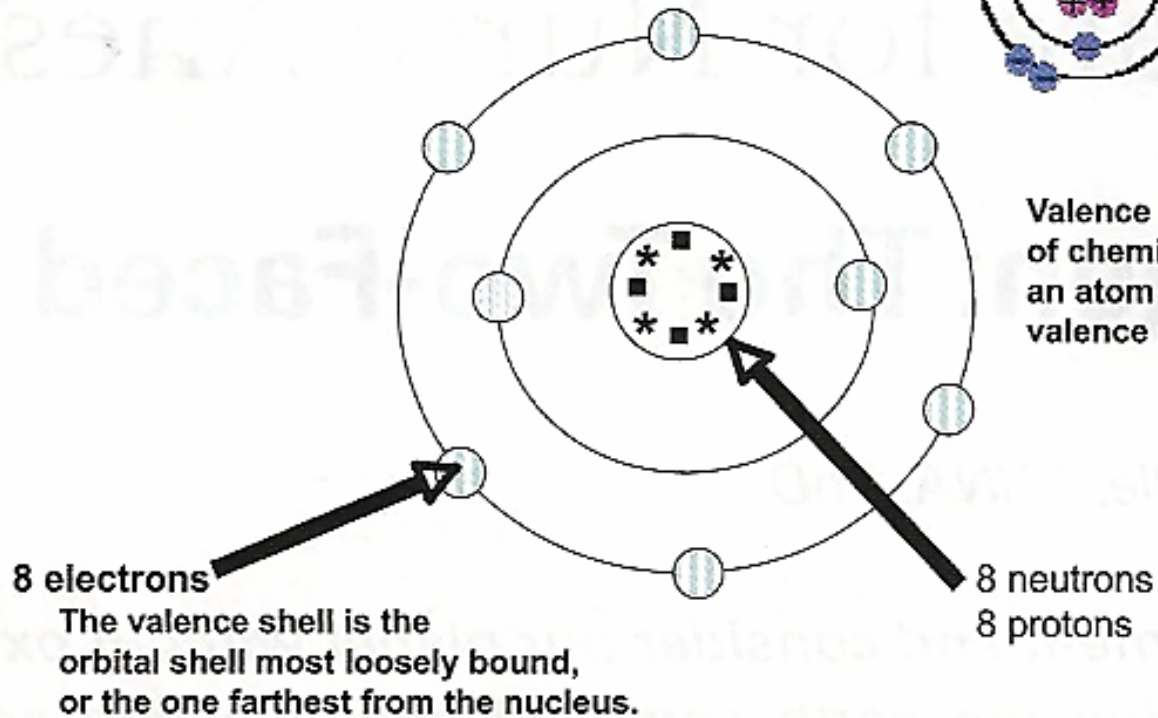


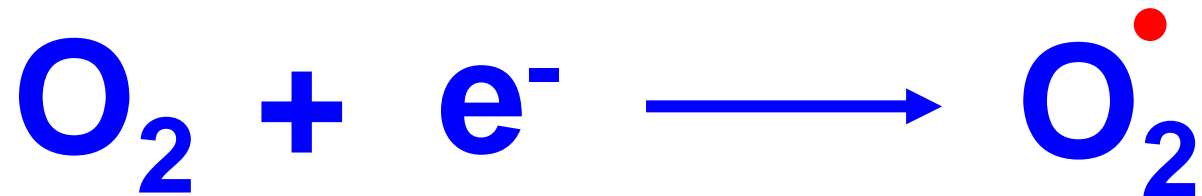
# What is an Oxygen Radical?

## The oxygen atom (O) and molecular oxygen (O<sub>2</sub>)



# What is an Oxygen Radical?

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**Formation of the Superoxide Anion**

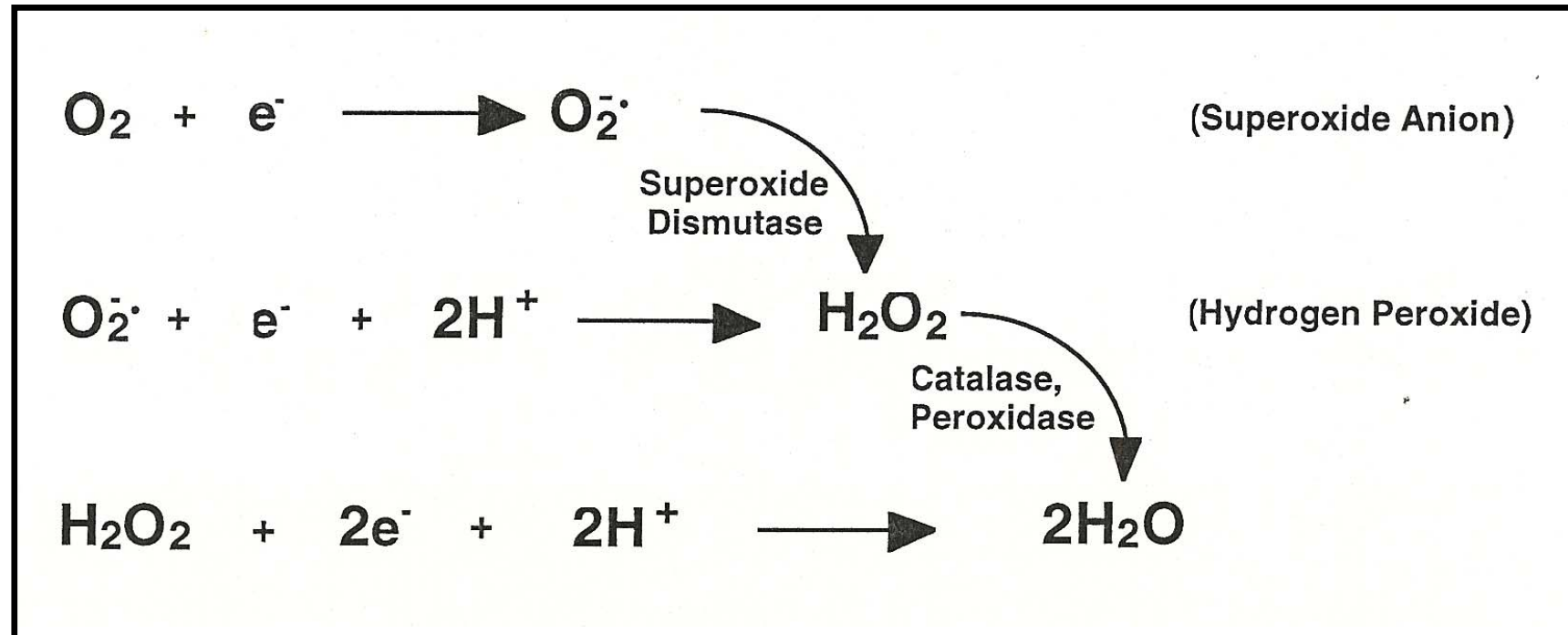
# Generation of Oxygen Free Radicals

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- **Cell Mitochondria during oxidative phosphorylation**
- **Macrophages**
- **Neutrophils**

# Elimination of Oxygen Radicals

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# Elimination of Oxygen Radicals

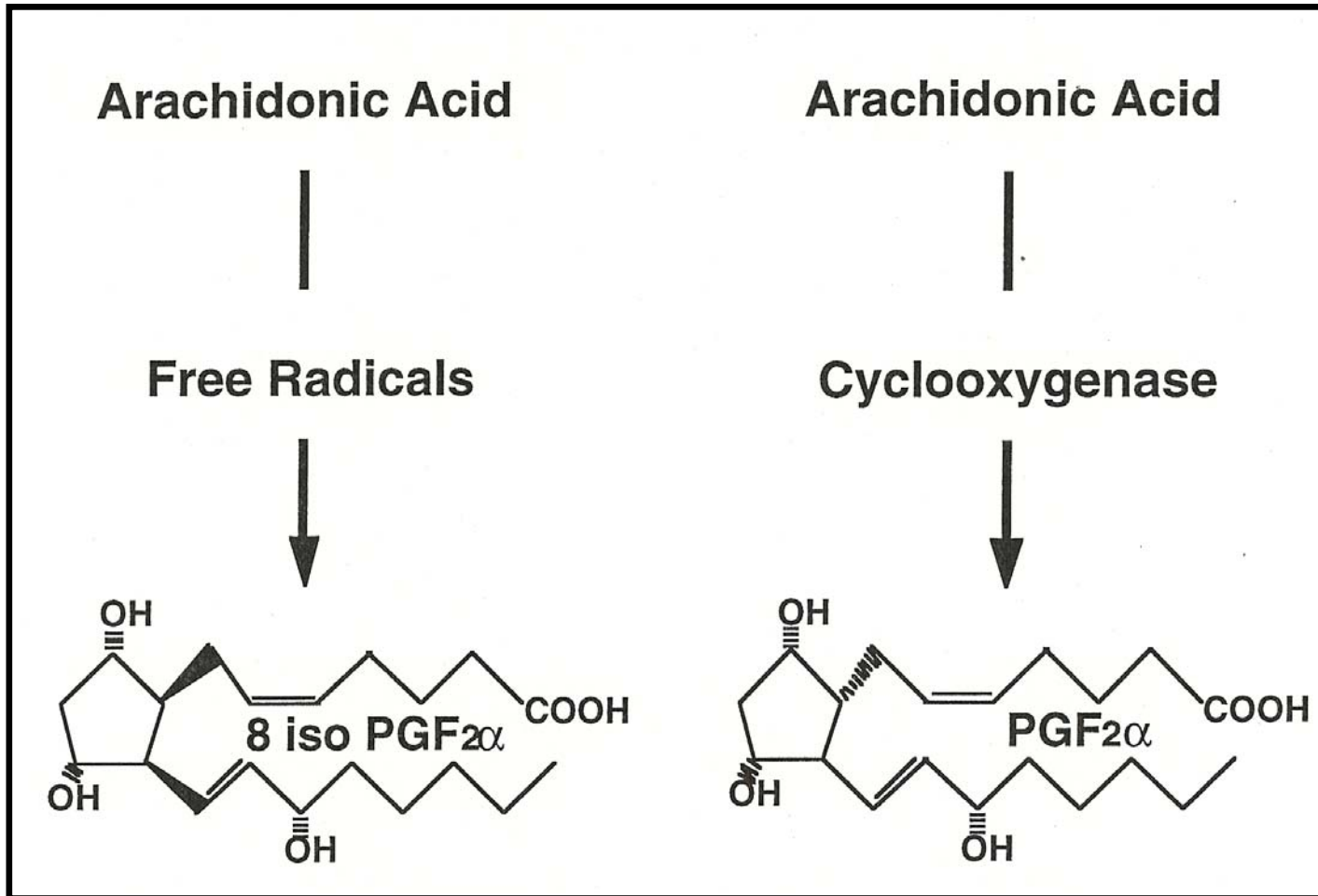
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## – Antioxidants

- **Superoxide Dismutase**
- **Catalase**
- **Peroxidase**
- **Vitamin C**
- **Vitamin E**
- **Selenium**

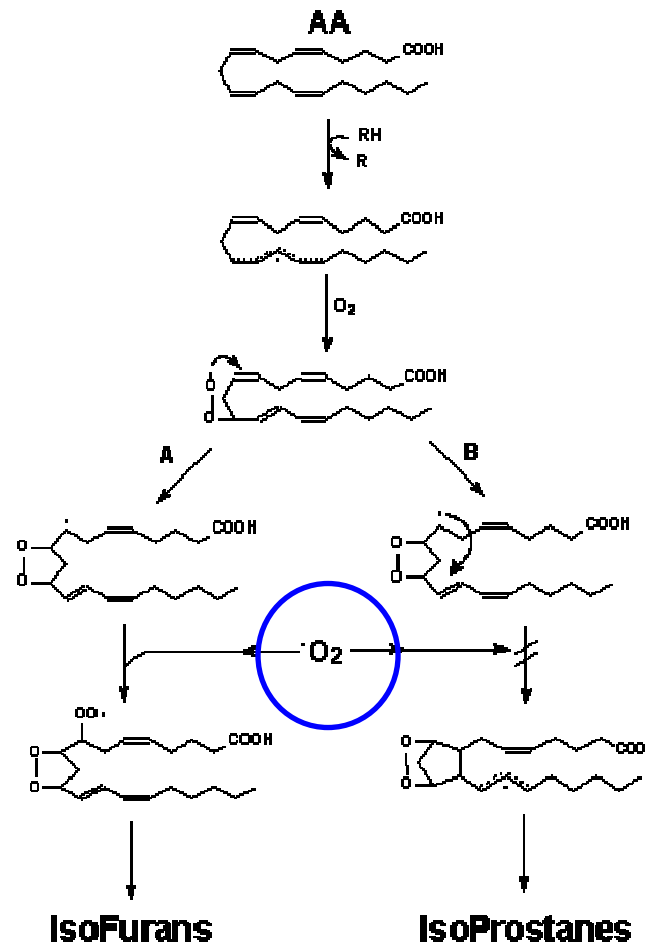
# The Oxygen Radical Prostaglandin Connection

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# The Oxygen Radical Prostaglandin Connection

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# Oxygen: An Environmental Toxin?

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# Except from National Geographic Article on Environmental Toxins

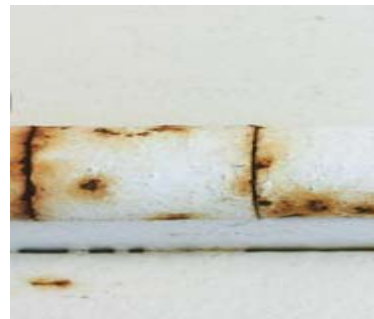
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**“Oxygen is the ultimate toxin,”** says Michael Trush, a toxicologist at Johns Hopkins Bloomberg School of Public Health.

Oxygen combines with food to produce energy, but our bodies also produce oxygen radicals that damage biomolecules, DNA, proteins, and lipids.

**“We are oxidizing all the time,”** says Trush. **“The biochemical price of breathing is aging.”**

**Which is to say, we rust:**



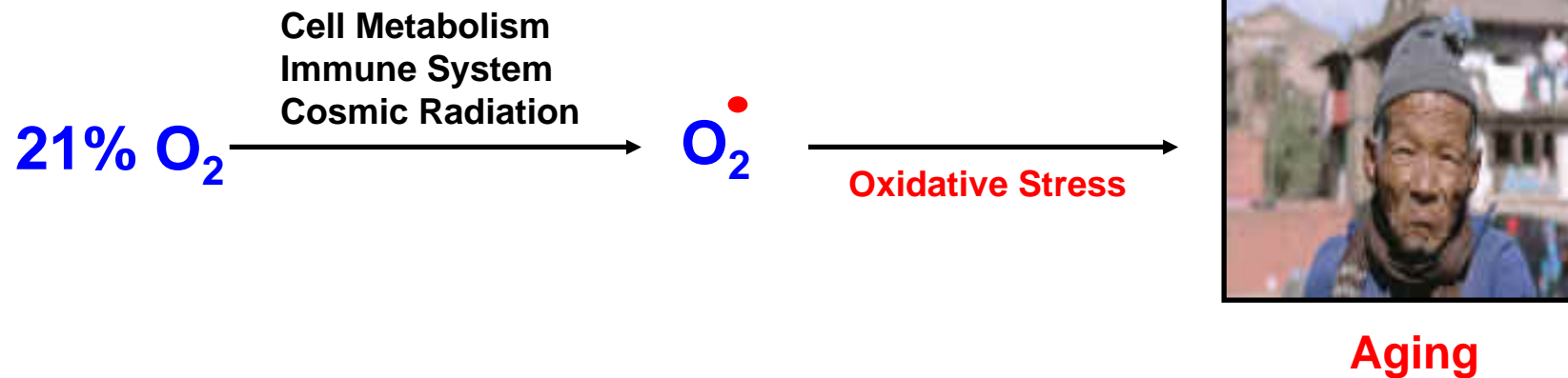
# The Effects of Breathing Ambient Air (21% O<sub>2</sub>) Over Your Lifetime

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The Good

The Bad

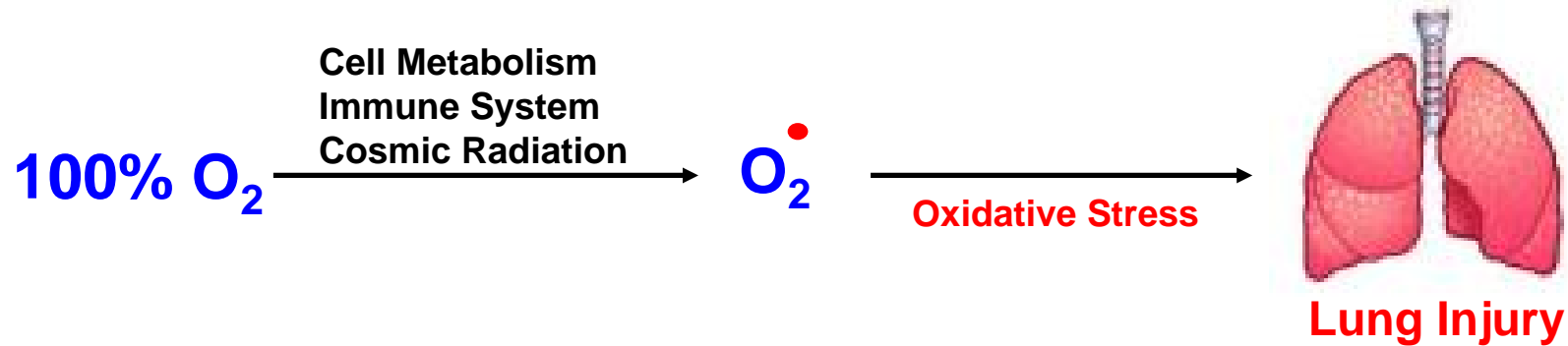
The Ugly



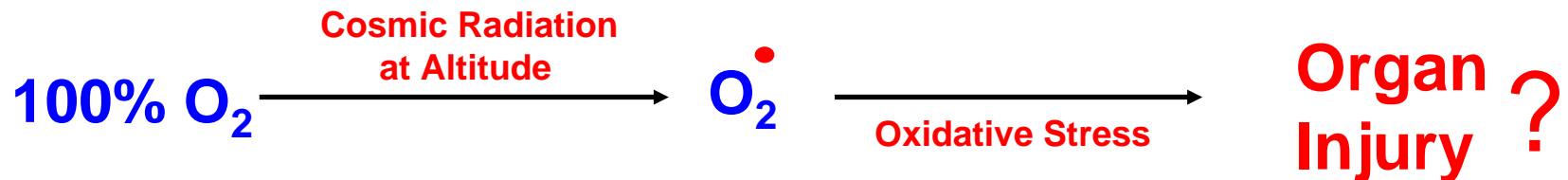
# Does Occupational Exposure to Oxygen Increase the Health Risk?

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## Animal / Medical Models



## Aviation Occupational Exposure



# “Long Term Effects of the Naval Jet Aircraft Environment on Pulmonary Function”

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*Aerospace Medicine, 1977*

A group of non-smoking Naval aviators breathing 100% oxygen were compared to a group of Naval aviators who did not breath oxygen while flying.

The oxygen breathing aviators had significantly reduced:

- Mid-maximal Expiratory Flow Rates (MMEFR)
- Maximal Expiratory Flow Rates (MEFR)

# The Oxygen Radical – Cancer Link

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- **Considerable evidence that oxygen radicals play a role in human tumor genesis**
  - Oxygen radicals can initiate spontaneous DNA damage
  - Oxidative DNA damage has been detected in human cells and tissues
- **Studies have suggested military and civilian pilots have increased risk for various types of cancer**
  - **1996 Air Force Study**
    - Pilots have significantly increased risk of developing cancer
  - **1998 National Cancer Institute Study**
    - U.S. commercial pilots and navigators have significantly increased mortality due to specific cancers

# The Oxygen Radical – Cancer Link

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- **“Predilection of Lung Cancer of the Upper Lobes: An Epidemiologic Inquiry”** *J National Cancer Institute, 1984*

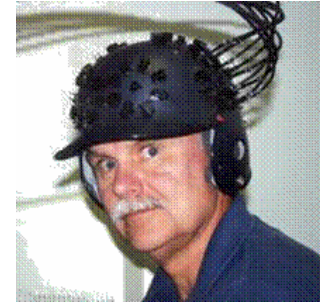
Suggested that the predilection for lung cancer to occur in the upper lobes was due to the better oxygenation of those lobes.

- **“Altitude, Radiation, and Mortality from Cancer and Heart Disease”** *Radiation Research, 1987*

The reduction in inspired oxygen partial pressure in populations living at altitude may provide a protective effect with respect to cancer risk.

# Food for Thought

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**Should the pulse oximeter be alarming not only when arterial saturation is below 90% but also when it's above 98%?**