</sup>, Robert Mansourian<sup>1</sup>, Sylviane Metairon<sup>1,4</sup>, Cecil Pace-Asciak<sup>3</sup>, Viktoria Bastic Schmid<sup>1</sup>, Serge Rezzi<sup>1,4</sup>, Dirk Haller<sup>2</sup> and Jalil Benyacoub<sup>1\*</sup>

*Mol. Nutr. Food Res.* 2011, 55, 239–246

DOI 10.1002/mnfr.201000070

239

RESEARCH ARTICLE

## Oral administration of docosahexaenoic acid attenuates colitis induced by dextran sulfate sodium in mice

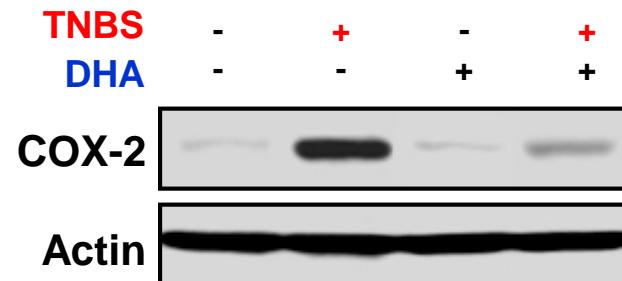
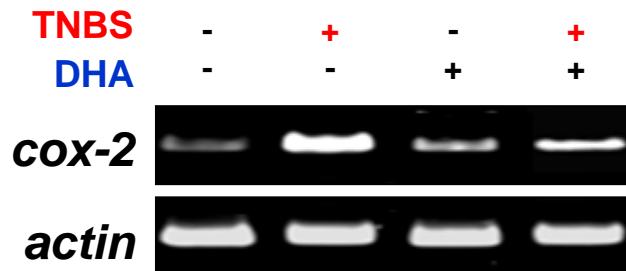
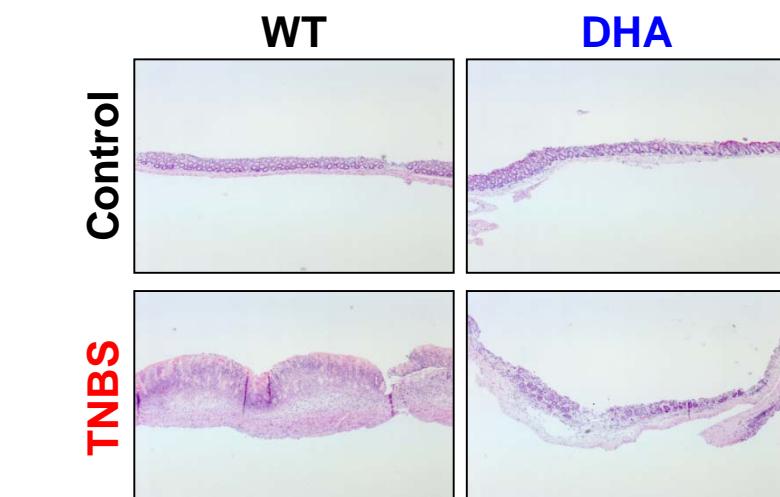
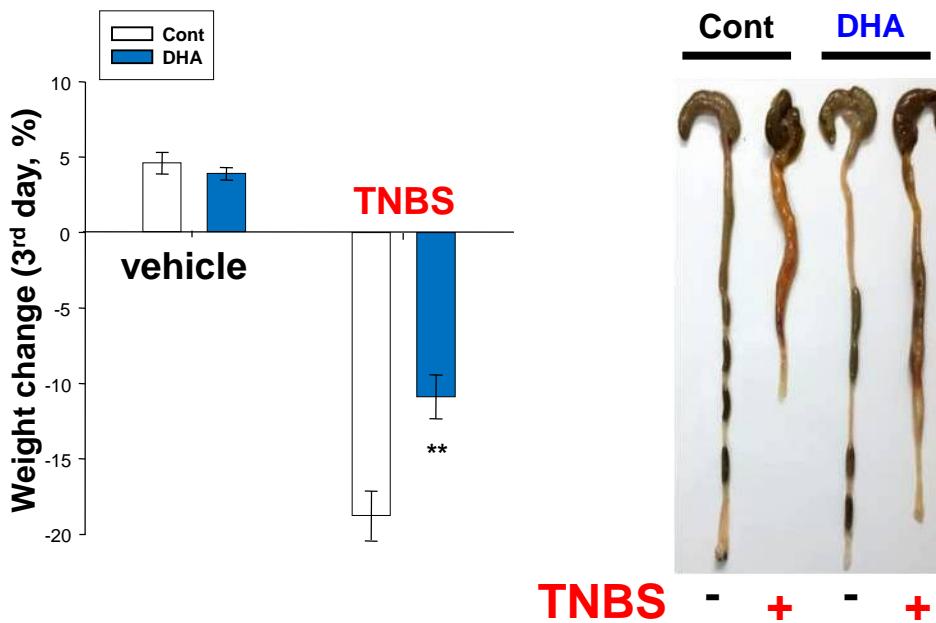
Jae Young Cho<sup>1</sup>, Sung-Gil Chi<sup>2</sup> and Hyang Sook Chun<sup>1</sup>

# DHA protects against trinitrobenzene sulfonic acid (TNBS)-induced mouse colitis



0 1 2 3 4 5 6 days

AIN-93G purified rodent diet  
4 mg/kg DHA in PBS  
2.5% TNBS in 50% ethanol

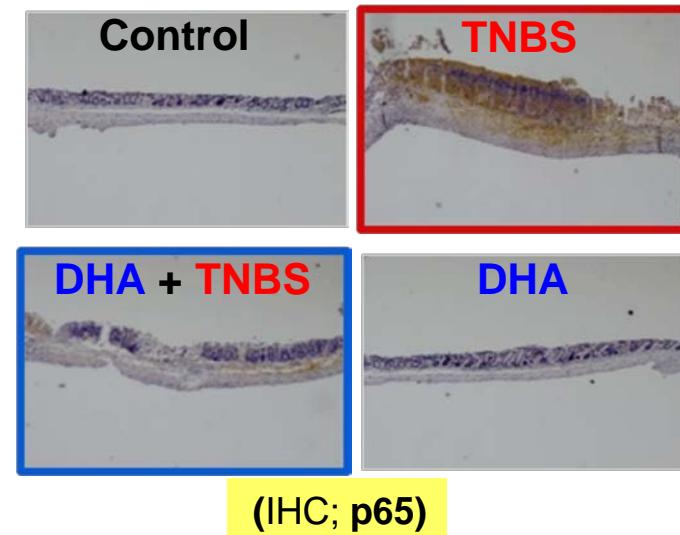
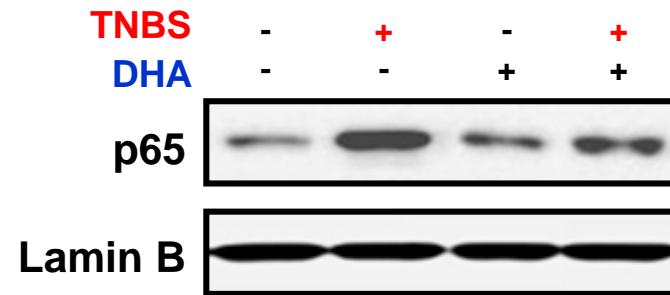
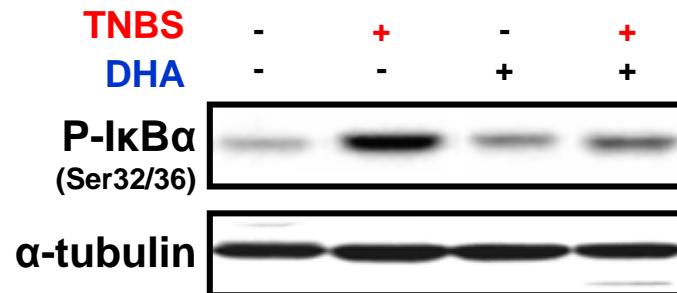
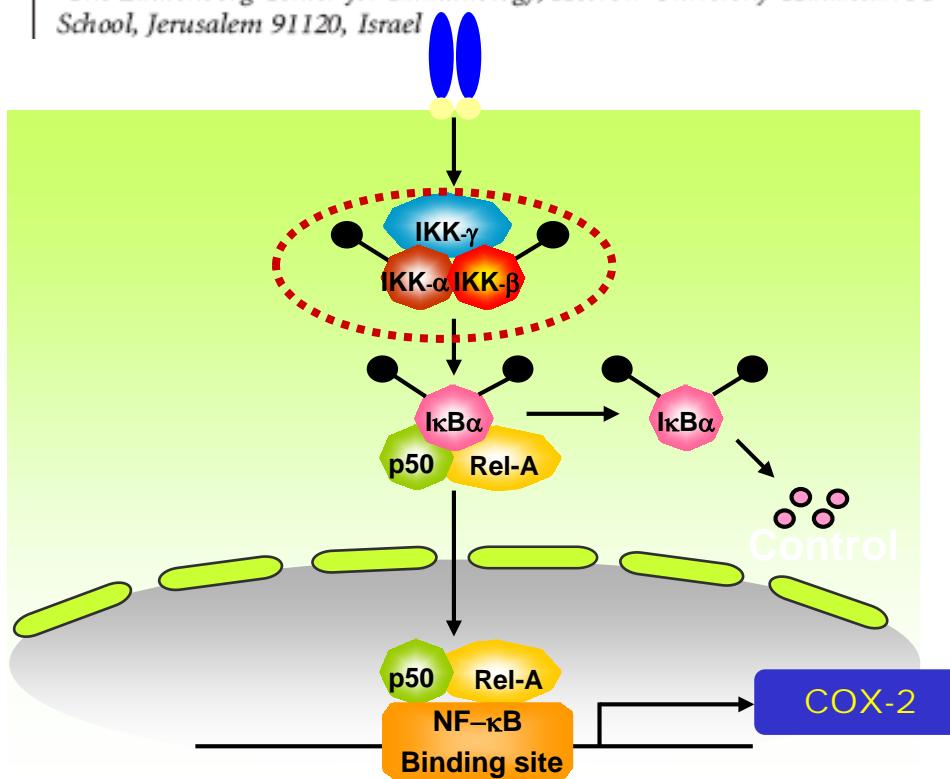


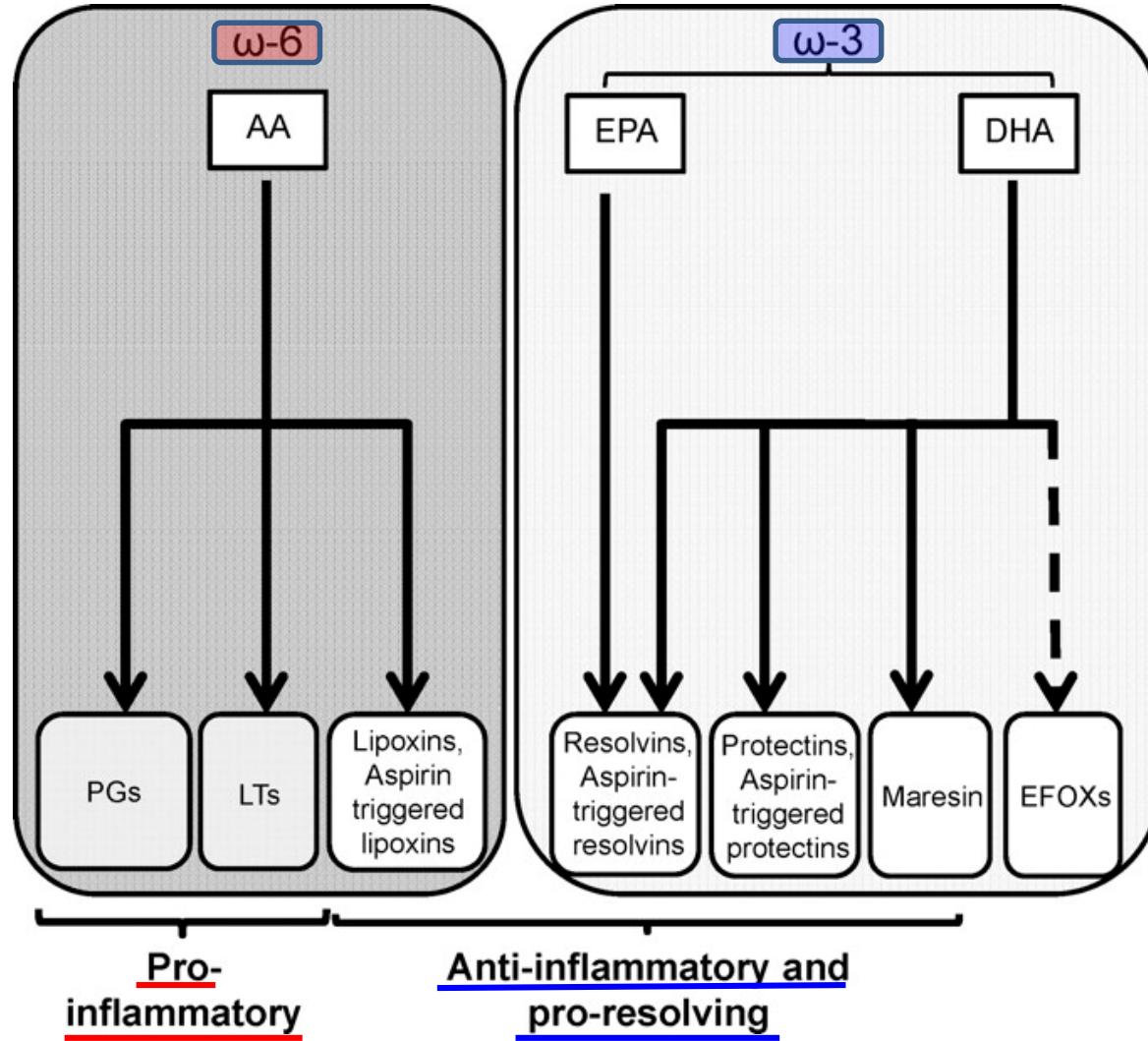
# NF- $\kappa$ B functions as a tumour promoter in inflammation-associated cancer

Eli Pikarsky<sup>1\*</sup>, Rinnat M. Porat<sup>1\*</sup>, Ilan Stein<sup>1,2\*</sup>, Rinat Abramovitch<sup>1</sup>,  
Sharon Amit<sup>2</sup>, Shafika Kasem<sup>1</sup>, Elena Gutkovich-Pyest<sup>2</sup>,  
Simcha Urieli-Shoval<sup>4</sup>, Ethan Galun<sup>3</sup> & Yinon Ben-Neriah<sup>2</sup>

<sup>1</sup>Department of Pathology, Hadassah-Hebrew University Medical Center,  
Jerusalem 91120, Israel

<sup>2</sup>The Lautenberg Center for Immunology, Hebrew University-Hadassah M.  
School, Jerusalem 91120, Israel





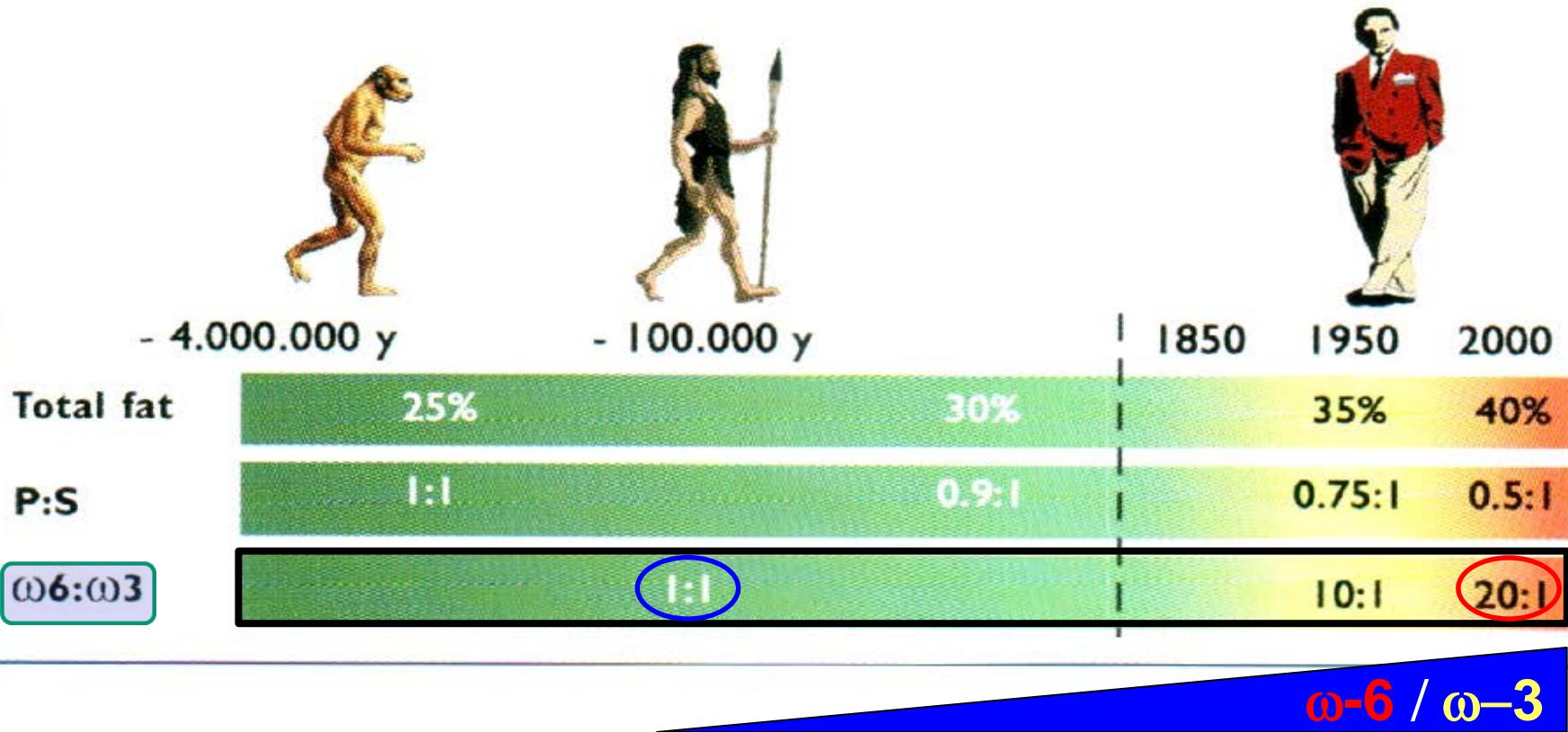
*Int. J. Cancer*: 123, 1974–1977 (2008)

© 2008 Wiley-Liss, Inc.

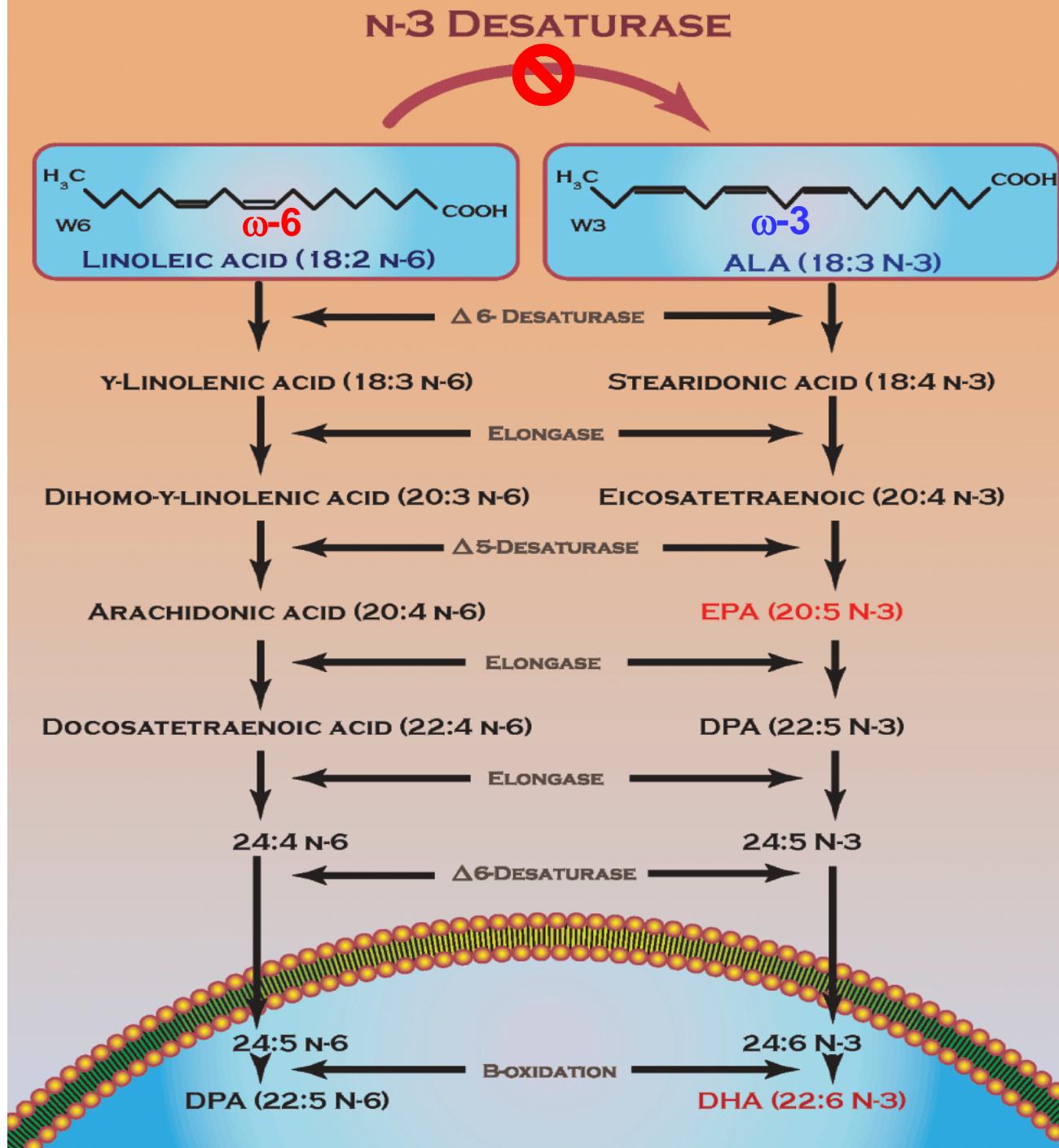
## SHORT REPORT

**Opposing associations** of serum **n-3** and **n-6** polyunsaturated fatty acids with **colorectal adenoma** risk: An endoscopy-based case-control study

## Evolution of the Human Diet

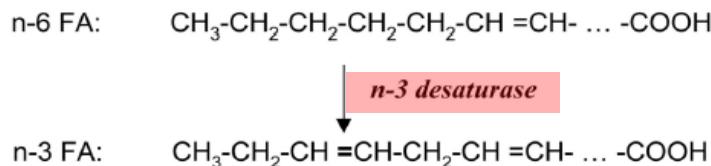


At the onset of the industrial revolution, there was a marked shift in the ratio of  $\omega$ -6 to  $\omega$ -3 fatty acids in the diet.



# Genetic dissection of polyunsaturated fatty acid synthesis in *Caenorhabditis elegans*

Jennifer L. Watts and John Browse\*



Humanized *fat-1*  
(optimized codon usage)



Microinjection  
of the gene into  
fertilized egg

# nature

International weekly journal of science

communications > Full Text

## Brief Communications

Nature 427, 504 (5 February 2004) | doi:10.1038/427504a

Transgenic mice: *Fat-1* mice convert n-6 to n-3 fatty acids

Jing X. Kang<sup>1</sup>, Jingdong Wang<sup>1</sup>, Lin Wu<sup>2</sup> & Zhao B. Kang<sup>1</sup>

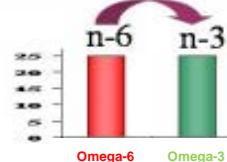
*Fat-1 Tg*

WT

*fat-1*



*actin*

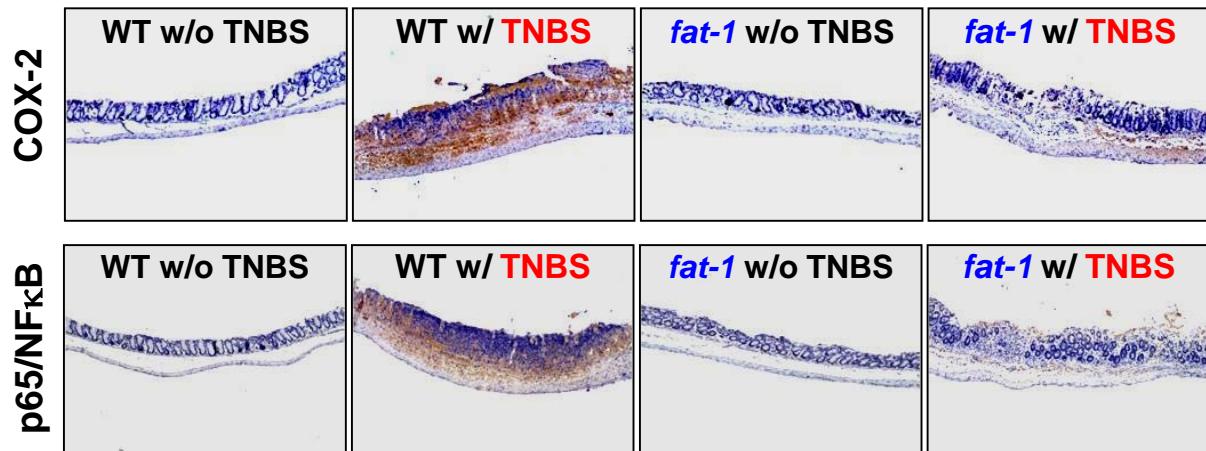
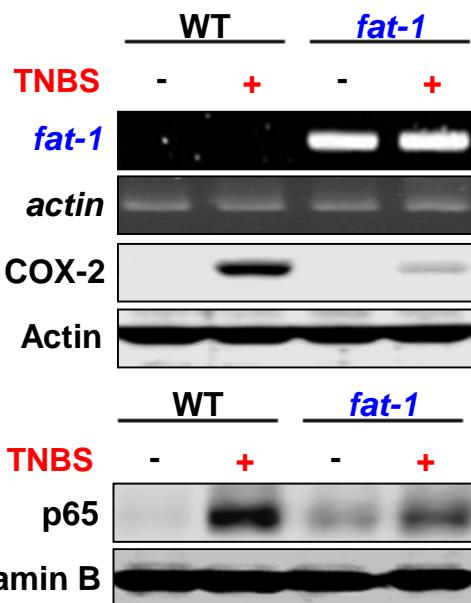




## Constitutive ω-3 fatty acid production in *fat-1* transgenic mice and docosahexaenoic acid administration to wild type mice protect against 2,4,6-trinitrobenzene sulfonic acid-induced colitis



Hye-Won Yum <sup>a</sup>, Jing X. Kang <sup>b</sup>, Ki Baik Hahm <sup>c, d</sup>, Young-Joon Surh <sup>a, \*</sup>



Eran Elinav, Roni Nowarski, Christoph A. Thaiss, Bo Hu, Chengcheng Jin & Richard A Flavell



OPEN ACCESS Freely available online

PLoS one

## Docosahexaenoic Acid Inhibits *Helicobacter pylori* Growth *In Vitro* and Mice Gastric Mucosa Colonization

Marta Correia<sup>1,2,3</sup>, Valérie Michel<sup>3</sup>, António A. Matos<sup>4,7</sup>, Patrícia Carvalho<sup>4,7</sup>, Maria J. Oliveira<sup>1✉a</sup>, Rui M. Ferreira<sup>1,2</sup>, Marie-Agnès Dillies<sup>5</sup>, Michel Huerre<sup>6✉b</sup>, Raquel Seruca<sup>1,2</sup>, Ceu Figueiredo<sup>1,2</sup>, Jose C. Machado<sup>1,2\*</sup>, Eliette Touati<sup>3\*</sup>

Search

go

Advanced search

Nature Reviews Cancer 9, 798-809 (November 2009) | doi:10.1038/nrc2734

## STATs in cancer inflammation and immunity: a leading role for STAT3

Hua Yu<sup>1</sup>, Drew Pardoll<sup>2</sup> & Richard Jove<sup>1</sup> [About the authors](#)

Review

### Targeting STAT3 in gastric cancer

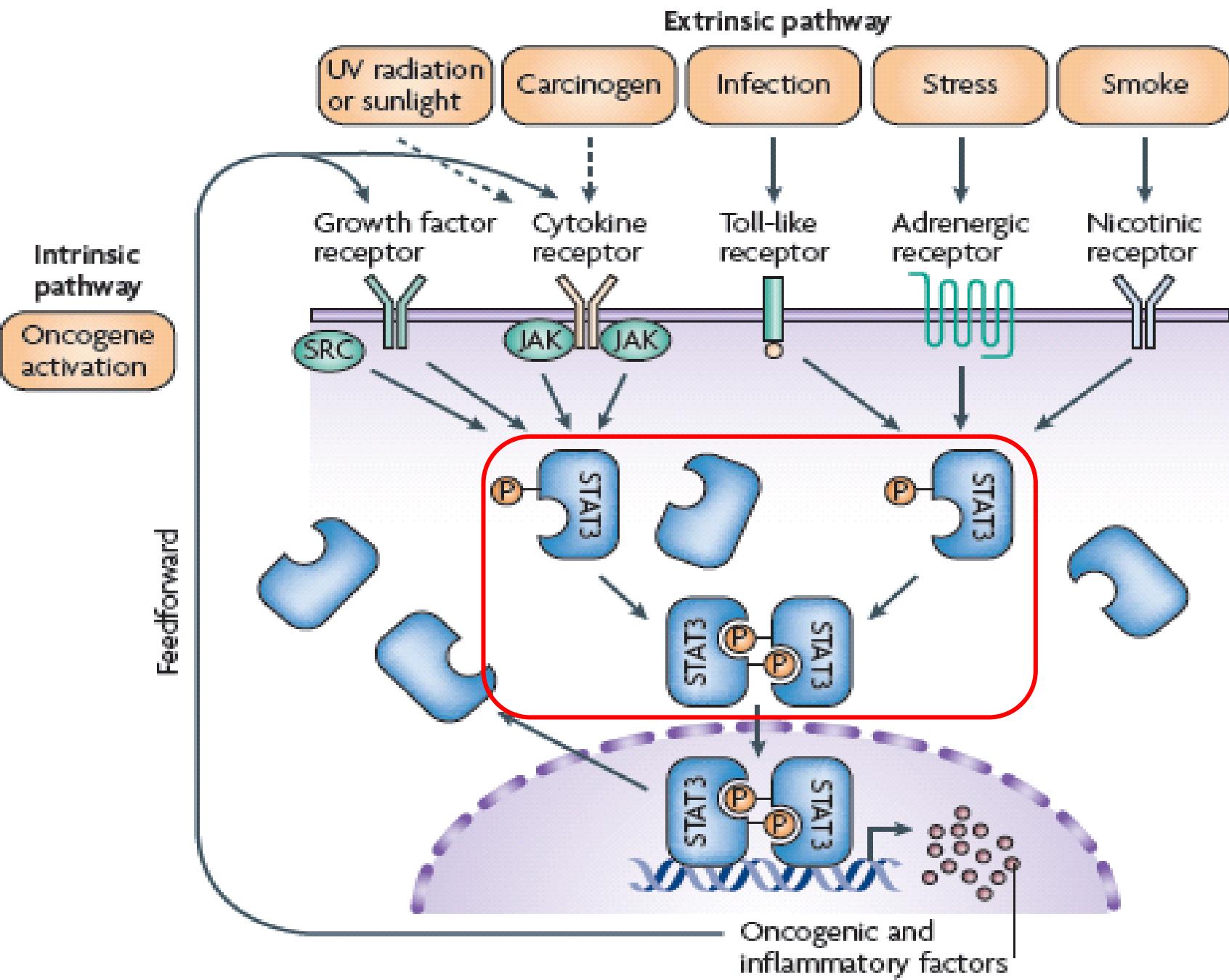
Andrew S Giraud<sup>†</sup>, Trevelyan R Menheniott & Louise M Judd

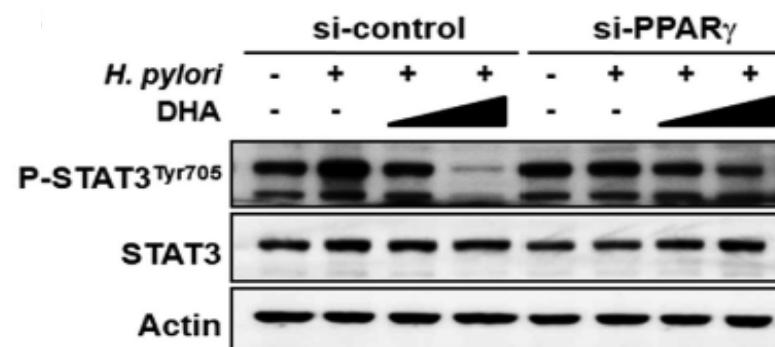
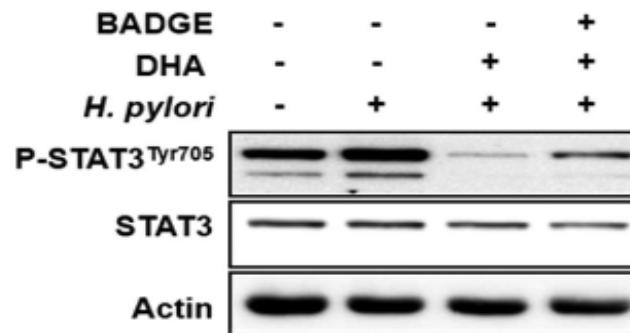
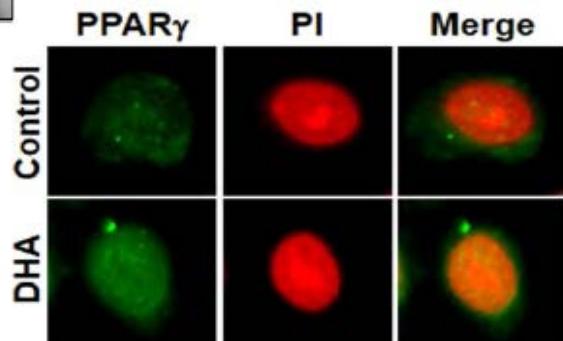
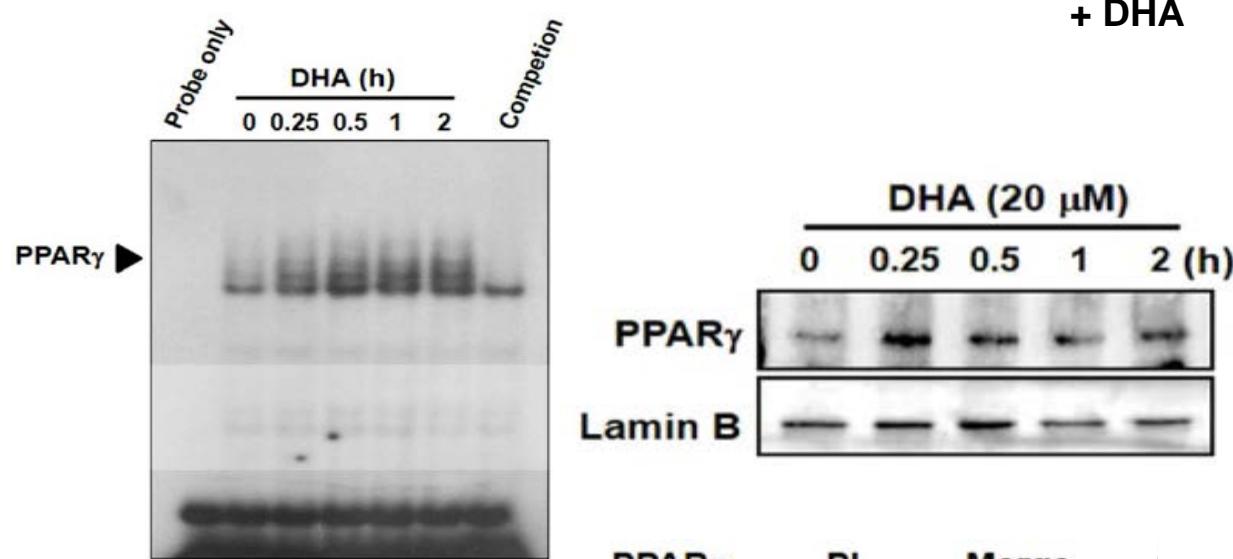
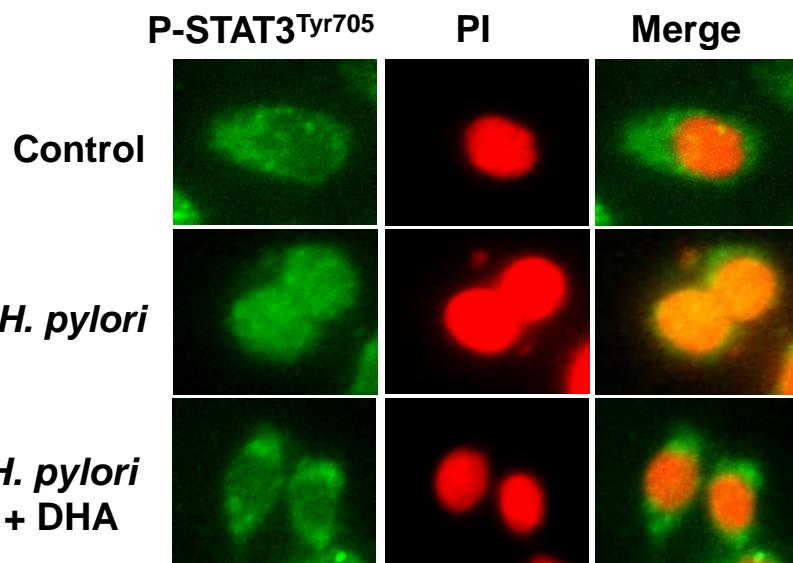
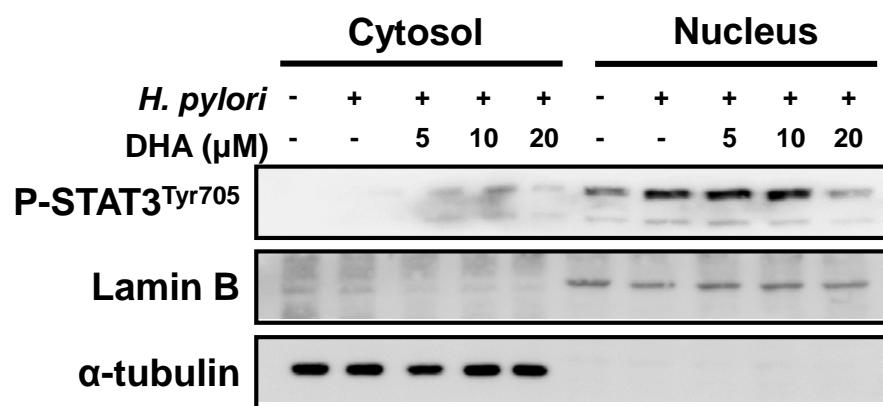
<sup>†</sup>*Murdoch Childrens Research Institute, Royal Childrens Hospital, Parkville, Australia*

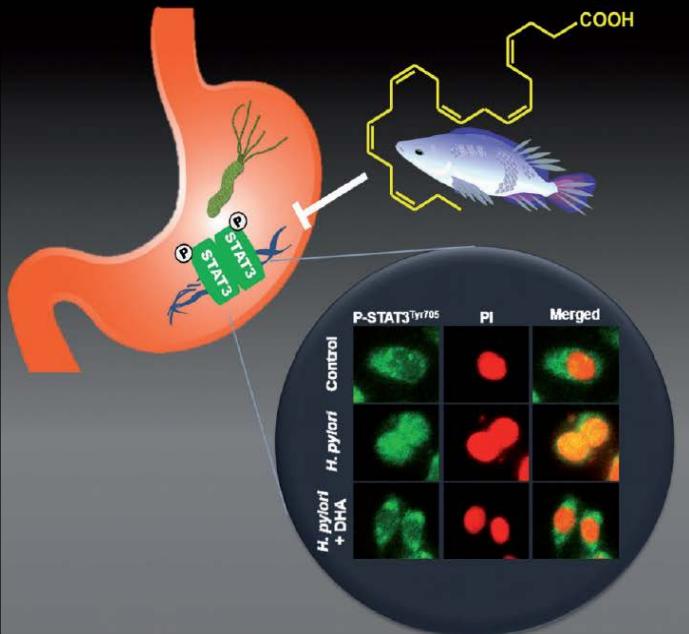
#### GASTROENTEROLOGY

### **STAT3 expression in gastric cancer indicates a poor prognosis**

Dae-Young Kim,\* Sung-Tae Cha,\* Dae-Ho Ahn,\* Hae-Yoon Kang,<sup>†</sup> Chang-Il Kwon,\* Kwang-Hyun Ko,\* Seong-Gyu Hwang,\* Pil-Won Park,\* Kyu-Sung Rim\* and Sung-Pyo Hong\*



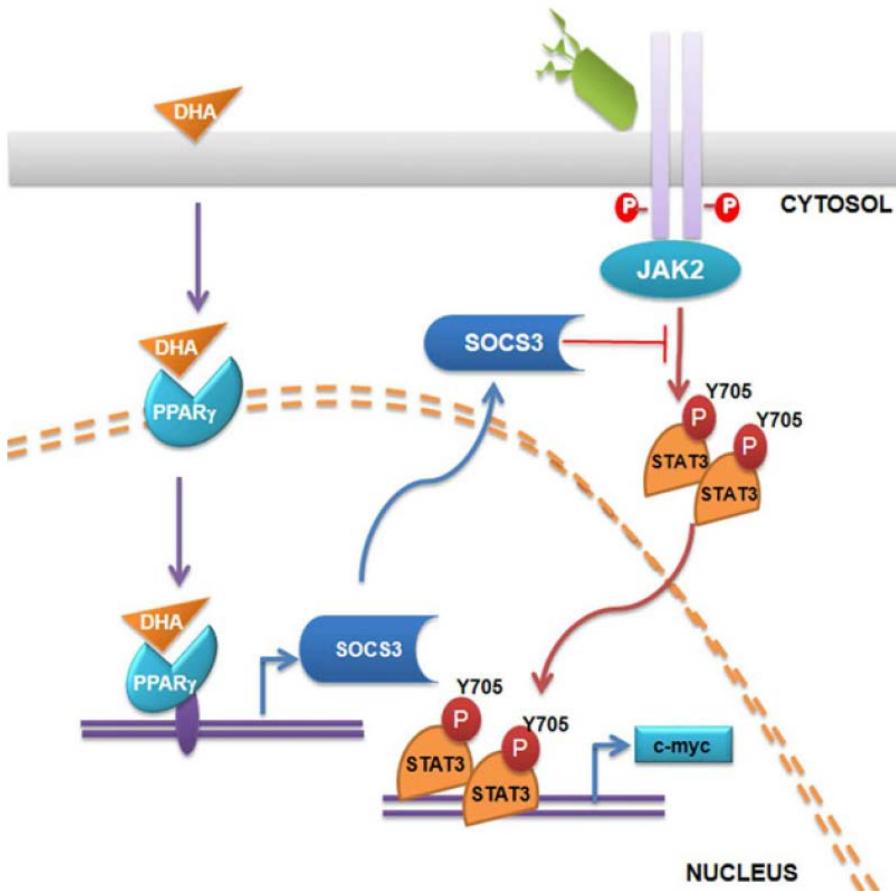




## RESEARCH ARTICLE

# Docosahexaenoic acid inhibits *Helicobacter pylori*-induced STAT3 phosphorylation through activation of PPAR $\gamma$

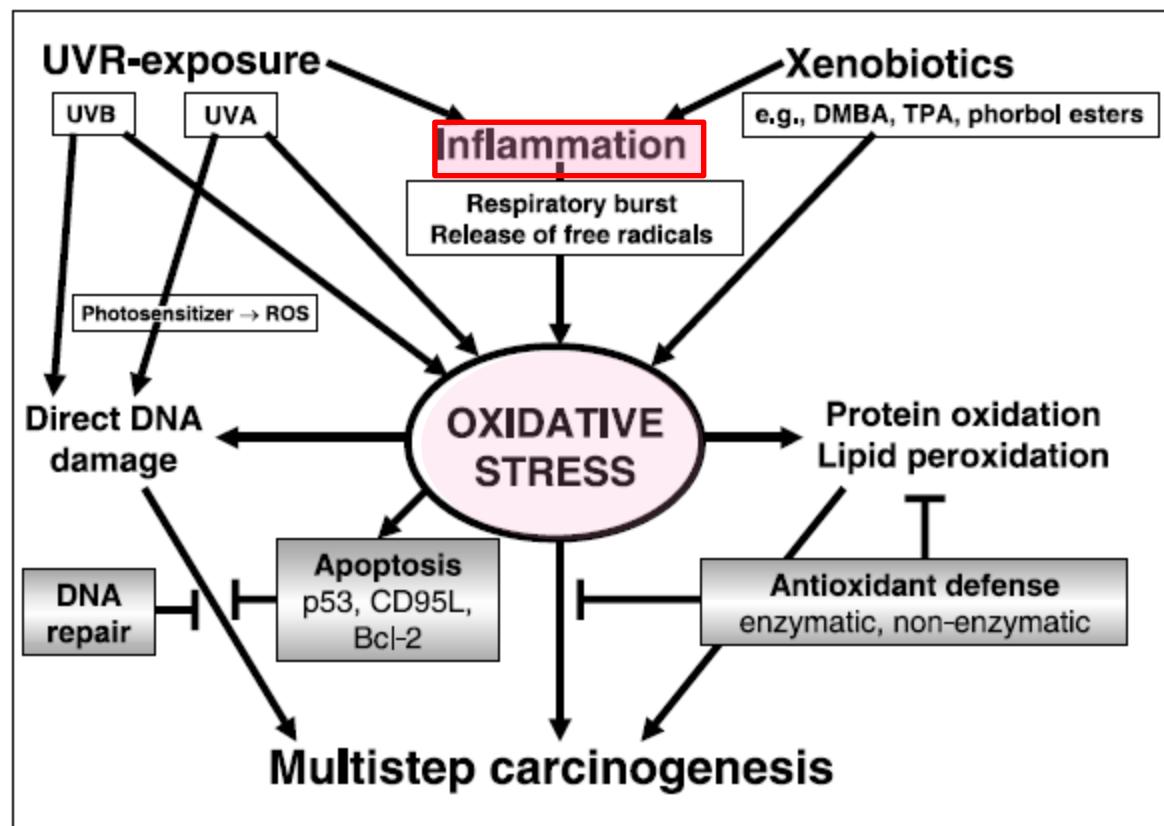
Hyeon-Geun Ji<sup>1,2\*\*</sup>, Juan-Yu Piao<sup>2\*\*</sup>, Su-Jung Kim<sup>3</sup>, Do-Hee Kim<sup>2</sup>, Ha-Na Lee<sup>2</sup>, Hye-Kyung Na<sup>4\*</sup> and Young-Joon Surh<sup>1,2,3</sup>



## Review

# Inflammation, gene mutation and photoimmunosuppression in response to UVR-induced oxidative damage contributes to photocarcinogenesis

Gary M. Halliday\*



# Consumption of omega-3 fatty acids and the risk of skin cancers: A systematic review and meta-analysis

Sophie E. Noel<sup>1</sup>, Adam C.S. Stoneham<sup>2</sup>, Catherine M. Olsen<sup>3</sup>, Lesley E. Rhodes<sup>4,5</sup> and Adele C. Green<sup>3,4,5</sup>

DOI:10.1111/j.1600-0625.2011.01294.x  
www.blackwellpublishing.com/EXD

Review Article

## Omega-3 polyunsaturated fatty acids: photoprotective macronutrients

Suzanne M. Pilkington<sup>1</sup>, Rachel E. B. Watson<sup>1</sup>, Anna Nicolaou<sup>2</sup> and Lesley E. Rhodes<sup>1</sup>



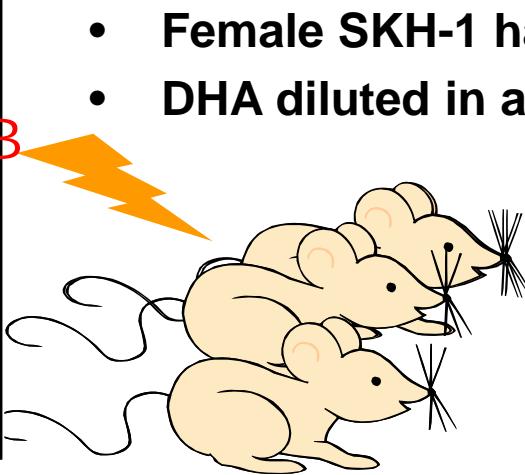
Journal of  
*Clinical Medicine*

Review

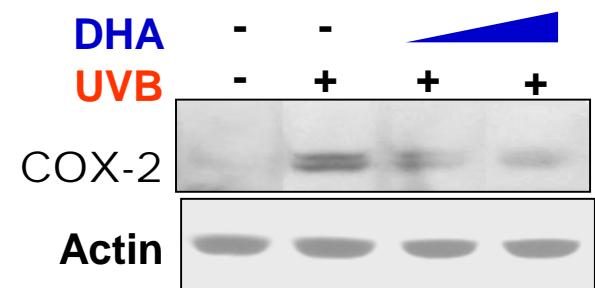
## Potential Benefits of Omega-3 Fatty Acids in Non-Melanoma Skin Cancer

Homer S. Black <sup>1,\*</sup> and Lesley E. Rhodes <sup>2</sup>





- Female SKH-1 hairless mice (6 to 7 weeks old)
- DHA diluted in acetone, topical application



Control

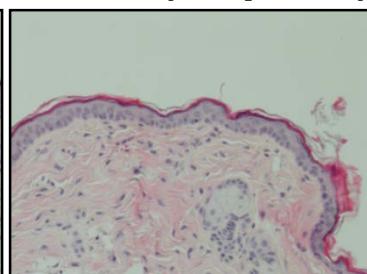
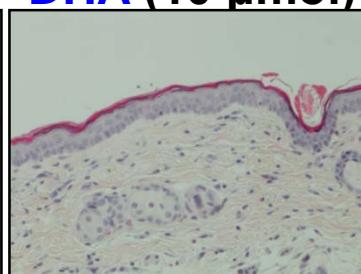
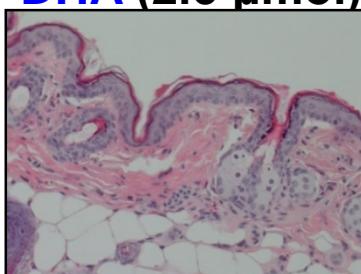
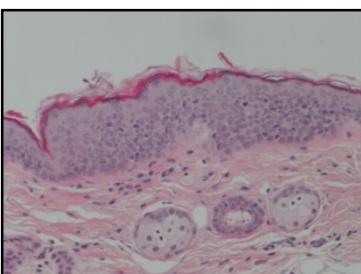
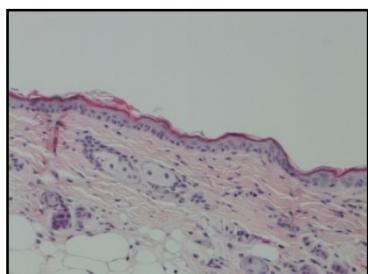
UVB

UVB +  
DHA (2.5  $\mu$ mol)

UVB +  
DHA (10  $\mu$ mol)

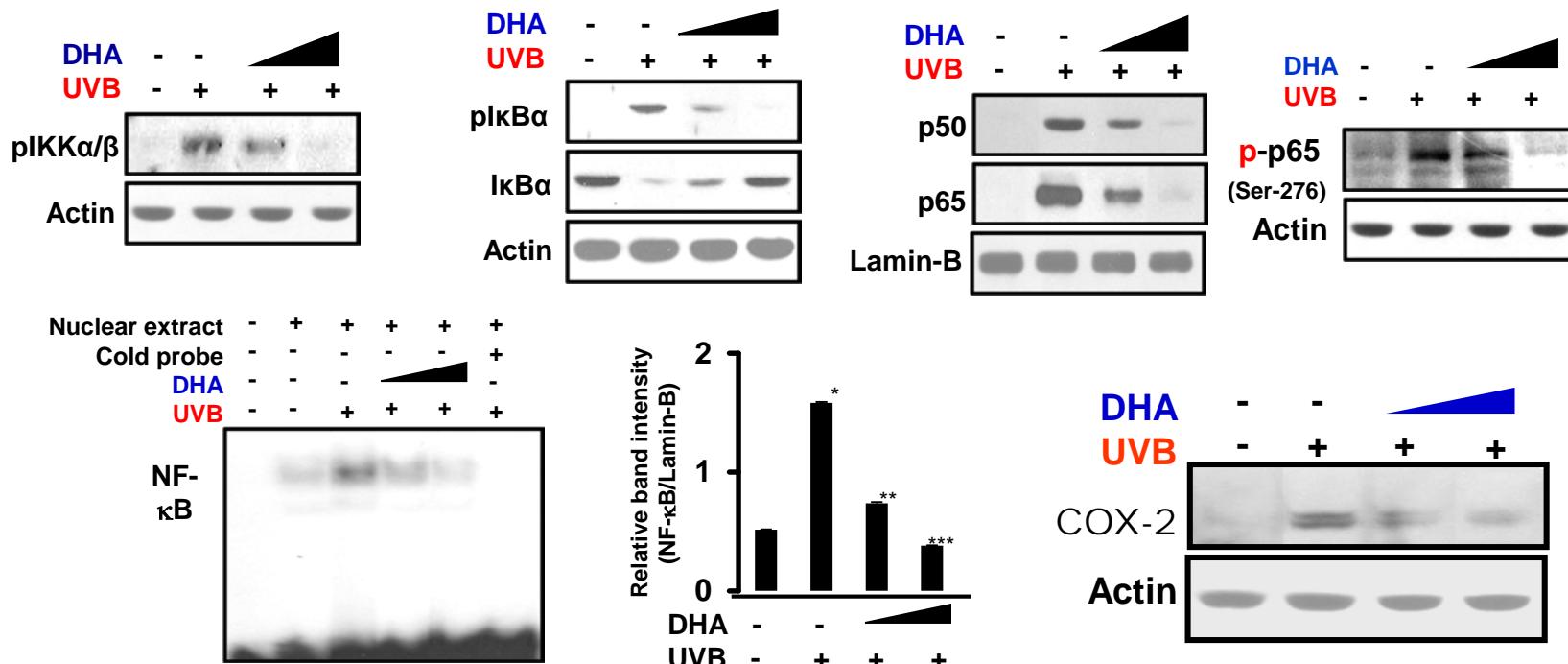
DHA (10  $\mu$ mol)

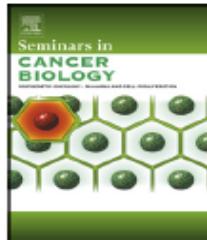
H&E



# Docosahexaenoic Acid Inhibits UVB-Induced Activation of NF- $\kappa$ B and Expression of COX-2 and NOX-4 in HR-1 Hairless Mouse Skin by Blocking MSK1 Signaling

Md. Mostafizur Rahman<sup>1</sup>, Joydeb Kumar Kundu<sup>1</sup>, Jun-Wan Shin<sup>1</sup>, Hye-Kyung Na<sup>2</sup>, Young-Joon Surh<sup>1,3,4\*</sup>



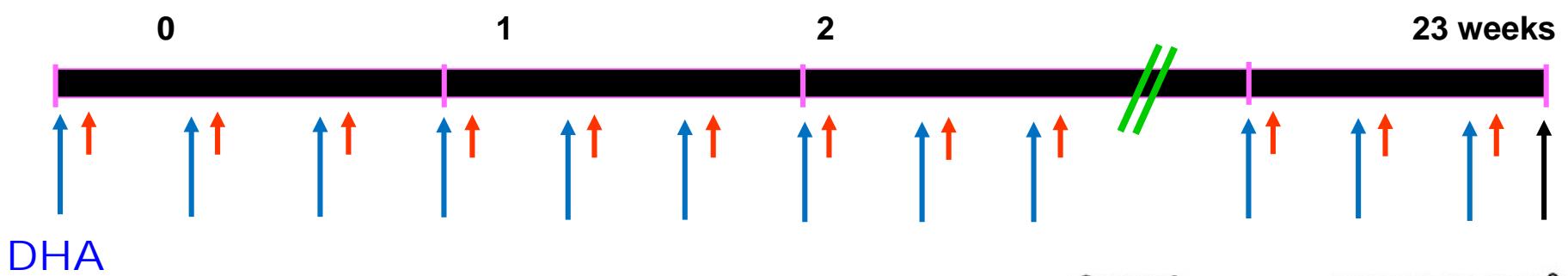


## Seminars in Cancer Biology

journal homepage: [www.elsevier.com/locate/semcancer](http://www.elsevier.com/locate/semcancer)

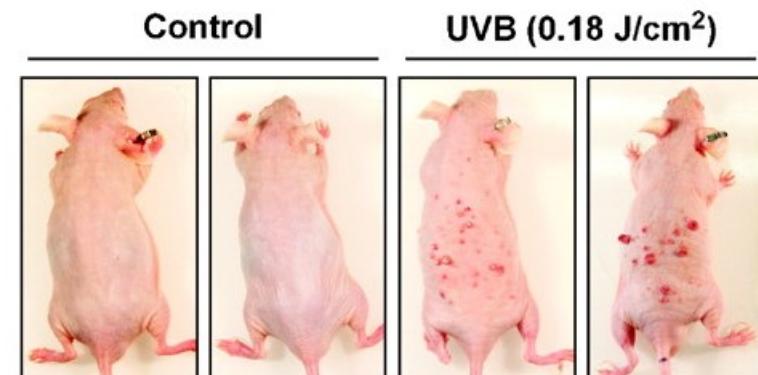
## Review

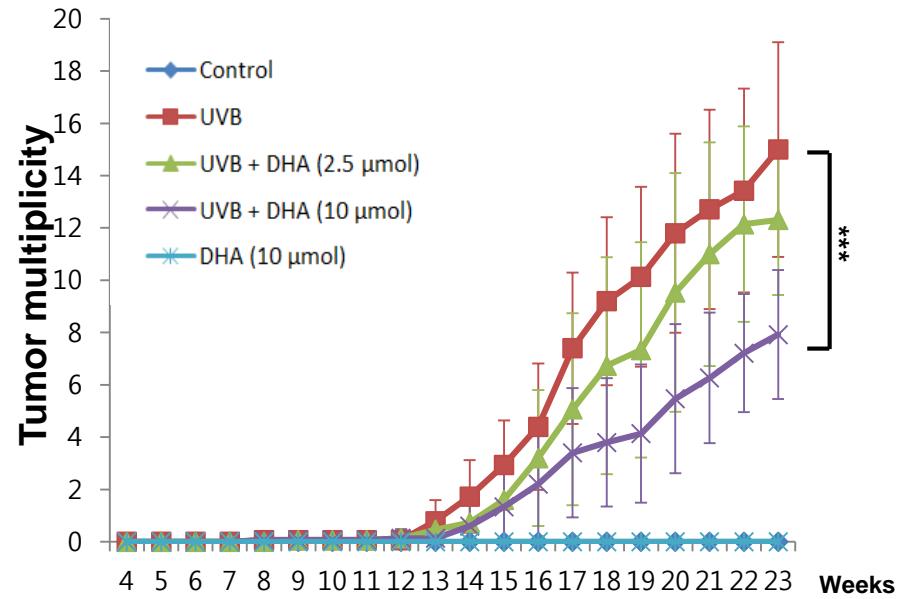
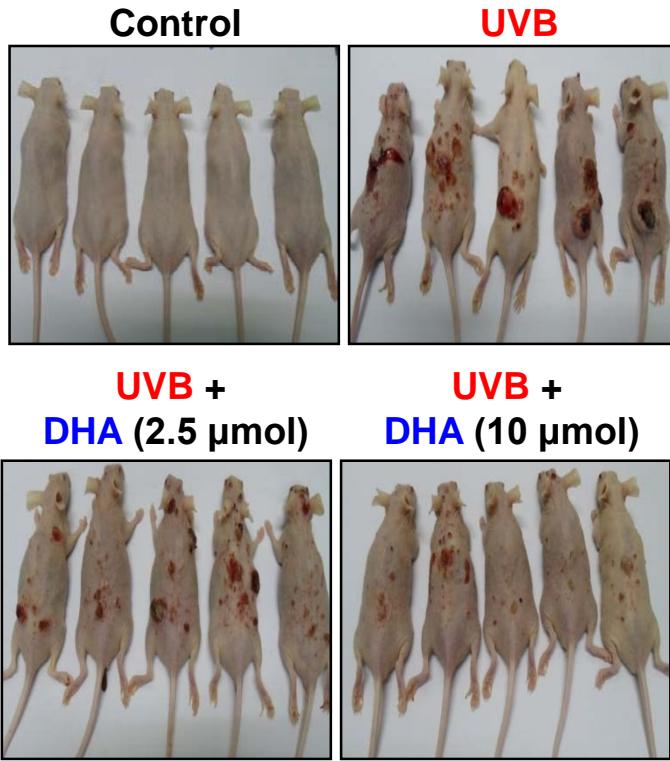
## Anti-inflammatory effects of docosahexaenoic acid: Implications for its cancer chemopreventive potential

Hye-Won Yum<sup>a,b</sup>, Hye-Kyung Na<sup>c,\*\*</sup>, Young-Joon Surh<sup>a,b,d,e,\*</sup>

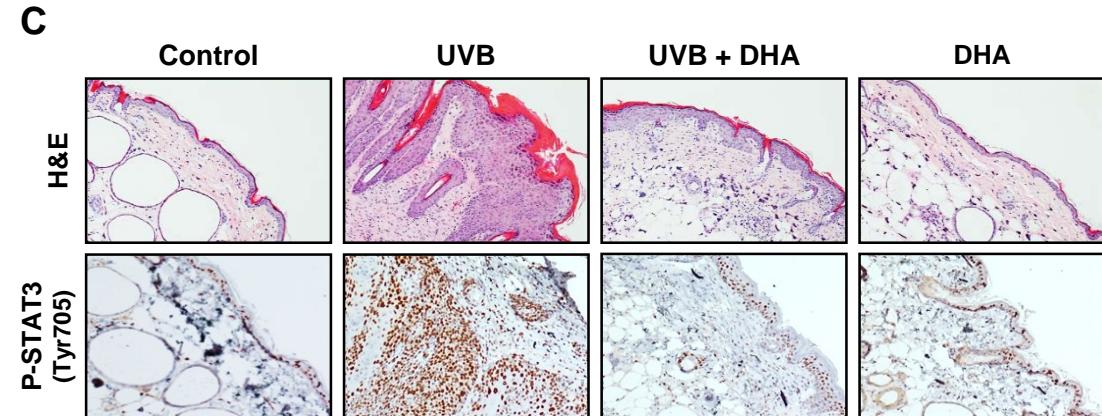
- Female SKH-1 hairless mice (6 to 7 weeks old)
- DHA in acetone topically applied
- $n = 15$  per each group

Jung SK et al.,  
Cancer Res.,  
2008





Cumulative Tumor Weight (g)	
Control	0
UVB	4.7348
UVB + DHA (2.5 µmol)	2.6683
UVB + DHA (10 µmol)	1.4998
DHA (10 µmol)	0



*fat-1* mice were crossbred with hairless mice which harbor the albino allele to generate hybrid mice for our convenience

Male *fat-1+/-, hr-/-*



X

Female *fat-1-/-, hr+/+*



50%

1<sup>st</sup> genetic background  
filtrated



87.5%

3<sup>rd</sup> genetic background  
filtrated



75%

2<sup>nd</sup> genetic background  
filtrated



93.75%

4<sup>th</sup> genetic background  
filtrated

The 5<sup>th</sup> genetic background filtrated



21 days



31 days



36 days



40 days



43 days



45 days

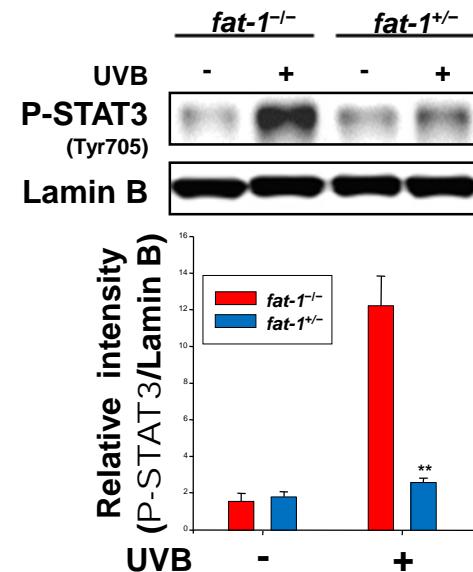
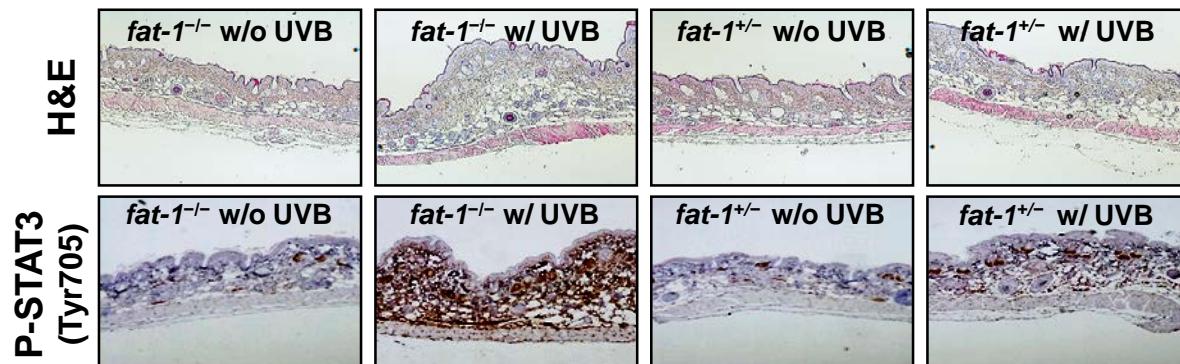
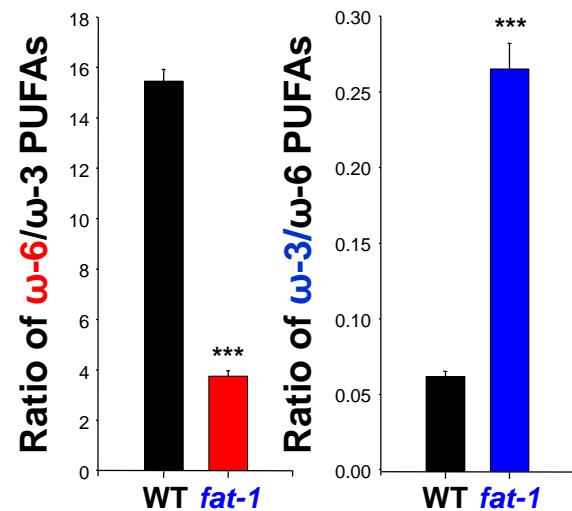


96.875%

There were significantly much higher proportions of  $\omega$ -3 fatty acids in the skin of hairless *fat-1* mice compared to those WT mouse skin

**Table Polyunsaturated fatty acid composition of hairless mouse skin**

		WT ( <i>n</i> = 3)	<i>fat-1</i> ( <i>n</i> = 3)
Linoleic acid	C18:2	31.81 ± 0.62	27.06 ± 0.86*
$\gamma$ -Linolenic acid	C18:3	0.46 ± 0.06	0.22 ± 0.01*
Dihomo- $\gamma$ -linolenic acid	C20:3	1.03 ± 0.04	0.54 ± 0.06**
Arachidonic acid	C20:4	0.37 ± 0.02	0.04 ± 0.01***
<b><math>\omega</math>-6 Polyunsaturated fatty acids (%)</b>		<b>33.66 ± 0.60</b>	<b>27.86 ± 0.89**</b>
$\alpha$ -Linolenic acid	C18:3	0.90 ± 0.04	2.46 ± 0.13***
Eicosatrienoic acid	C20:3	0.56 ± 0.06	1.03 ± 0.01**
Eicosapentaenoic acid	C20:5	0.35 ± 0.04	1.29 ± 0.02***
Docosahexaenoic acid	C22:6	0.36 ± 0.01	2.63 ± 0.11***
<b><math>\omega</math>-3 Polyunsaturated fatty acids (%)</b>		<b>2.18 ± 0.03</b>	<b>7.41 ± 0.24***</b>





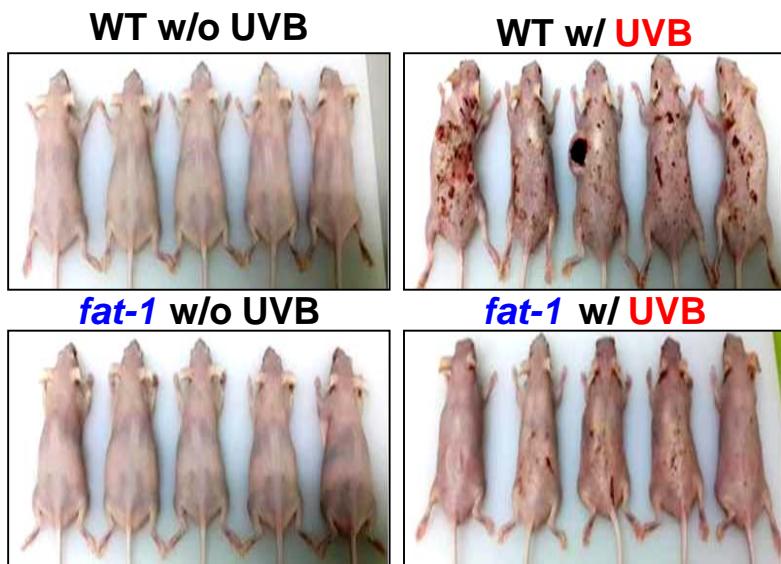
4 weeks age      6-7 weeks

AIN-93G purified rodent diet containing 10% safflower oil  
180 mJ/cm<sup>2</sup>  
UVB

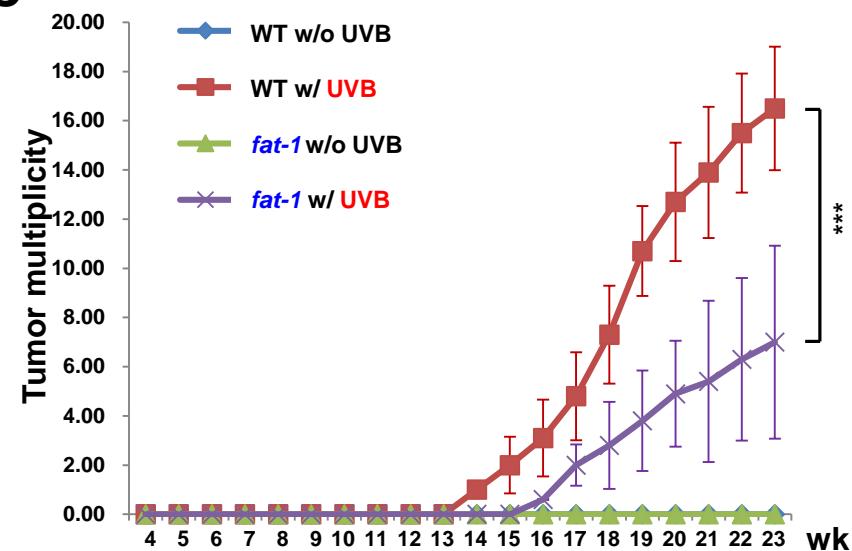
30 weeks

Normal

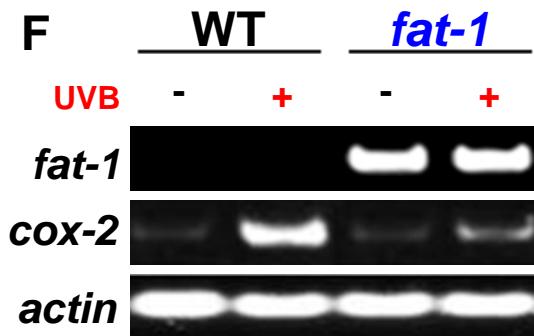
A



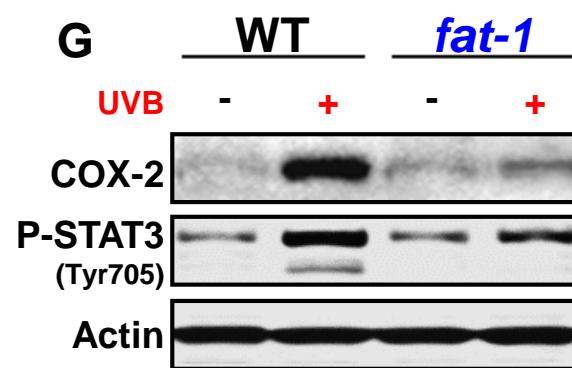
C



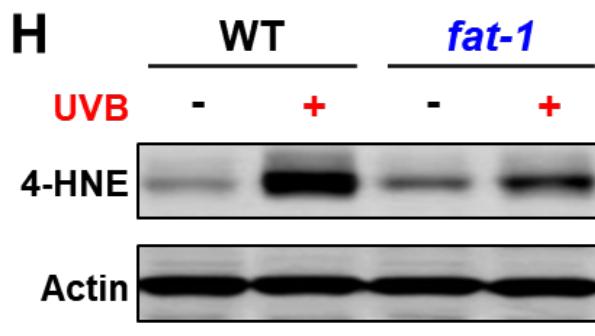
F



G



H

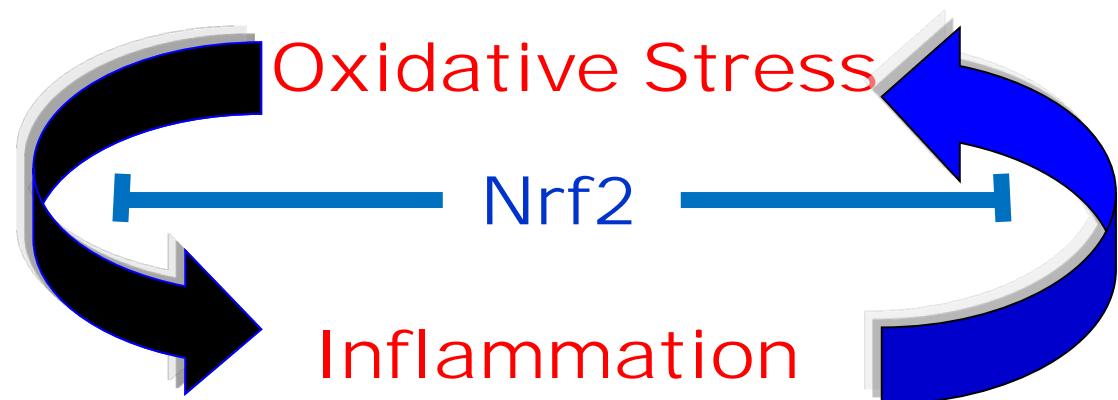
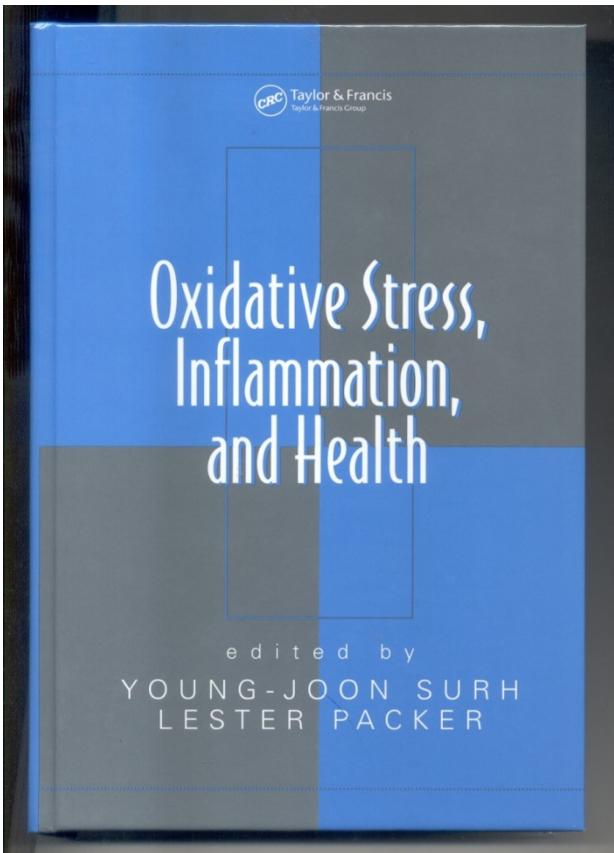


## **Chronic inflammation and oxidative stress in human carcinogenesis**

**Alessandro Federico<sup>1</sup>, Floriana Morgillo<sup>2</sup>, Concetta Tuccillo<sup>1</sup>, Fortunato Ciardiello<sup>2</sup> and Carmela Loguercio<sup>1</sup>**

<sup>1</sup>*Division of Gastroenterology, “F. Magrassi and A. Lanzara” Medical-Surgical Department,  
Second University of Naples, Naples, Italy*

<sup>2</sup>*Division of Oncology, “F. Magrassi and A. Lanzara” Medical-Surgical Department,  
Second University of Naples, Naples, Italy*



**Kundu, J.K & Surh, Y.-J. (2010) *Pharm. Res.***



Contents lists available at ScienceDirect

## Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis

journal homepage: [www.elsevier.com/locate/molmut](http://www.elsevier.com/locate/molmut)

Community address: [www.elsevier.com/locate/mutres](http://www.elsevier.com/locate/mutres)



### Review

## A protective role of nuclear factor-erythroid 2-related factor-2 (Nrf2) in inflammatory disorders

Jiyoung Kim<sup>a</sup>, Young-Nam Cha<sup>d</sup>, Young-Joon Surh<sup>a,b,c,\*</sup>

<sup>a</sup> National Research Laboratory, College of Pharmacy, Graduate School of Convergence Science and Technology, Seoul National University, Seoul 151-742, Republic of Korea

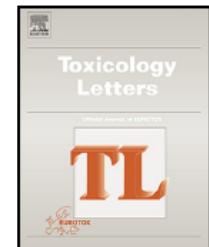
<sup>b</sup> Department of Molecular Medicine and Biopharmaceutical Sciences, Graduate School of Convergence Science and Technology, Seoul National University, Seoul 151-742, Republic of Korea

<sup>c</sup> Cancer Research Institute, Seoul National University, Seoul 110-799, Republic of Korea

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## Toxicology Letters

journal homepage: [www.elsevier.com/locate/toxlet](http://www.elsevier.com/locate/toxlet)



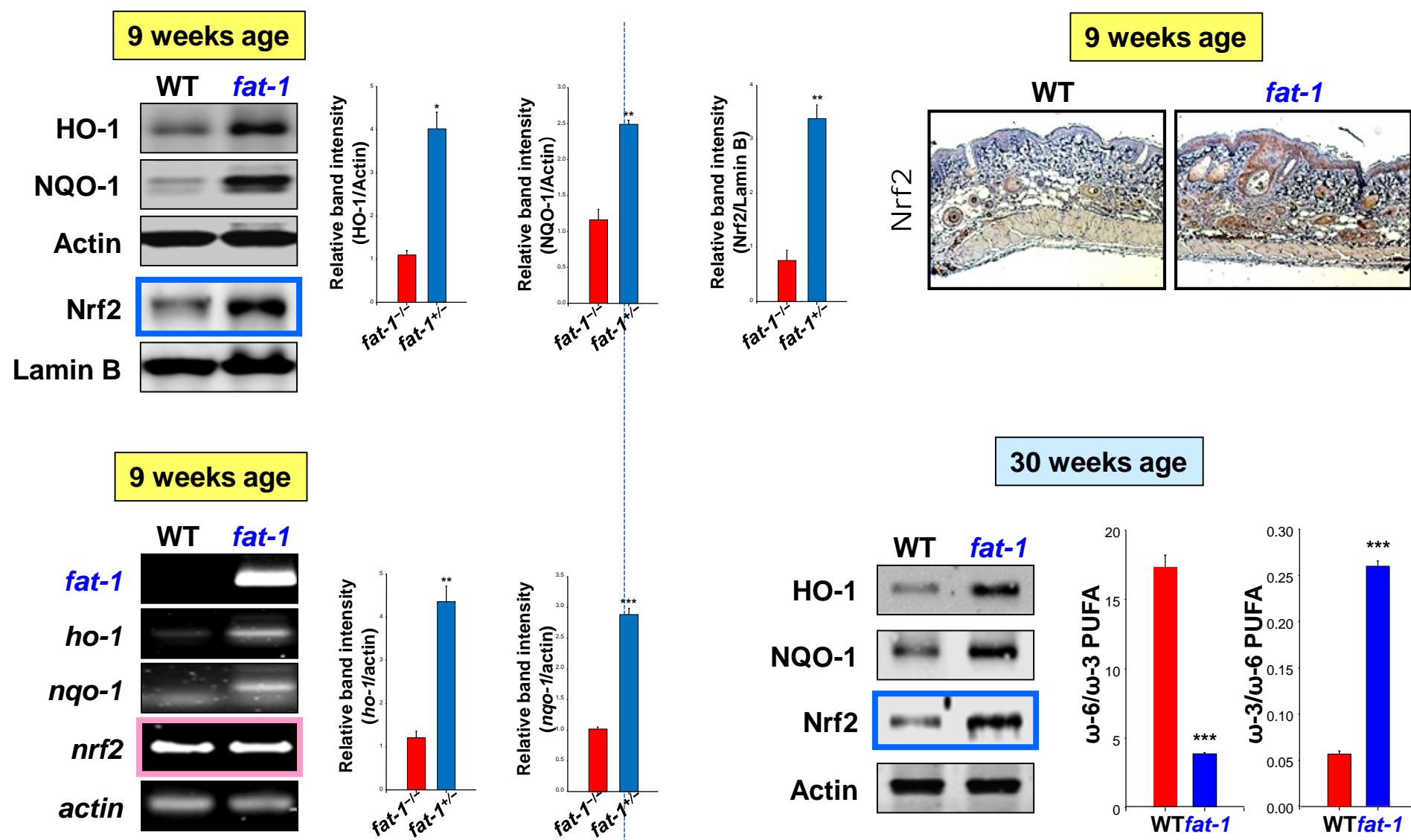
### Mini review

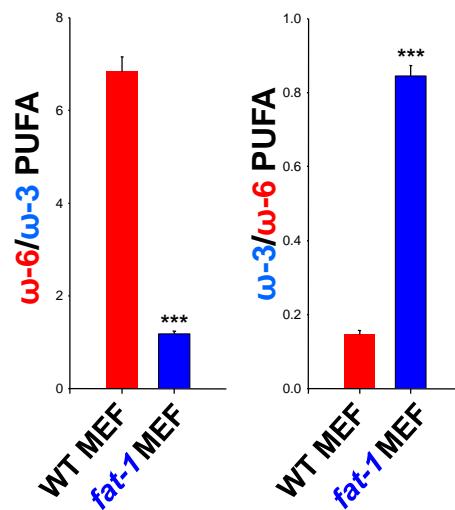
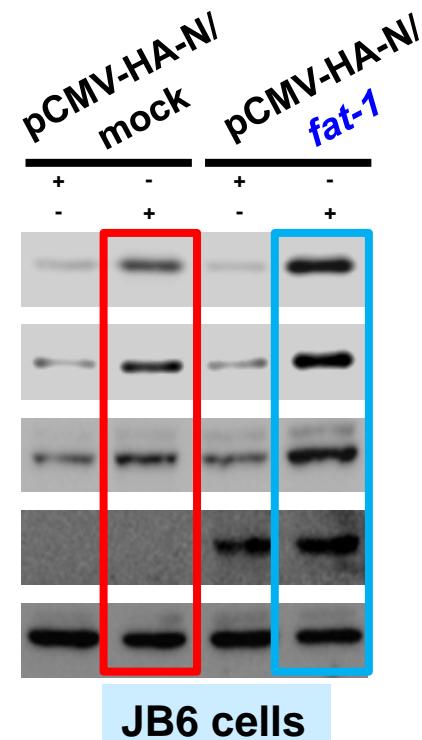
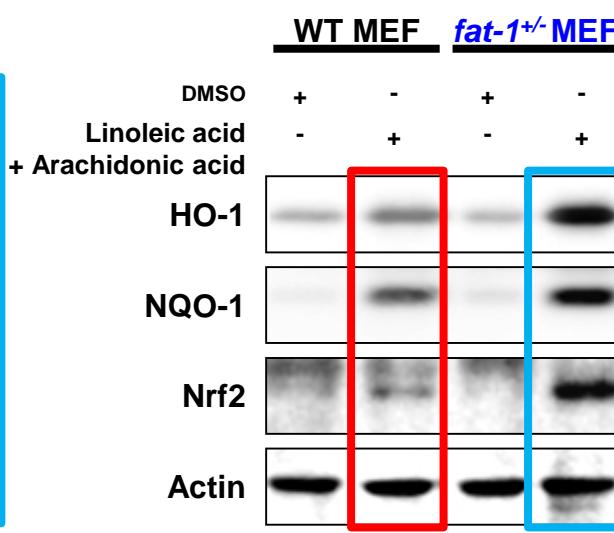
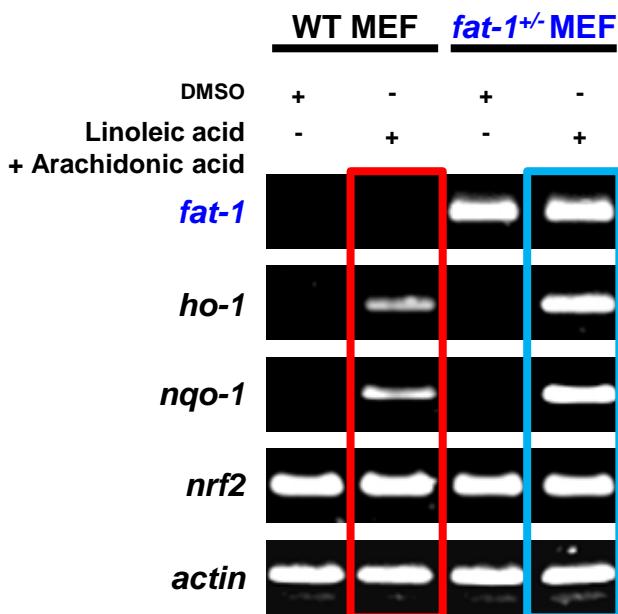
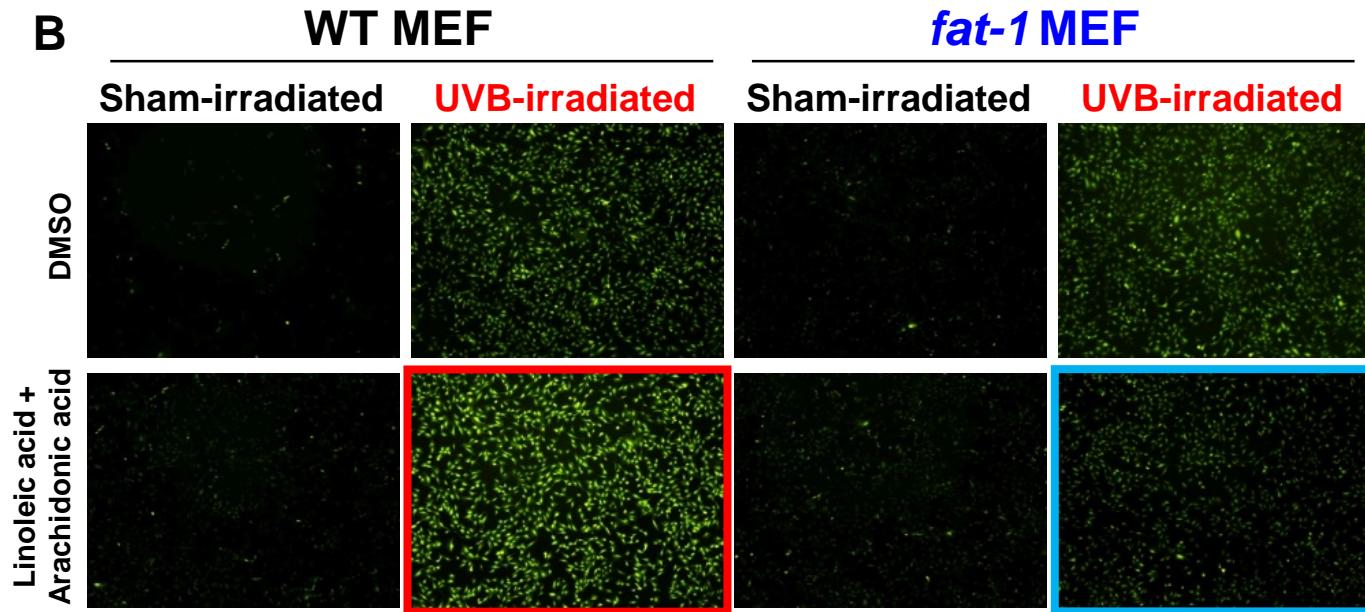
## Targeting Nrf2-Keap1 signaling for chemoprevention of skin carcinogenesis with bioactive phytochemicals

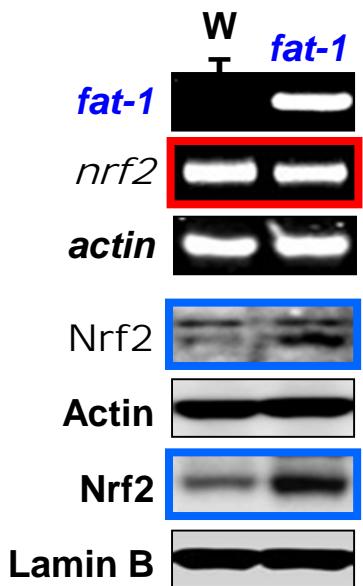
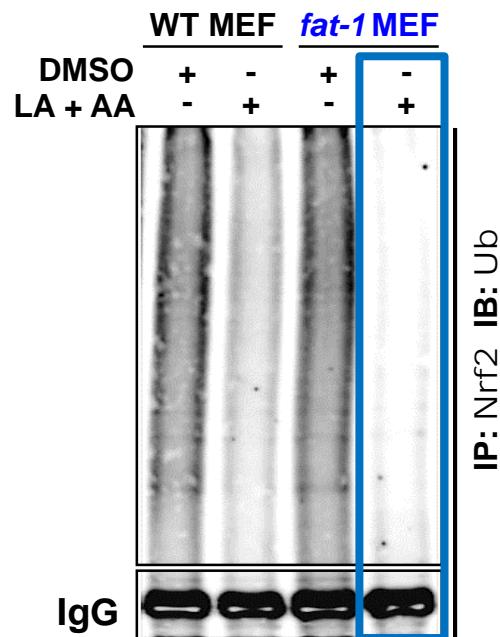
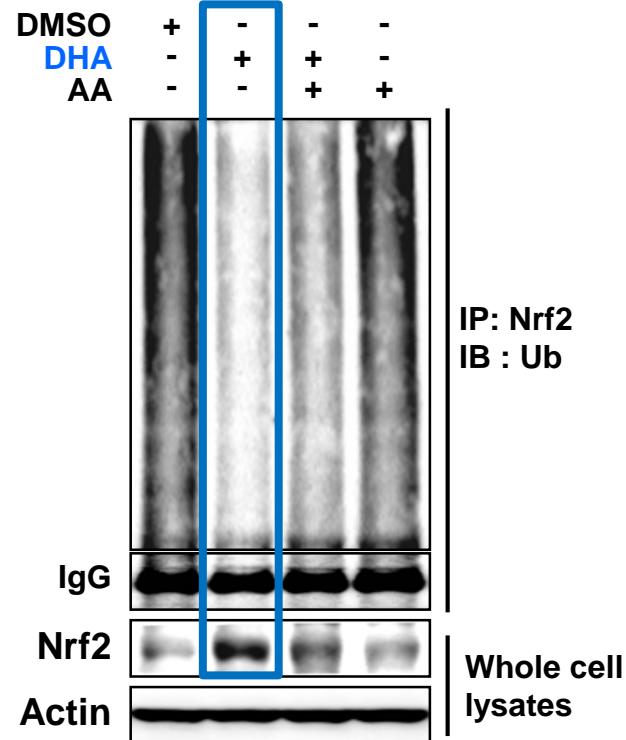
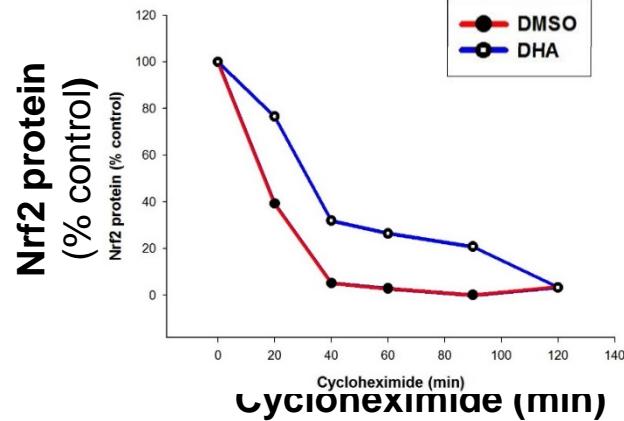
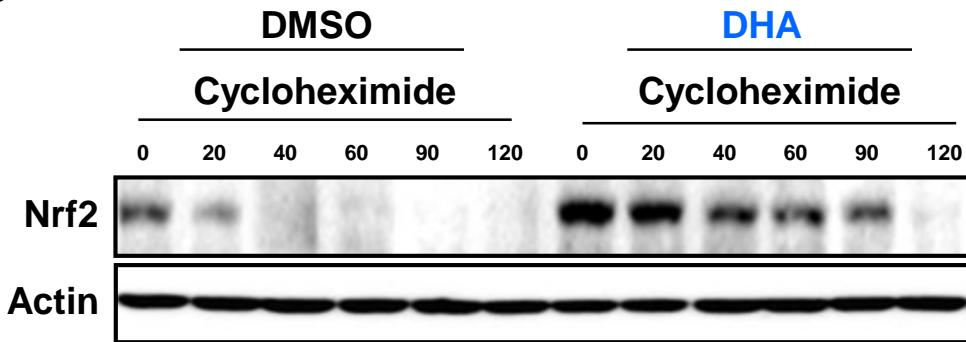
Kyung-Soo Chun<sup>a</sup>, Juthika Kundu<sup>a</sup>, Joydeb Kumar Kundu<sup>a</sup>, Young-Joon Surh<sup>b,c,\*</sup>



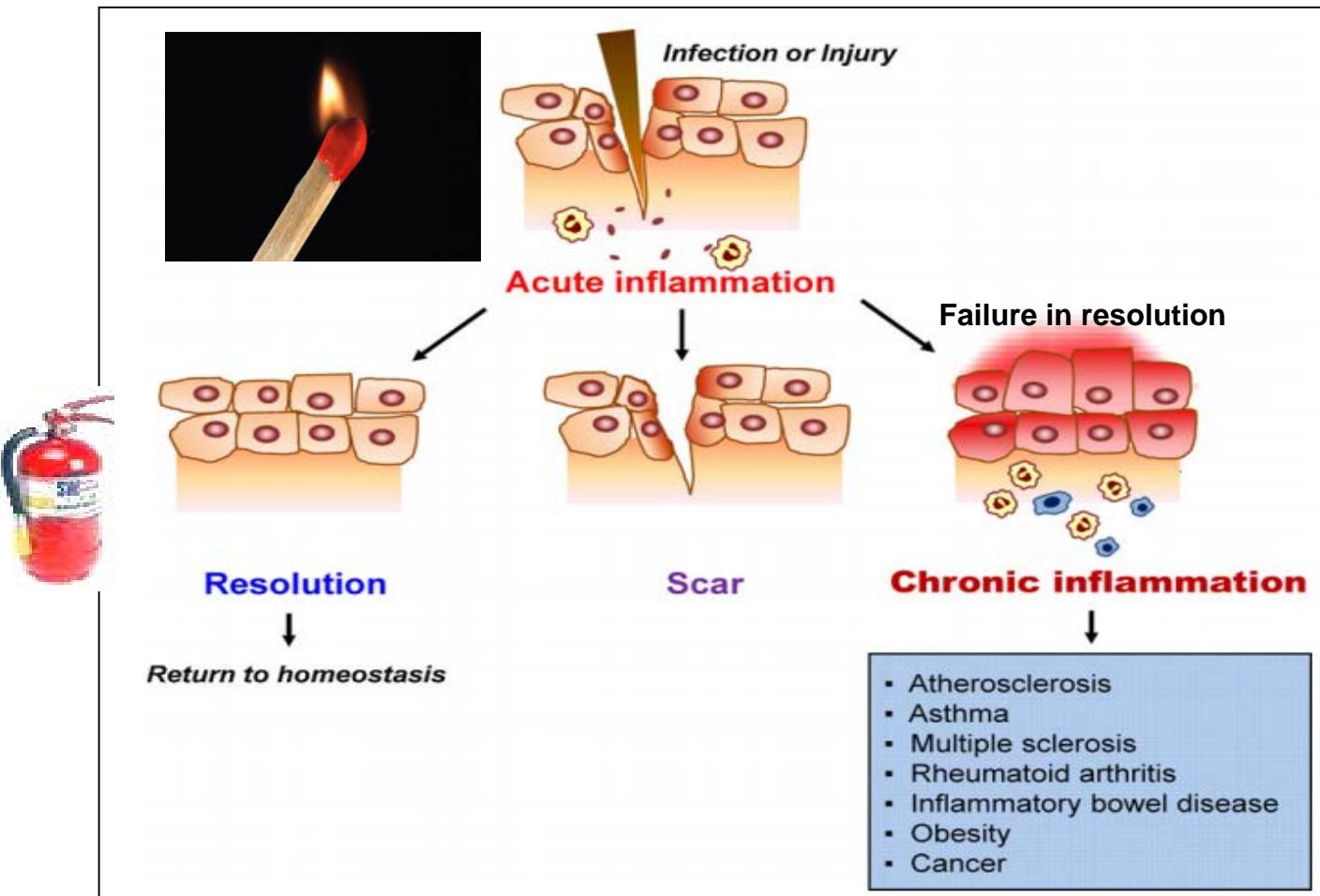
# Expression of Nrf2-regulated cytoprotective proteins is higher in skin tissues of hairless *fat-1* mice



**A****B**

**A****B****C****D**

# Inflammation (炎症) 火 = Fire



Lee, H.-N & Surh, Y.-J., *Biochem. Pharmacol.* (2012)

**Timely resolution of inflammatory response is important for preventing chronic inflammation and cancer**

## Nonresolving Inflammation

Carl Nathan<sup>1,2,\*</sup> and Aihao Ding<sup>1,2</sup>

*Int. J. Exp. Path.* (2007), 88, 85–94

doi: 10.1111/j.1365-2613.2006.00507.x

REVIEW ARTICLE

## Chronic inflammation: a failure of resolution?

Toby Lawrence\* and Derek W. Gilroy

Semin Immunopathol (2013) 35:151–161

DOI 10.1007/s00281-013-0363-y

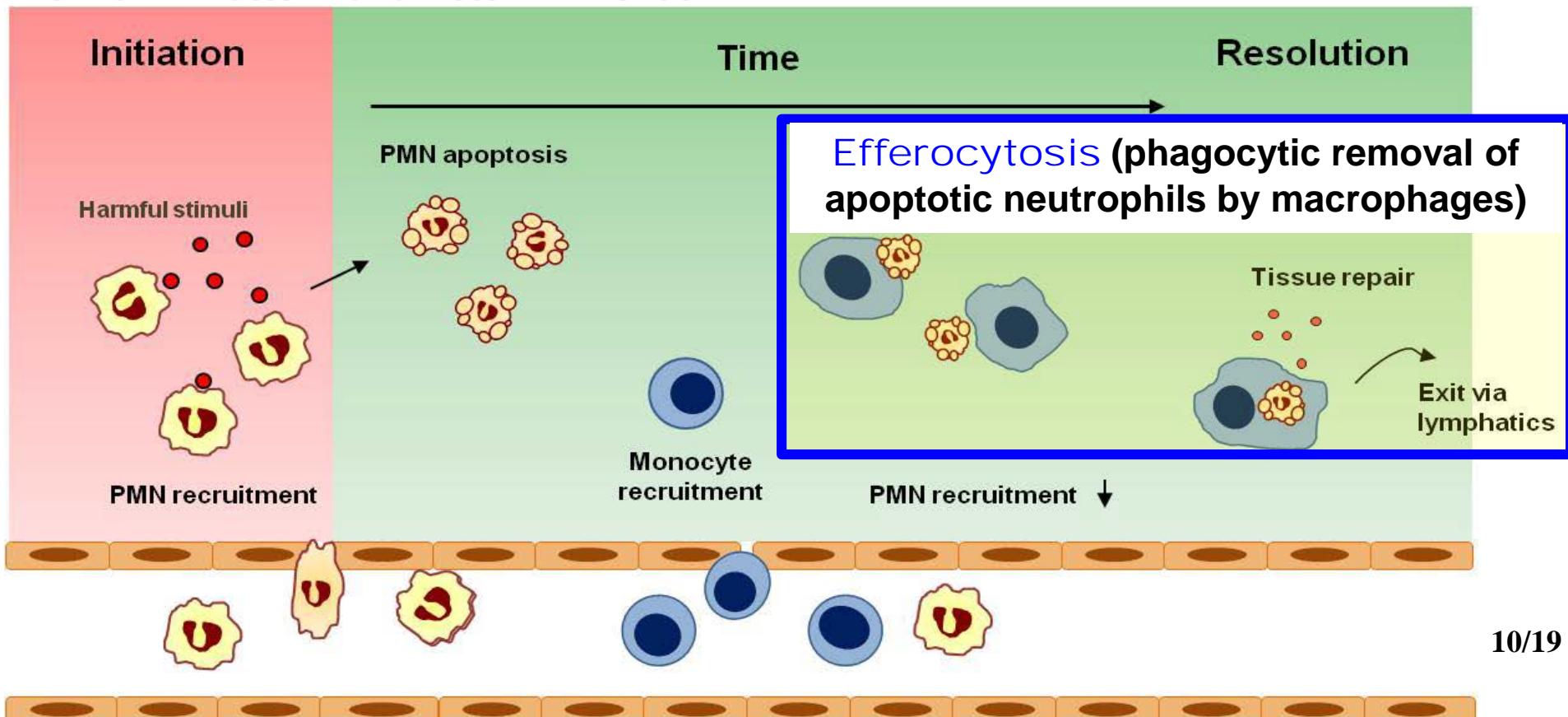
REVIEW

## Resolution of inflammation as a novel chemopreventive strategy

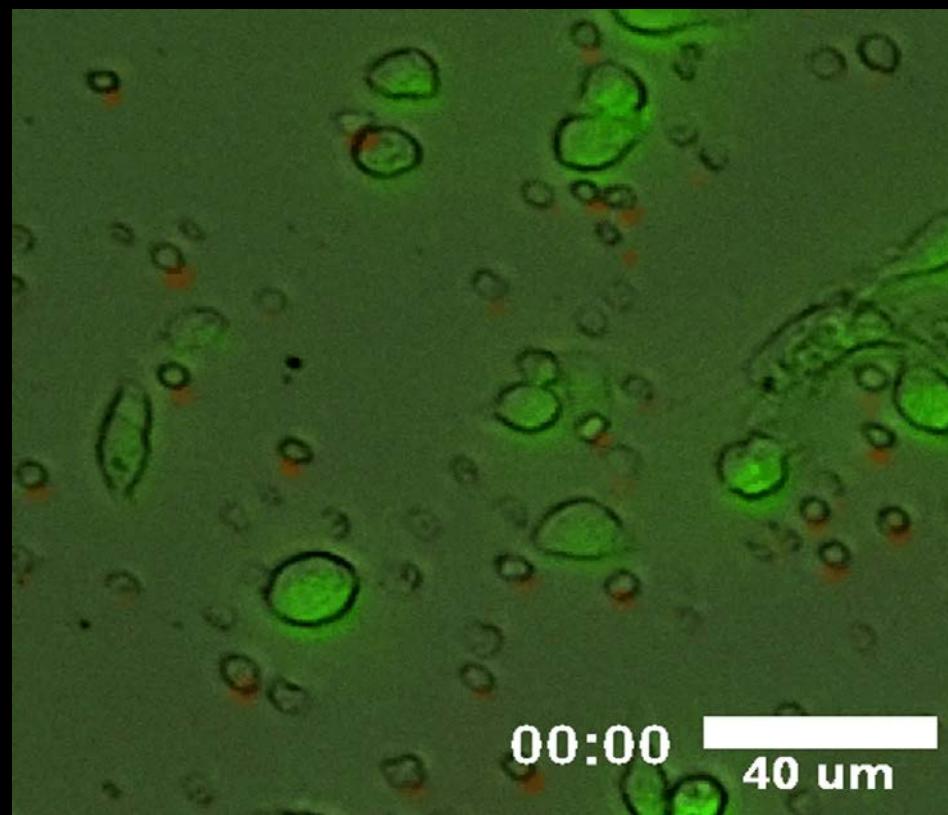
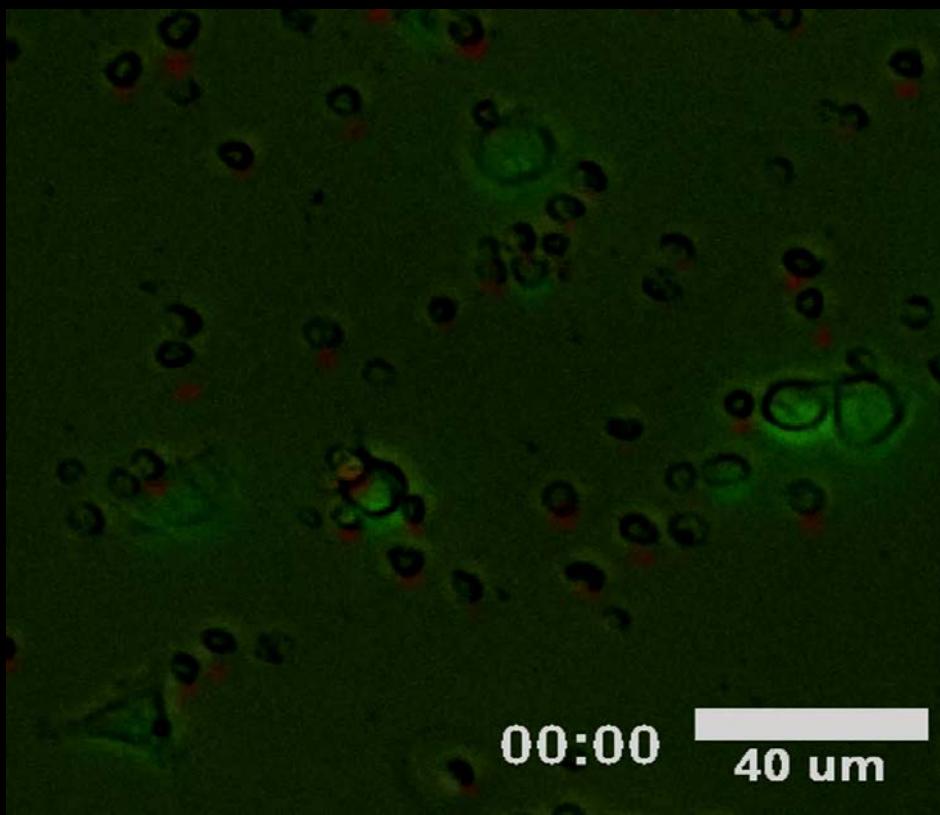
Ha-Na Lee • Hye-Kyung Na • Young-Joon Surh

# Neutrophil clearance: when the party is over, clean-up begins

Donna L. Bratton<sup>1</sup> and Peter M. Henson<sup>2</sup>



# Phagocytic removal of apoptotic cells by macrophages



Green : Macrophages  
Red : Apoptotic thymocytes

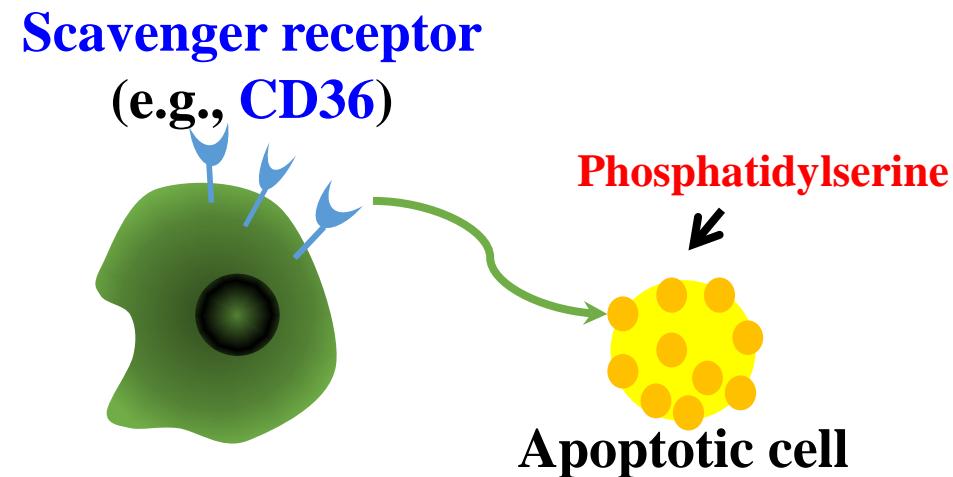
## Beginnings of a Good Apoptotic Meal: The Find-Me and Eat-Me Signaling Pathways

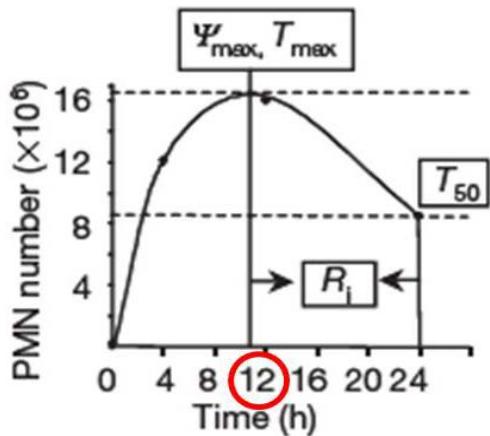
Kodi S. Ravichandran<sup>1,\*</sup>

**CD36 Is Required for Phagocytosis of Apoptotic Cells by Human Macrophages That Use Either a Phosphatidylserine Receptor or the Vitronectin Receptor ( $\alpha v \beta 3$ )**

Valerie A. Fadok, Mary L. Warner  
Peter M. Henson

*J Immunol* 1998;161:6250-6257





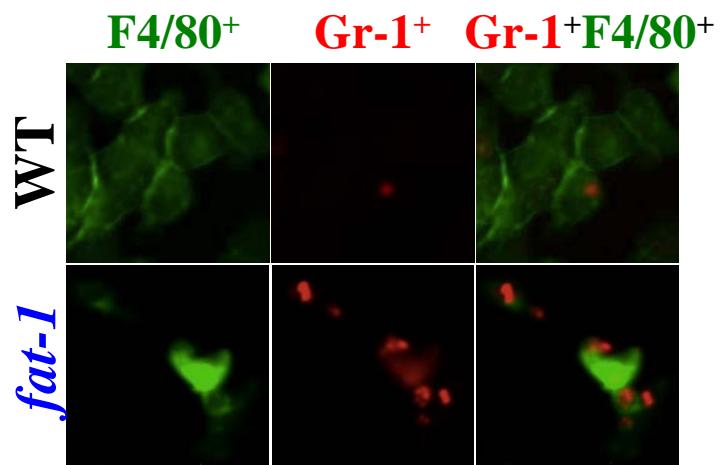
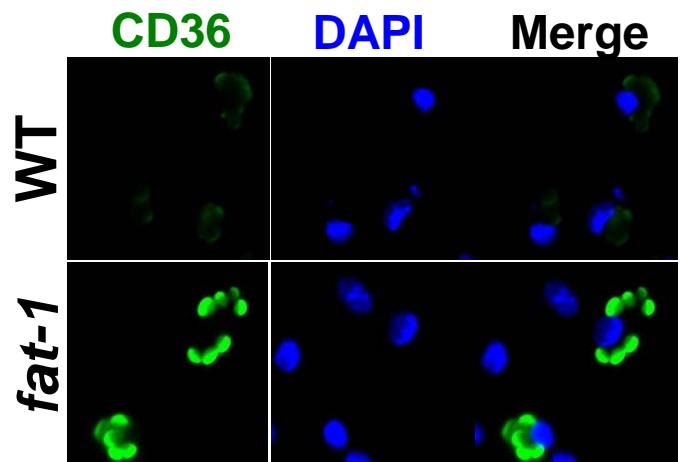
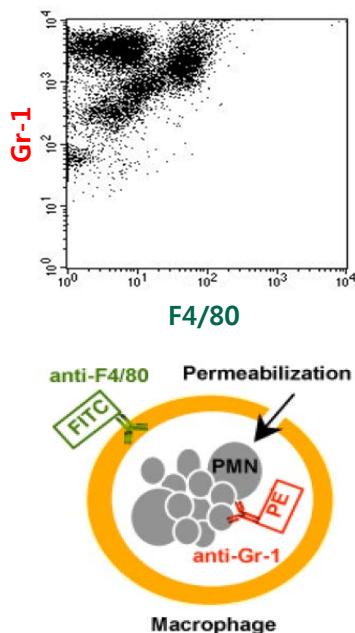
Zymosan-initiated inflammation



Zymosan A  
for 12 h



Collecting peritoneal  
exudate cells



**F4/80 :** macrophage marker  
**Gr-1 :** neutrophil marker

# Resolution of inflammation: the beginning programs the end

Charles N Serhan<sup>1</sup> & John Savill<sup>2</sup>

---

**The final step in programmed  
cell death: phagocytes carry  
apoptotic cells to the grave**

Aimee M. deCathelineau and Peter M. Henson<sup>1</sup>

# Inflammation's STOP SIGNALS

**Lipoxins**

Lipids whose jobs include stimulating macrophages and preventing neutrophils from slipping between endothelial cells to enter damaged tissue.

**Resolvins**

Family of lipids that block neutrophils' exit from the bloodstream and prod macrophages to eat cellular debris.

**Maresins**

Made by macrophages, lipids that spur tissue repair and act on nerves to ease pain.

**Protectins**

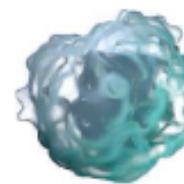
Lipids that curtail release of inflammation-promoting molecules and are protective in the nervous system.

**Annexin A1**

A protein released by dying neutrophils, its functions include preventing other neutrophils from entering the injured site.

**Hydrogen sulfide**

Message-carrying gas that reduces pain and stimulates neutrophils to commit suicide.

**Macrophages**

After clearing an infection, these immune cells consume proinflammatory cellular remains.

**Neutrophils**

First responders to wounds and infections, they release inflammatory cytokines.

**Endothelial cells**

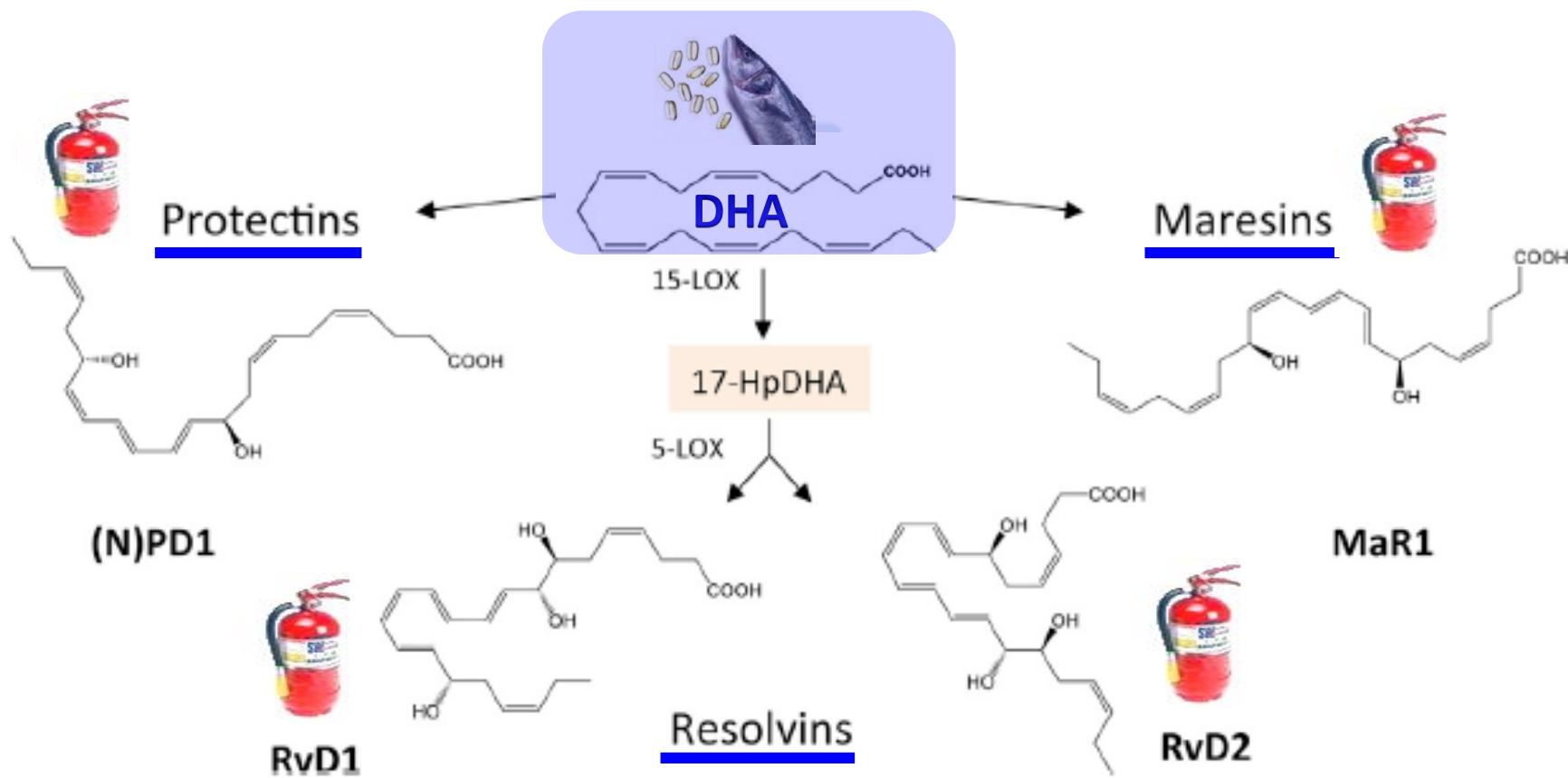
These cells form the walls of blood vessels and make H<sub>2</sub>S.

**Nerves**

Inflammatory molecules trigger nerve cells, creating pain and itchiness.

# Resolvins, Specialized Proresolving Lipid Mediators, and Their Potential Roles in Metabolic Diseases

Matthew Spite,<sup>1</sup> Joan Clària,<sup>2</sup> and Charles N. Serhan<sup>3,\*</sup>





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Biochemical Pharmacology

journal homepage: [www.elsevier.com/locate/biochempharm](http://www.elsevier.com/locate/biochempharm)



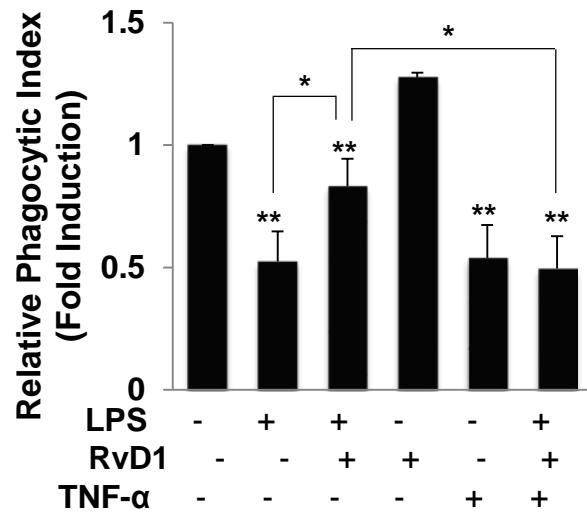
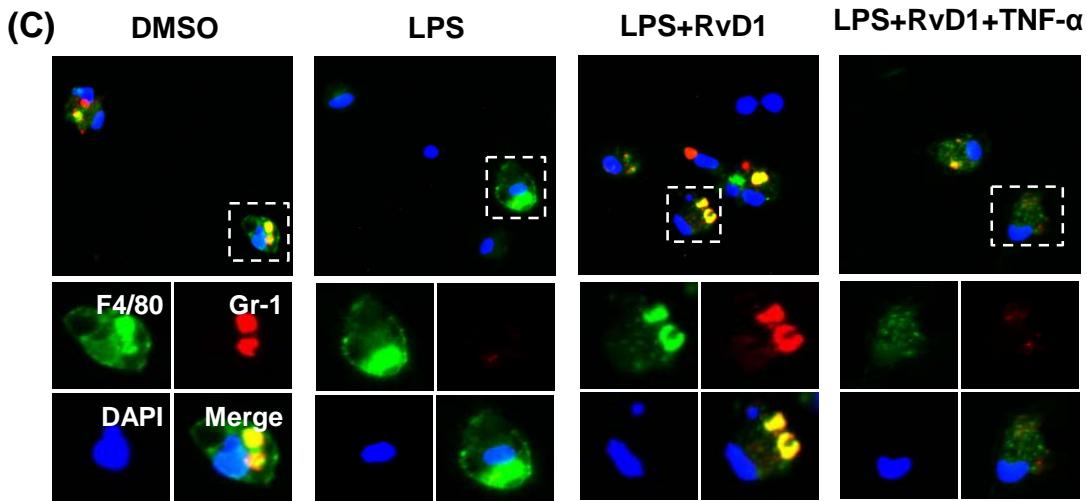
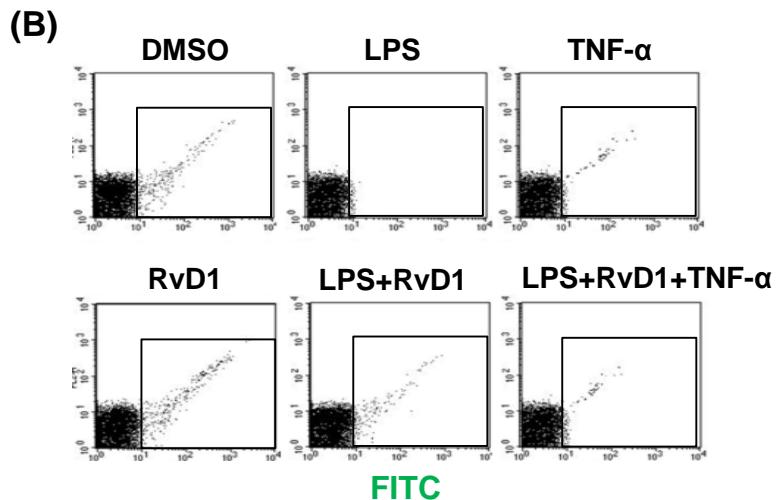
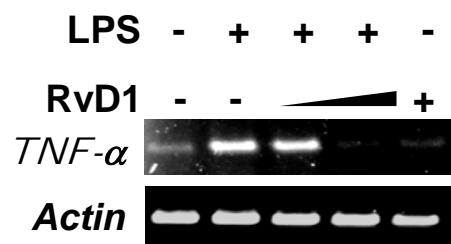
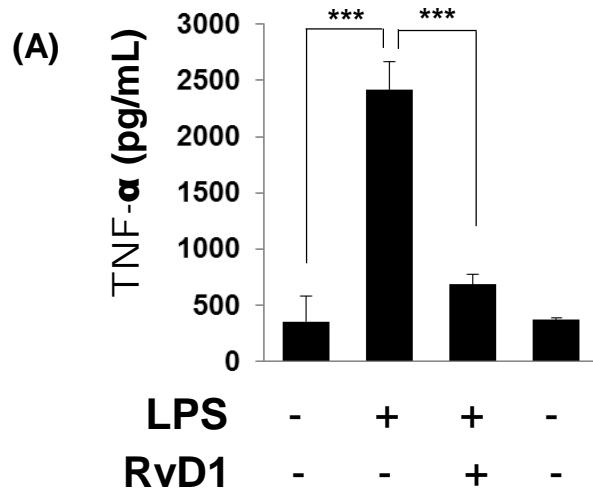
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## Therapeutic potential of resolvins for the prevention and treatment of inflammatory disorders

Ha-Na Lee, Young-Joon Surh \*

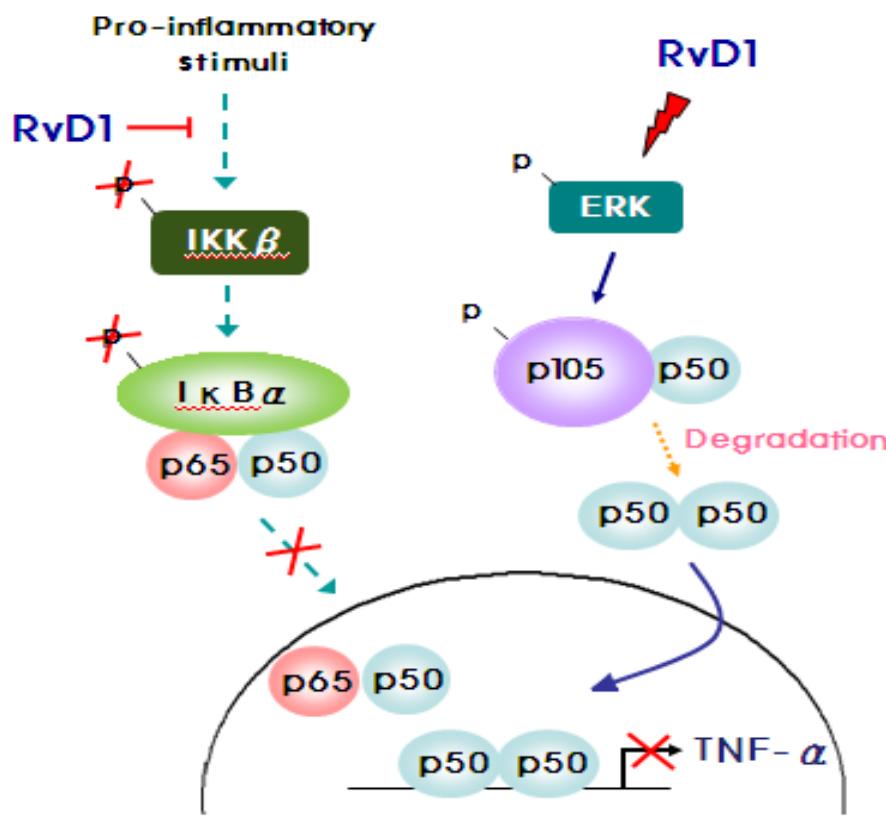


# Resolvin D1 (RvD1)-mediated repression of TNF- $\alpha$ production restores the efferocytic activity of macrophages



# Resolvin D1 stimulates efferocytosis through p50/p50-mediated suppression of tumor necrosis factor- $\alpha$ expression

Ha-Na Lee<sup>1</sup>, Joydeb Kumar Kundu<sup>2</sup>, Young-Nam Cha<sup>3</sup> and Young-Joon Surh<sup>1,4,5,\*</sup>



RvD1 stimulates efferocytosis during resolution of inflammation by inhibiting TNF- $\alpha$  production via two different NF- $\kappa$ B pathways:

- 1) suppressing nuclear translocation of p65/p50
- 2) facilitating nuclear translocation of p50/p50

# Health Beneficial Effects of Docosahexaenoic Acid: A Marine Treasure

Na-Young Song and Young-Joon Surh



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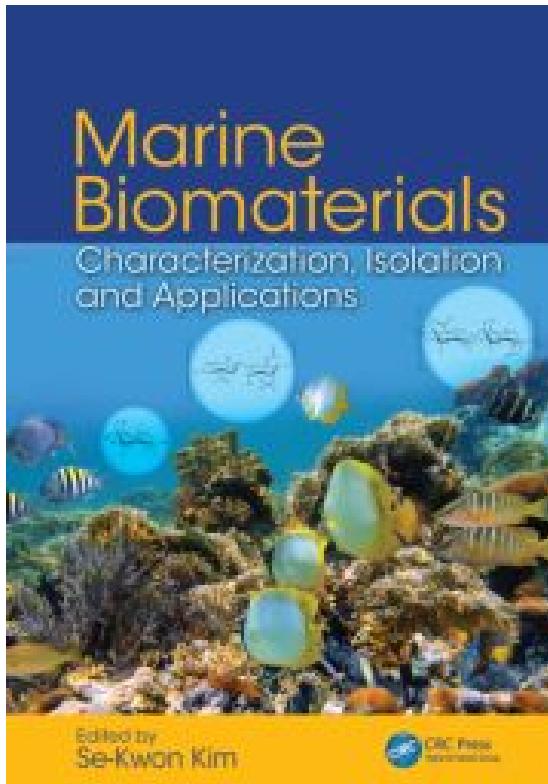


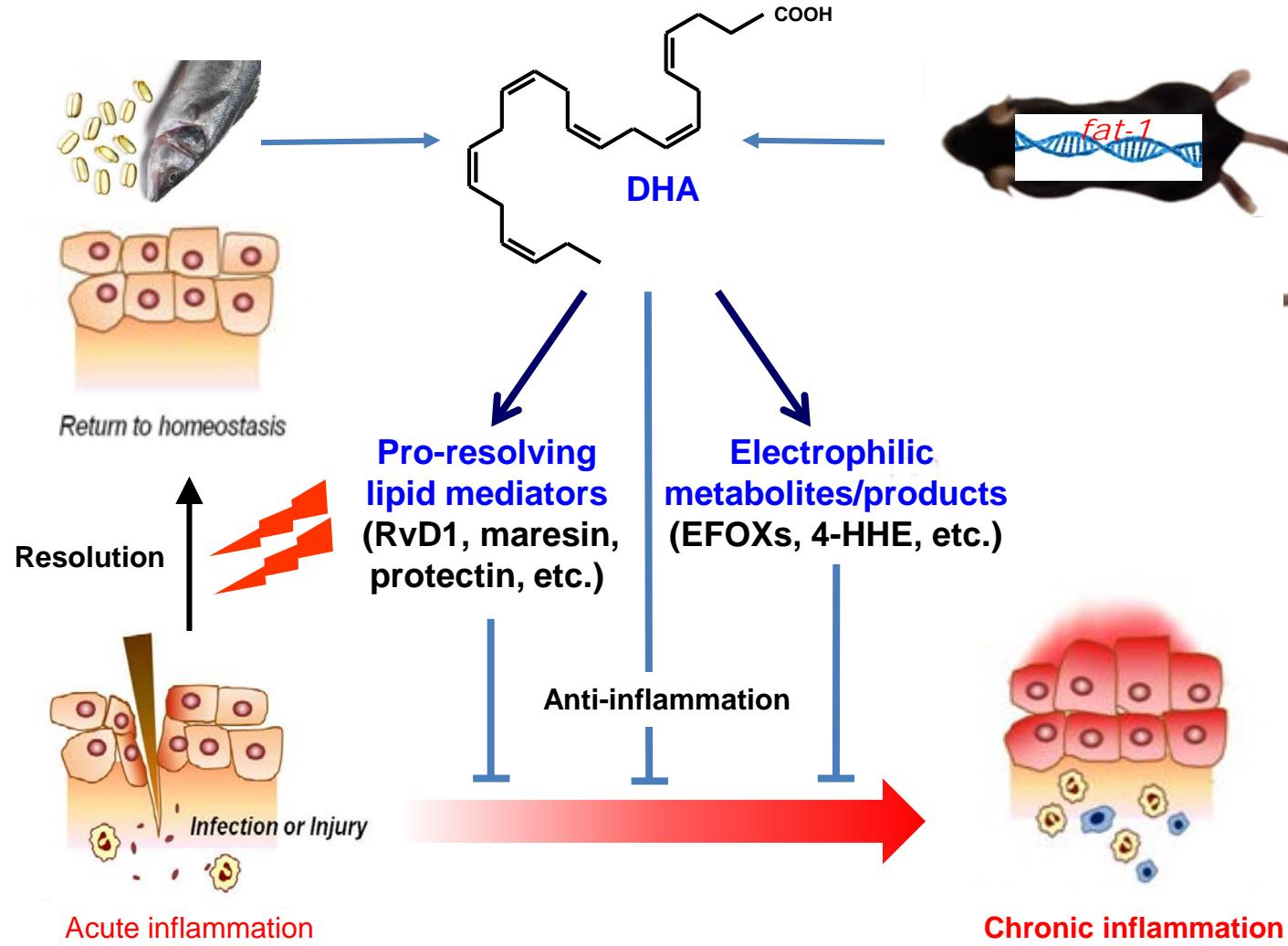
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## Anti-Inflammatory and Proresolving Effects of Docosahexaenoic Acid Implications for Its Chemopreventive Potential

Young-Joon Surh, Na-Young Song,  
Ha-Na Lee, and Hye-Kyung Na





Adopted from: H.-W. Yum, H.-K. Na & Y.-J. Surh (2016) *Sem. Cancer Biol.*, 40-41: 141-159



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# Wall of Honor SNU Pharmacy Hye-Won Yum

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- Abstract submission deadline: **August 31, 2017**
- Early-bird registration: **Sept. 15, 2017**