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**Micronutrients in controlling
INFLAMMATION**

Webinar June 12, 2012

- 1. What is Inflammation?**
- 2. Acute and Chronic Inflammation**
- 3. Role of Chronic Inflammation in Modern Human Diseases**
- 4. Beneficial Micronutrients in Chronic Inflammation**
- 5. Molecular Mechanisms of Inflammation**
- 6. Research on Micronutrients and Inflammation at Dr Rath Research Institute**

**Inflammation is a
reaction of organism
to irritation, injury,
or infection.**



Acute inflammation

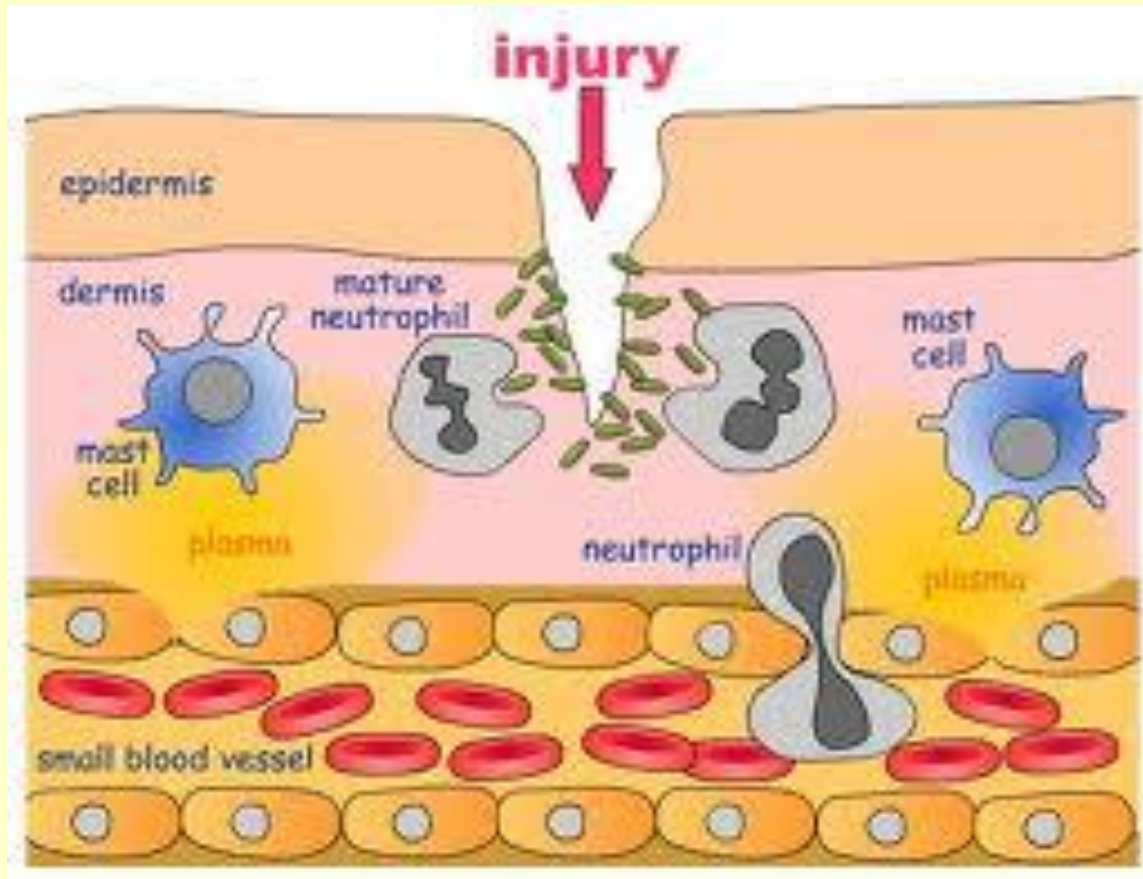
Pain

Redness

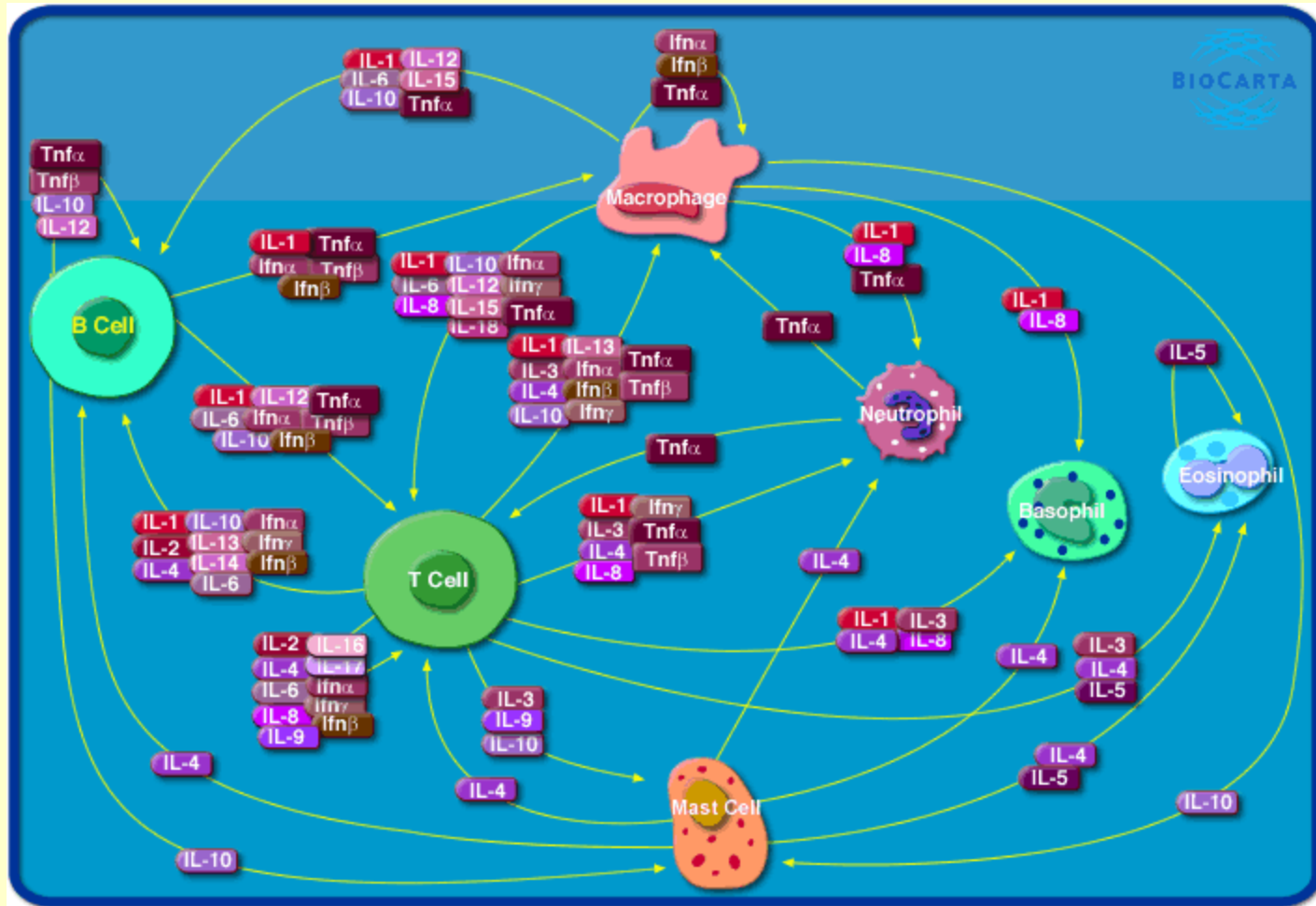
Immobility

Swelling

Heat



Inflammatory Cytokines



Outcomes of Acute Inflammation

1. Resolution

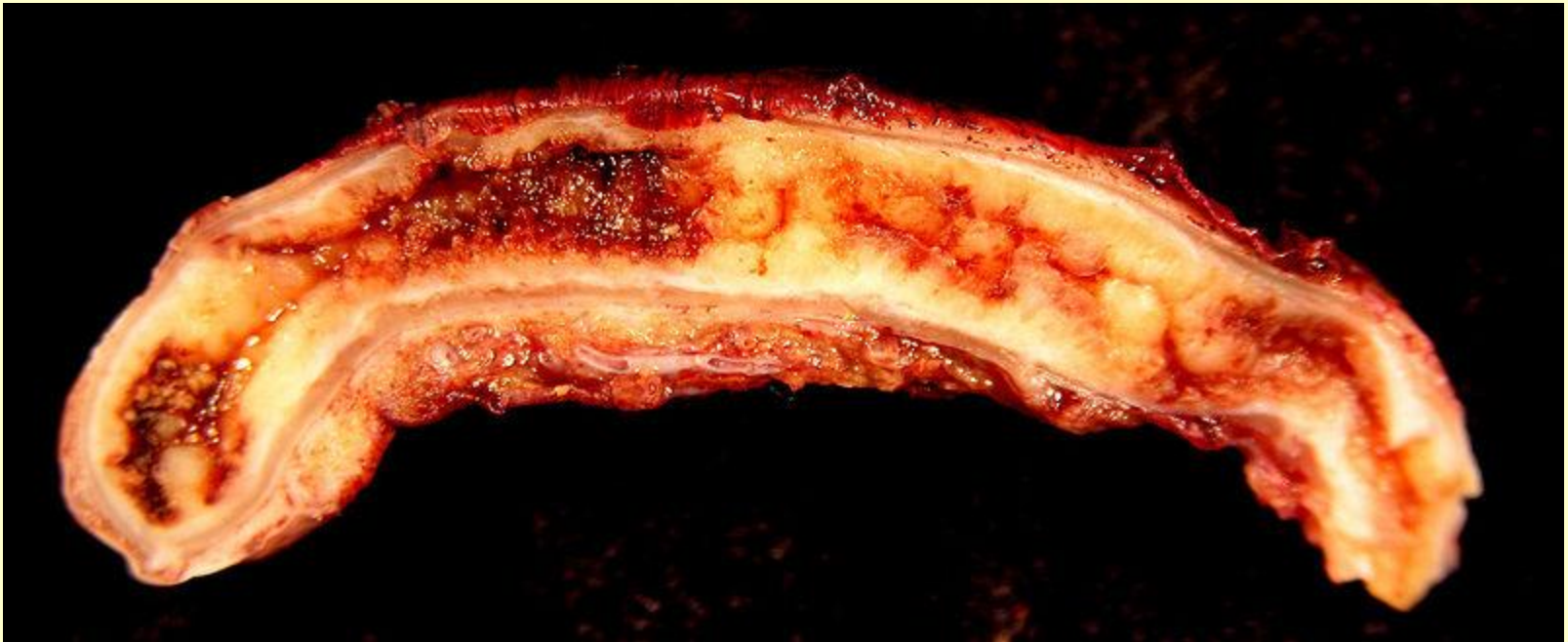
Outcomes of Acute Inflammation

2. Fibrosis



Outcomes of Acute Inflammation

3. Abscess formation



Acute Appendicitis

Outcomes of Acute Inflammation

4. Chronic inflammation

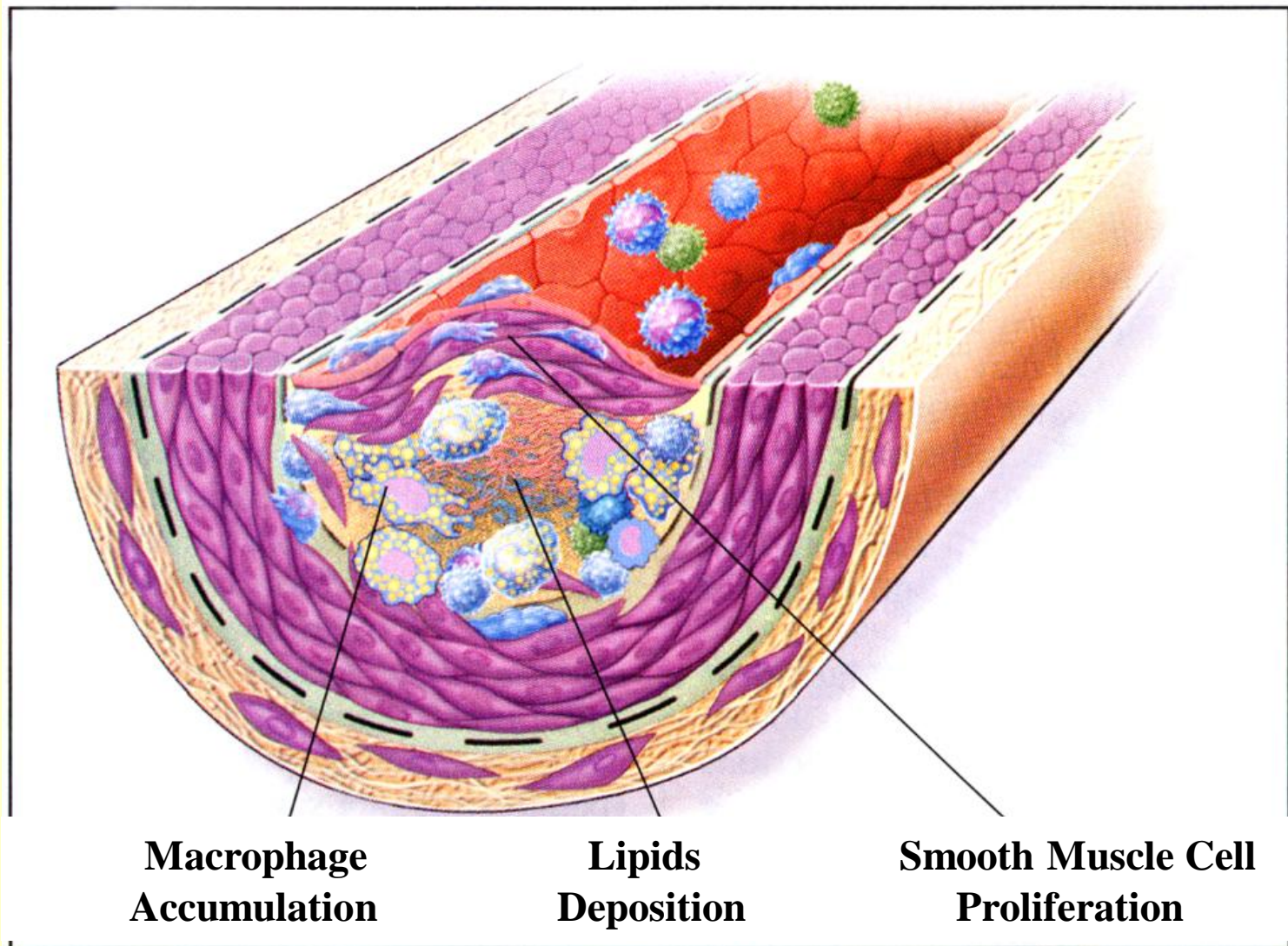
Role of Chronic Inflammation in Modern Human Diseases

- a. Cardiovascular Disease**
- b. Cancer**
- c. Chronic Infections**
- d. Arthritis**
- e. Allergy**
- f. Alzheimer**
- g. Parkinson**
- h. Multiple Sclerosis**

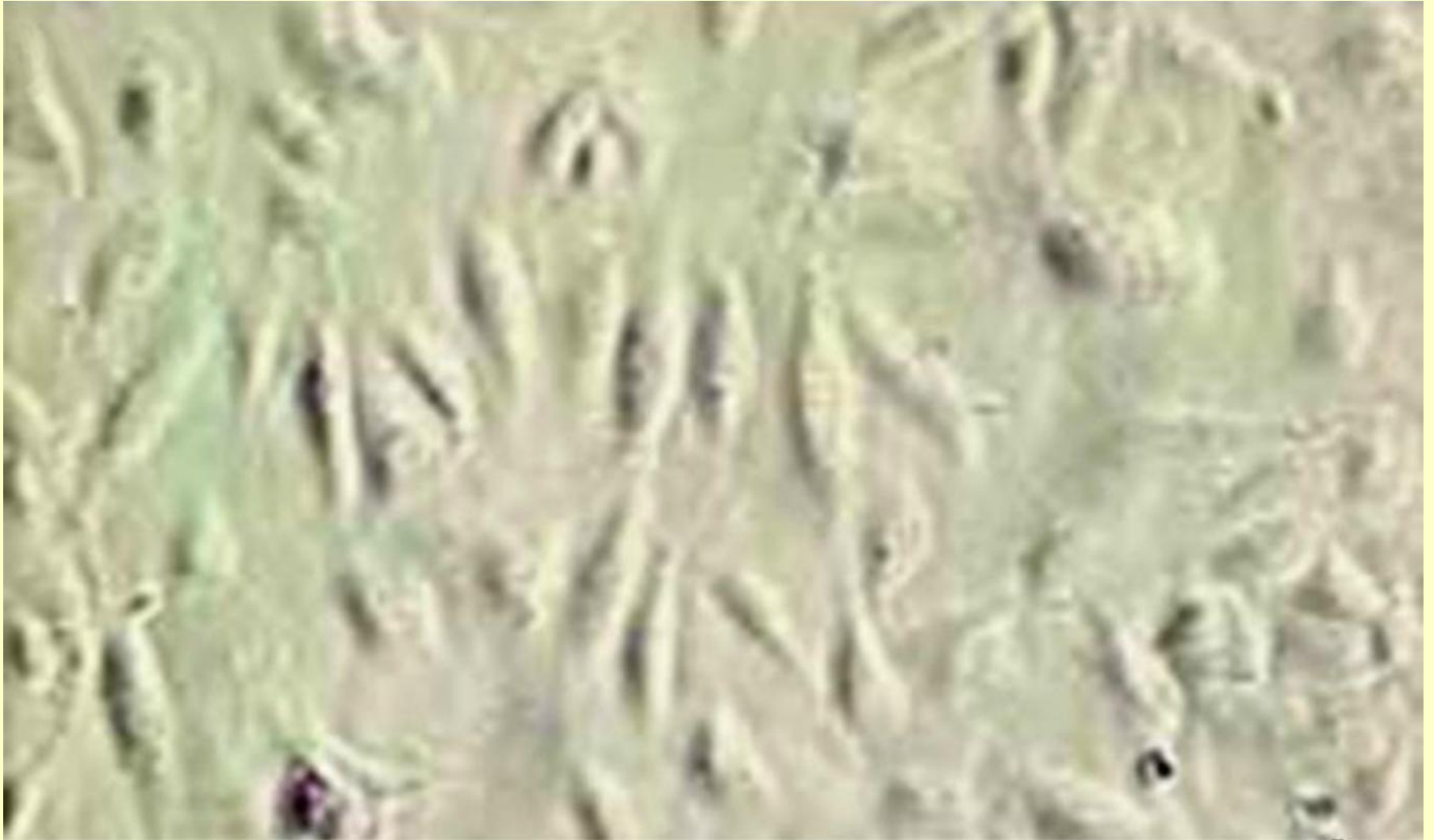
Beneficial Micronutrients and Food Products in Chronic Inflammation

- 1. Vitamins A, B, C, D, E**
- 2. Protein Proline, Lysine, Arginine**
- 3. Fats and Oils**
Omega-3 and Monounsaturated Fatty Acids
- 4. Phytochemicals**
Green Tea, Citrus, Ginger, Pomegranate, Chokeberry, Cabbage, Turmeric, Walnut

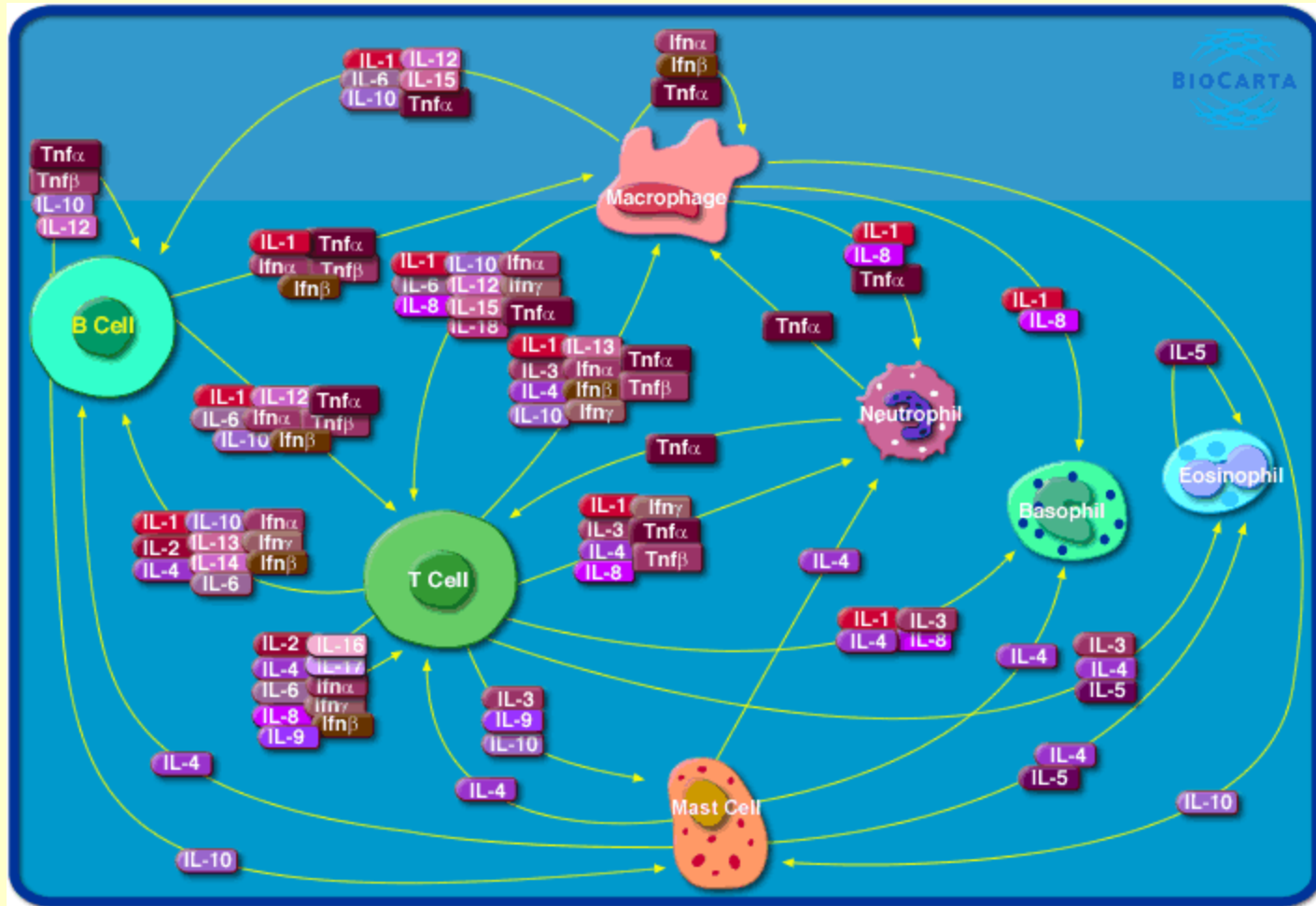
Inflammation in Cardiovascular Disease



Cultured Human Vascular Cells



Inflammatory Cytokines

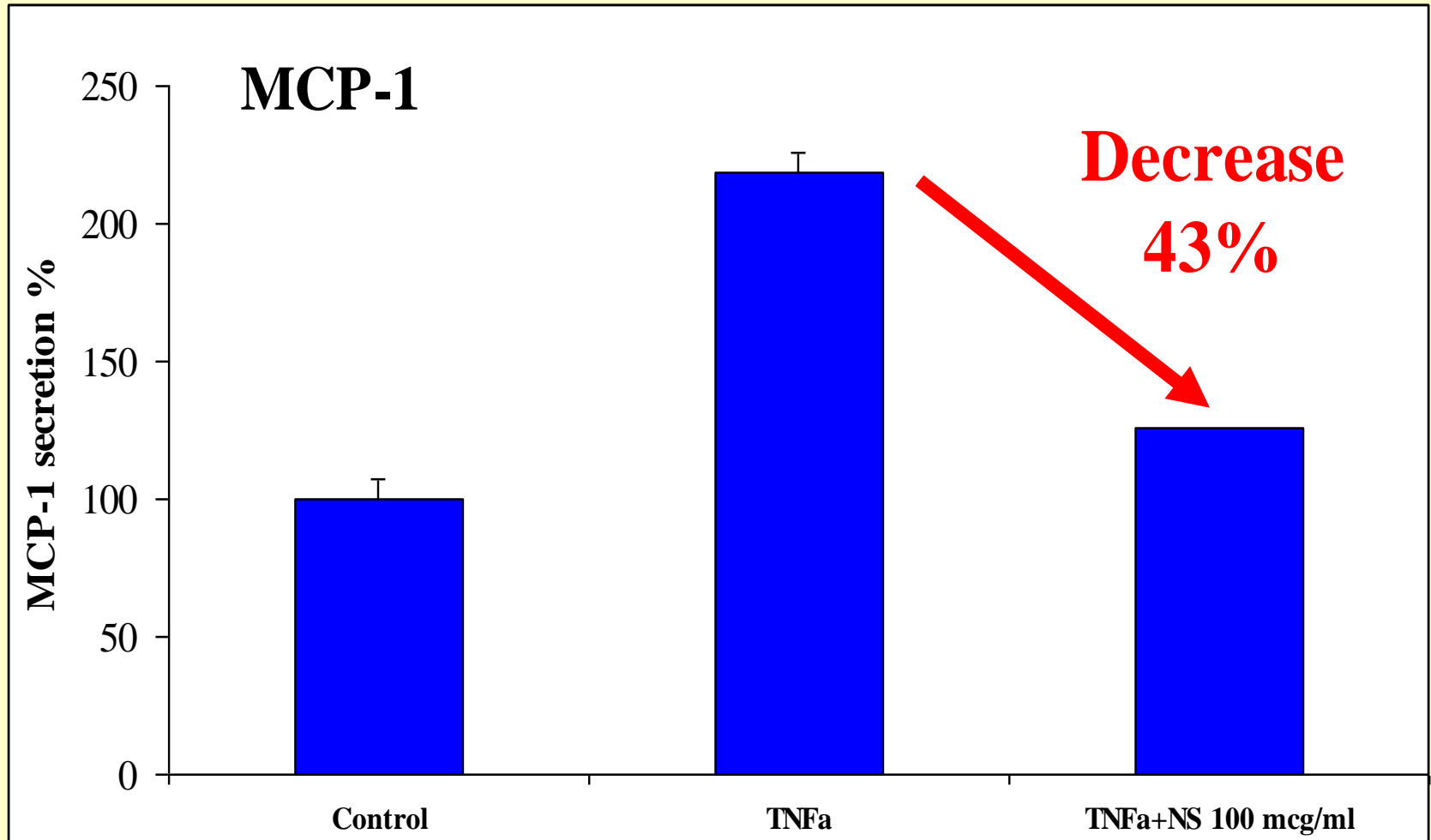


Micronutrients decrease inflammatory response of human aorta smooth muscle cells

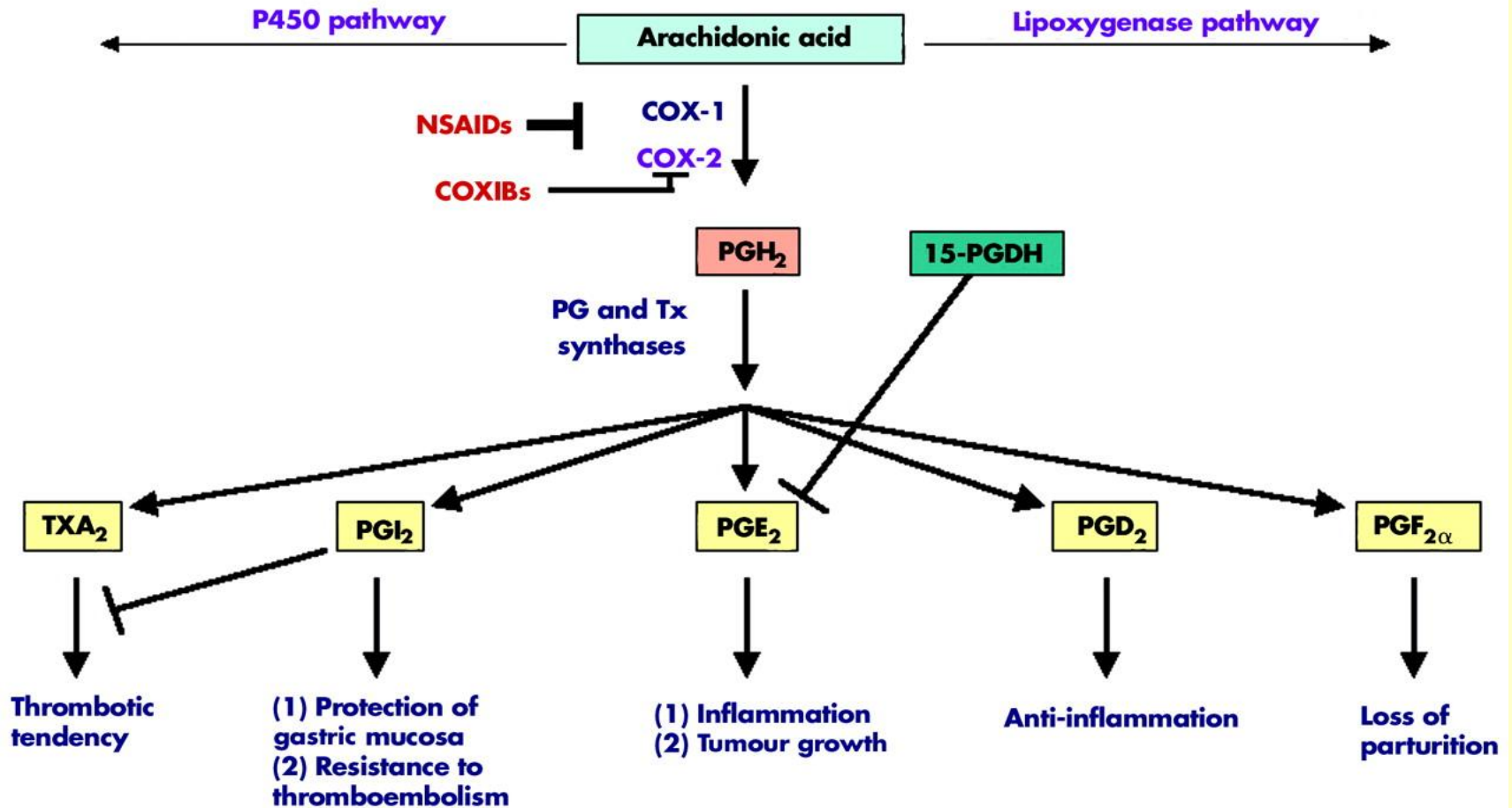
Inhibition of Cytokines Secretion

Pro-IL1beta	↓ 89%
IL-1beta	↓ 87%
Caspase-1	↓ 63%
IL-1alpha	↓ 55%
IL-6	↓ 70%

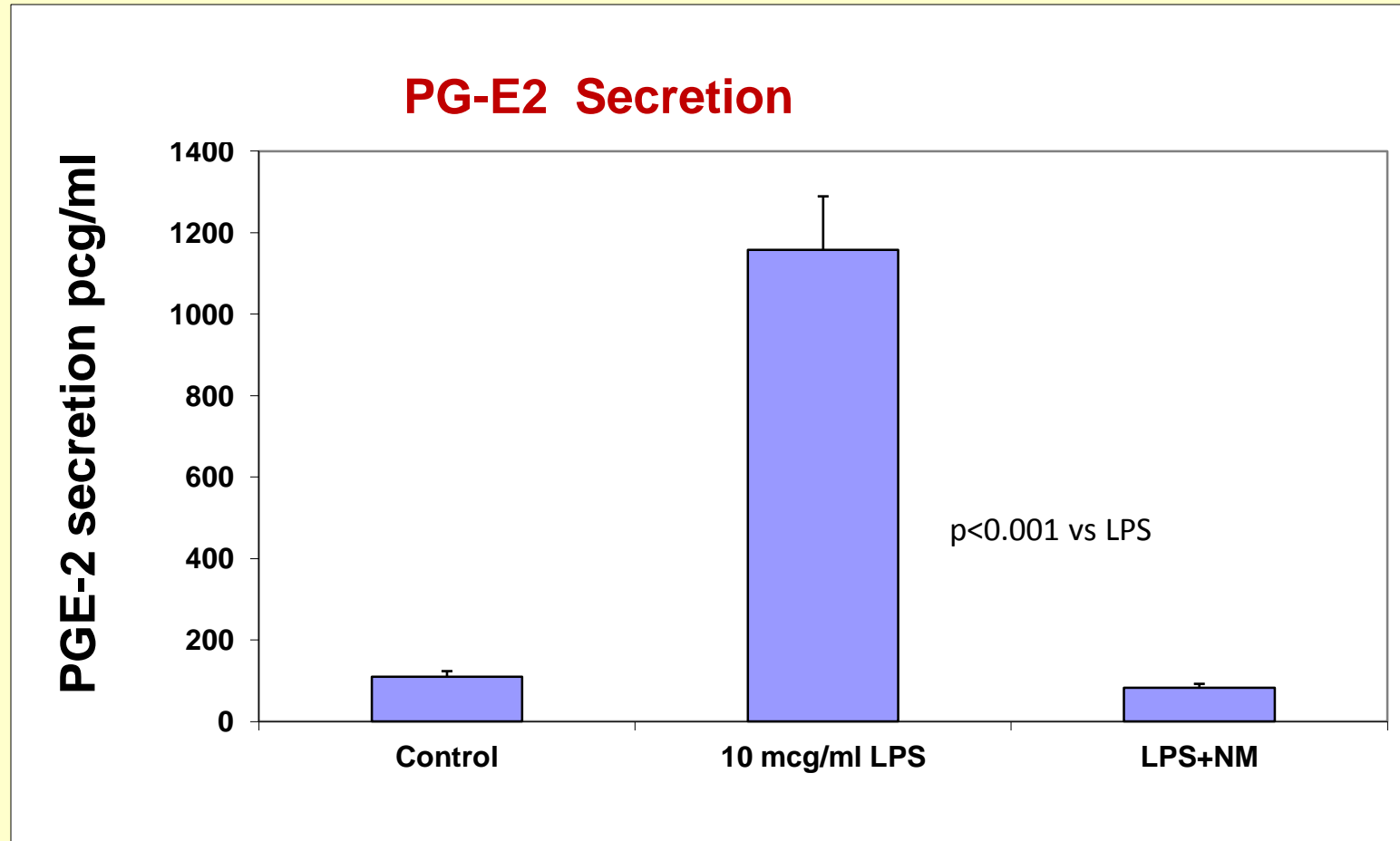
Micronutrients Decrease Secretion of Monocyte Chemoattractant Protein (MCP-1)



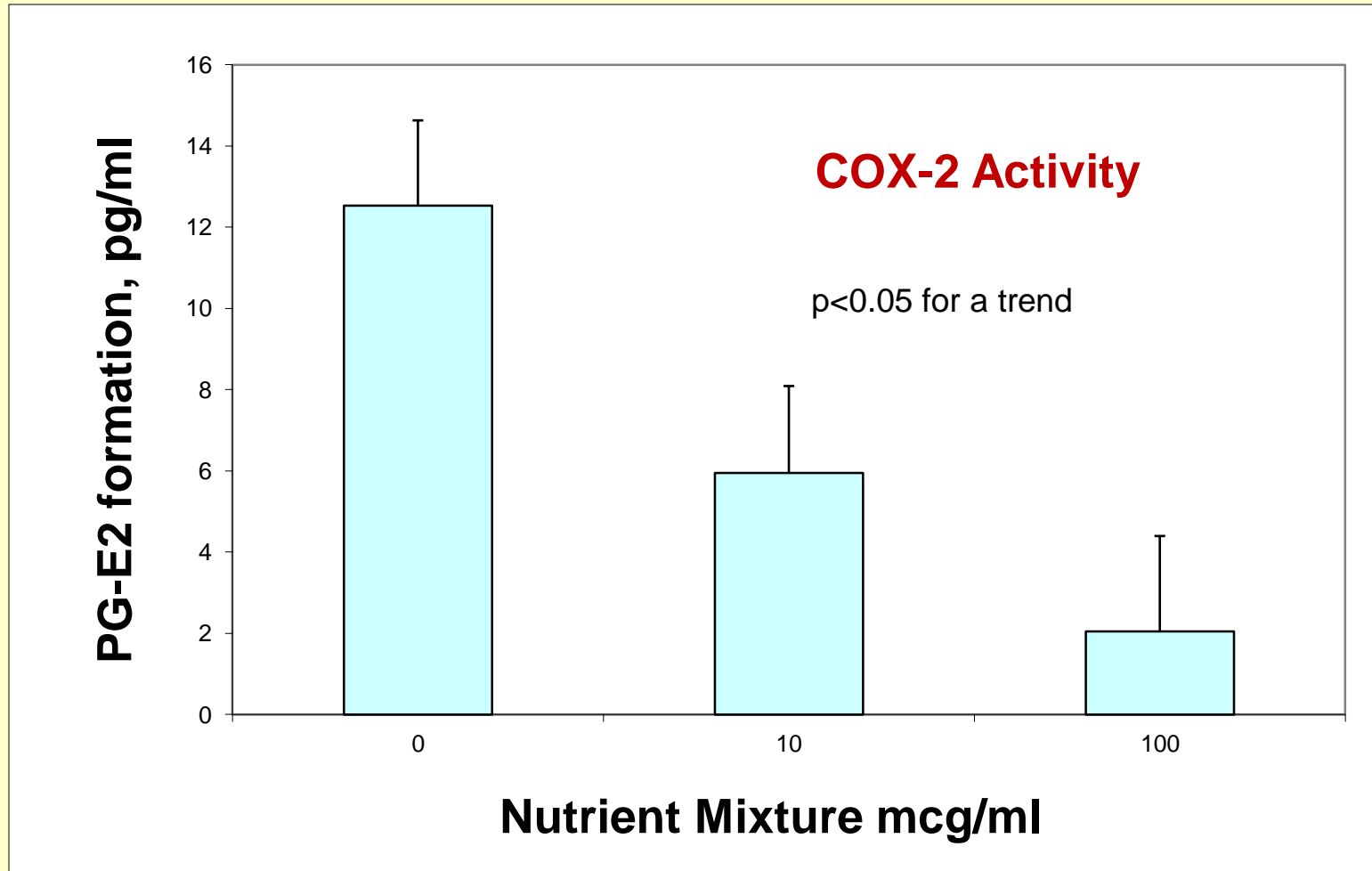
Role of COX-2 in Inflammation



Regulation by PG-E2 production by Nutrient Mixture



Inhibition of COX-2 Activity by Nutrients



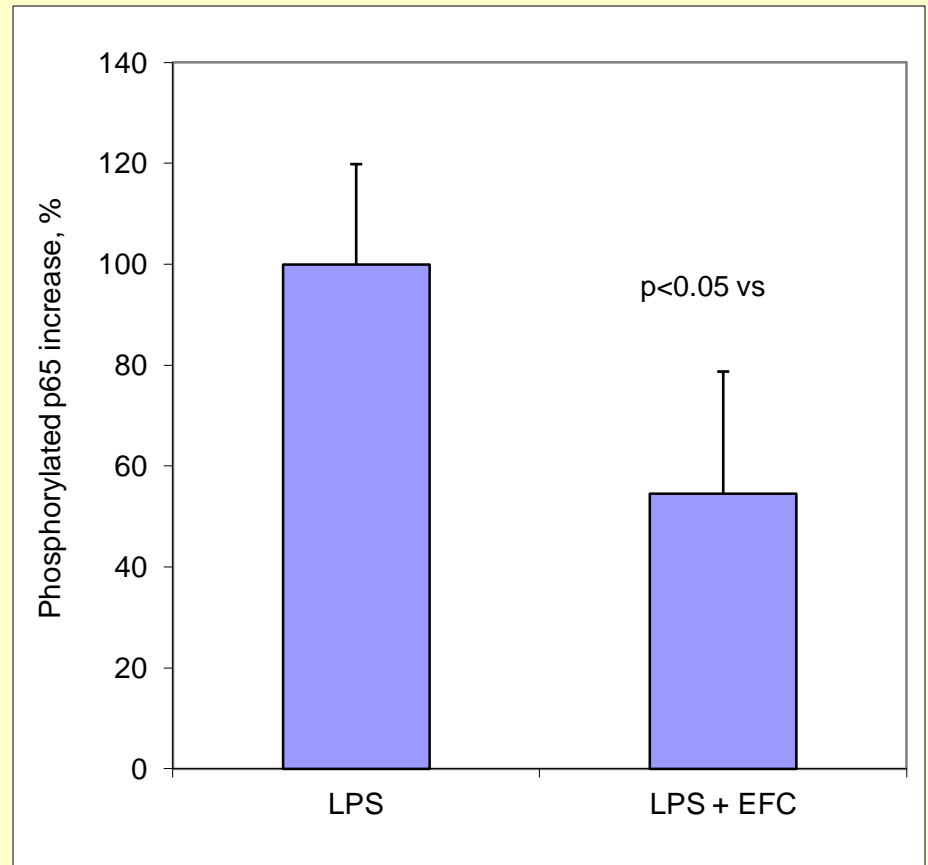
Regulation of Inflammation (cytokines release) by PG-E2 signaling

- **Activation (NFkb)**
- **COX-2 gene expression**
- **Synthesis of COX-2 enzyme**
- **PG-E2 Production by COX-2 from Arachidonic Acid**
- **Induction of Cytokine Release by PG-E2**

INFLAMMATION

Regulation by PG-E2 signaling

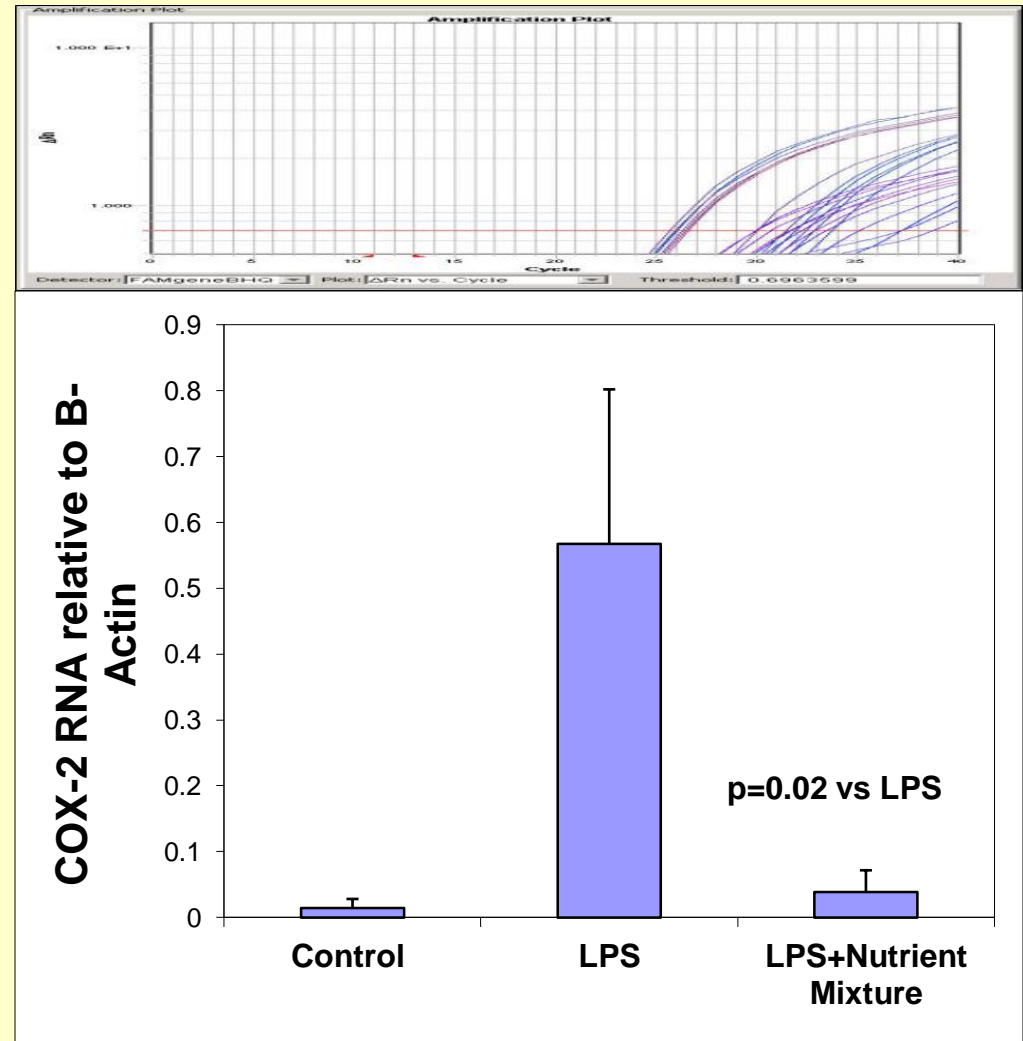
- **Activation (NF κ b)**
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- **PG-E2 Production**



INFLAMMATION

Regulation by PG-E2 signaling

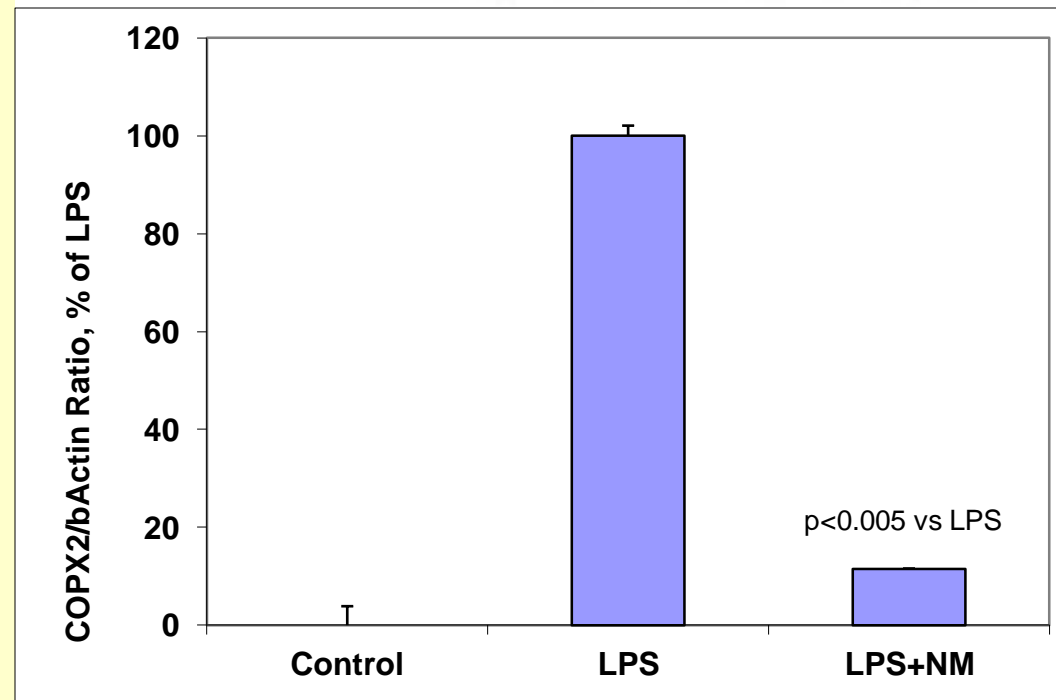
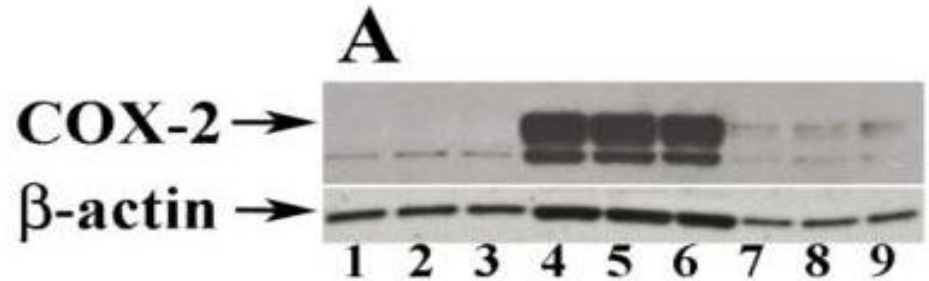
- Activation (NF κ b)
- **COX-2 gene expression**
- Synthesis of COX-2 enzyme
- PG-E2 Production



INFLAMMATION

Regulation by PG-E2 signaling

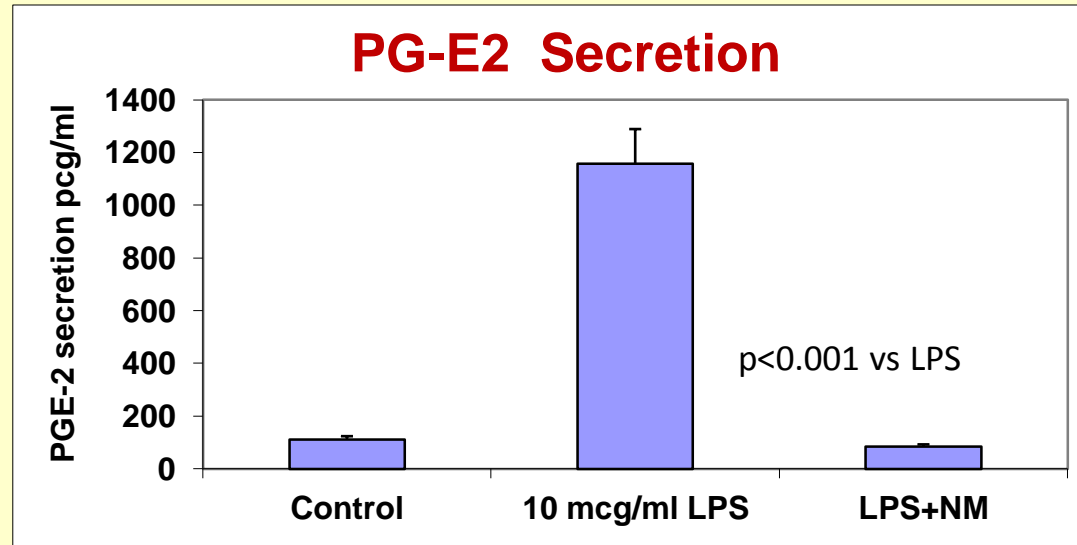
- Activation (NF κ b)
- COX-2 gene expression
- Synthesis of COX-2 enzyme
- PG-E2 Production



INFLAMMATION

Regulation by PG-E2 signaling

- Activation (NF κ b)
- COX-2 gene expression
- Synthesis of COX-2 enzyme
- **PG-E2 Production**



Nutrient Mixture Regulates PG-E2 Production by Both:

- Direct Inhibition of COX-2 Activity
- Inhibition of COX-2 Synthesis

CONCLUSIONS

Micronutrients can effectively control pathological processes involved in the development and maintaining of chronic inflammation by multiple molecular actions