

Healthy People, Healthy Planet

Climate Change and Chronic Disease: Common Drivers, Common Solutions

Module 1: Climate Change

Module 2: Chronic Disease

**Module 3: Common Drivers,
Common Solutions**



Presented by:

Jill Stein, MD

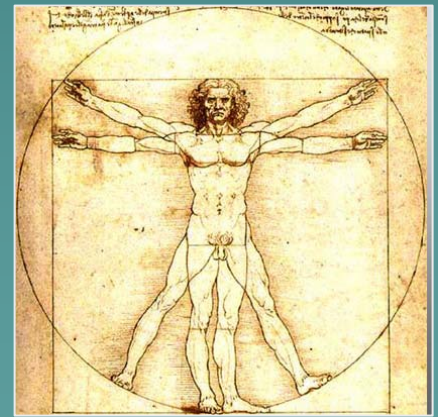
Greater Boston Physicians for Social Responsibility

With Support from:

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Healthy People, Healthy Planet: Objectives

- ◆ **To inform & empower health providers to understand, mitigate & help prevent climate change & chronic disease.**
- ◆ **Review key science behind climate change and chronic disease.**
- ◆ **Clarify the major drivers of these crises – and how we can fix them.**



Healthy People, Healthy Planet

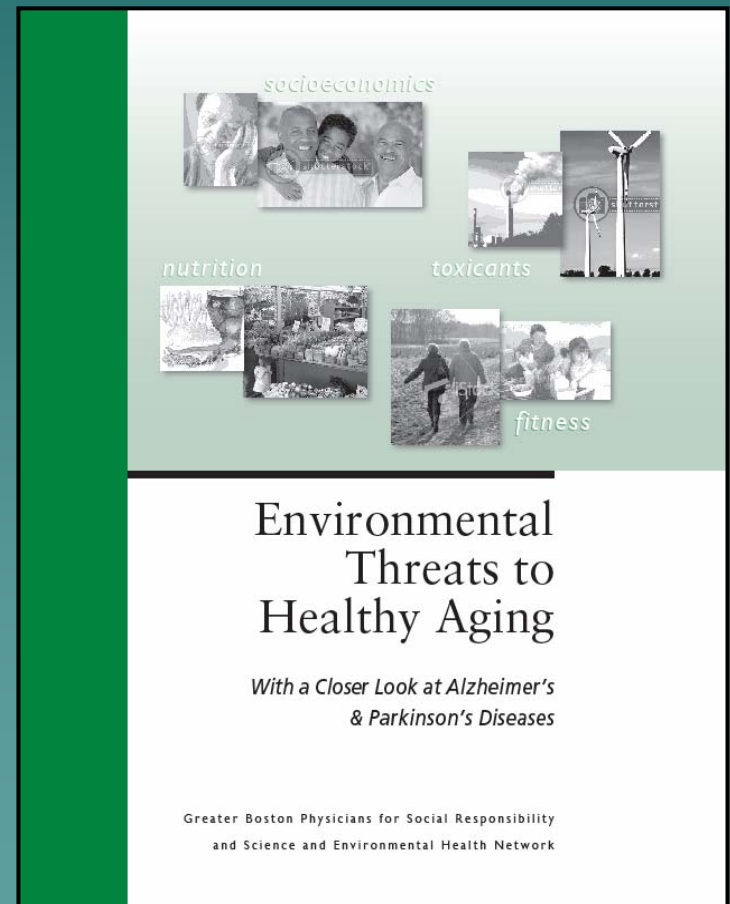
Climate Change and Chronic Disease: Common Drivers, Common Solutions

Chronic Disease

Module 2 of 3

Jill Stein, MD

*Greater Boston
Physicians for Social
Responsibility*

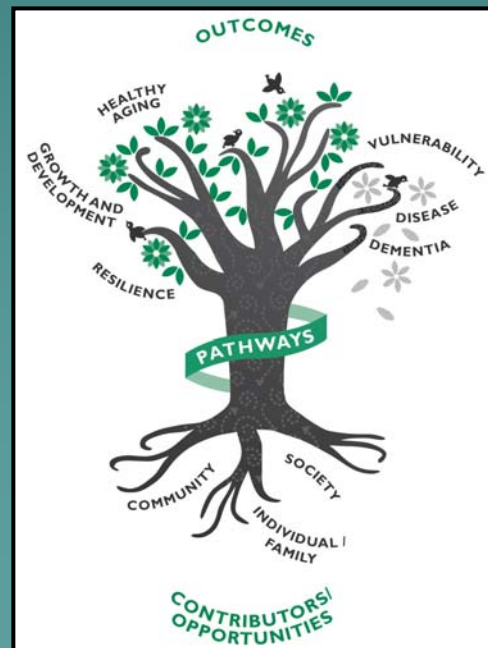


Module 1: Climate Change Review

- ◆ Climate change is already causing devastating human impacts, and it is accelerating.
- ◆ CO₂, temperature, ice, and sea levels are linked. High CO₂ is melting ice sheets worldwide, posing risks of catastrophic sea level rise if allowed to persist.
- ◆ Over 300,000 lives per year are lost from extreme weather, famine, floods, declining air quality, and spreading tropical diseases. Greatest impacts are in poor countries.
- ◆ To reverse these impacts and prevent far worse ones already in the pipeline, CO₂ must be brought to a safe level – below 350 ppm – urgently.

Module 2: What We Will Cover

- ◆ Environmental factors are key drivers of many common chronic diseases.
- ◆ Environmental factors alter key biological pathways leading to chronic disease.



Scope of the Problem

- ◆ A century of change in natural, built and social environments has caused dramatic changes in the patterns and distribution of diseases.
- ◆ Since the beginning of the 20th century more children are developing chronic diseases.
- ◆ The over-65 population will nearly double by 2030 to more than 71 million, sharply increasing the number of people at risk of chronic diseases of aging like Alzheimer's and Parkinson's diseases, among others.
- ◆ We are seeing dramatic increases in chronic diseases such as diabetes that are themselves risk factors for dementia.
- ◆ Lifetime environmental factors play a key role in health.

The Changing Environment and Disease Patterns

- ◆ **During the past century, human activity has altered virtually all aspects of the world's ecosystems:**
 - Pervasive spread of synthetic chemicals; air and water pollution.
 - Industrialized food supply.
 - Destruction of critical natural habitats, stressing ecosystems.
 - Climate change.
- ◆ **How we live, eat, work, play, socialize affects health:**
 - Built environments have increased social isolation for many people; reduced physical activity.
 - Growing income gap increases disease risk.
 - Diseases of civilization - obesity, diabetes, cardiovascular disease, hypertension.



Alzheimer's Disease/dementia

- ◆ Disabling impairment of memory and executive function, usually accompanied by other cognitive and motor deficits.
- ◆ Expected to triple by mid-century to over 13 million.
- ◆ Likely caused by varying combinations of genetic and environmental factors.
- ◆ Not an inevitable feature of normal aging.
- ◆ Annual costs in US over \$150 billion.



Parkinson's Disease

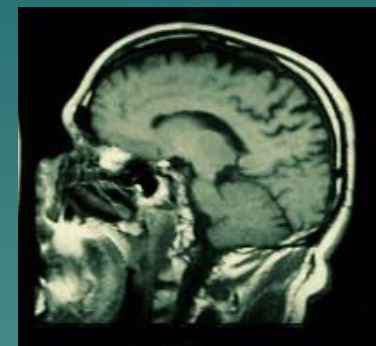
- ◆ **Progressive movement disorder that includes combinations of tremors, stiffness, emotional changes leading to severe disability.**
- ◆ **Likely caused by variable combinations of genetic and environmental factors.**
- ◆ **About 50,000 new cases annually in US.***
- ◆ **Prevalence in US expected to double by 2030.***

* Due to the lack of registries and baseline data on Parkinson's Disease, the figures used here are estimates.

Alzheimer's and Parkinson's Diseases

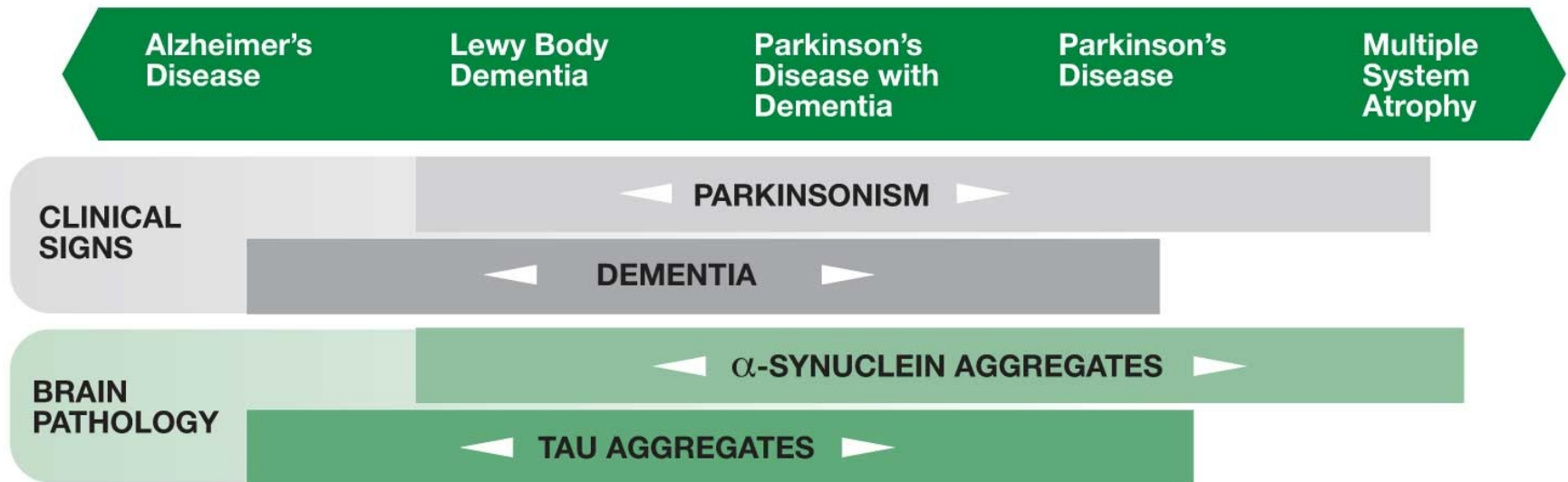
◆ Characterized by:

- abnormal protein deposits
- chronic inflammation
- abnormal oxidative stress



- ## ◆ Many neuroscientists are beginning to think of some neurodegenerative diseases along a continuum, often without clearly distinct boundaries or clinical or pathological manifestations

Continuum of Age-Associated Cognitive Impairment



Environment Drives Chronic Disease

Environmental Factors

Food system/Diet
Fossil Fuels
Socioeconomics/Stress
Chemicals
Built Environment/
Transportation



Altered Pathways

- Inflammation
- Disrupted Insulin Signaling
- Oxidative Stress



Western Disease Cluster

- Diabetes
- Obesity
- Abnormal Lipids
- Metabolic Syndrome
- Cardiovascular Disease



Parkinson's

Alzheimer's





Profound Public Health Impact Of The Western Disease Cluster

- ◆ **Obesity/overweight – 2/3 US adults, prevalence X2 in recent decades**
- ◆ **Pre/Diabetes – 40% US adults. Prevalence DM ~X2 over 20 yrs** Cowie 09 CDC. <http://apps.nccd.cdc.gov/DDTSTRS/default.aspx>
- ◆ **Cardiovascular disease – still leading cause of death. Hypertension increasing.**
- ◆ **Metabolic syndrome = early signs of other cluster diseases; 35% adults, ~55%>60 yrs** Ford ES 05
- ◆ **Alzheimer's disease – 1/2 >84 yrs old, 5.3M**

Basic Principles

- ◆ **Early life experiences can influence later-life health and disease.**
- ◆ **Multiple factors interact to influence health & disease.**
- ◆ **An ecological health framework considers the individual in the context of family, community, society and ecosystem.**
- ◆ **Environmental factors can alter natural pathways which in turn can lead to chronic disease.**

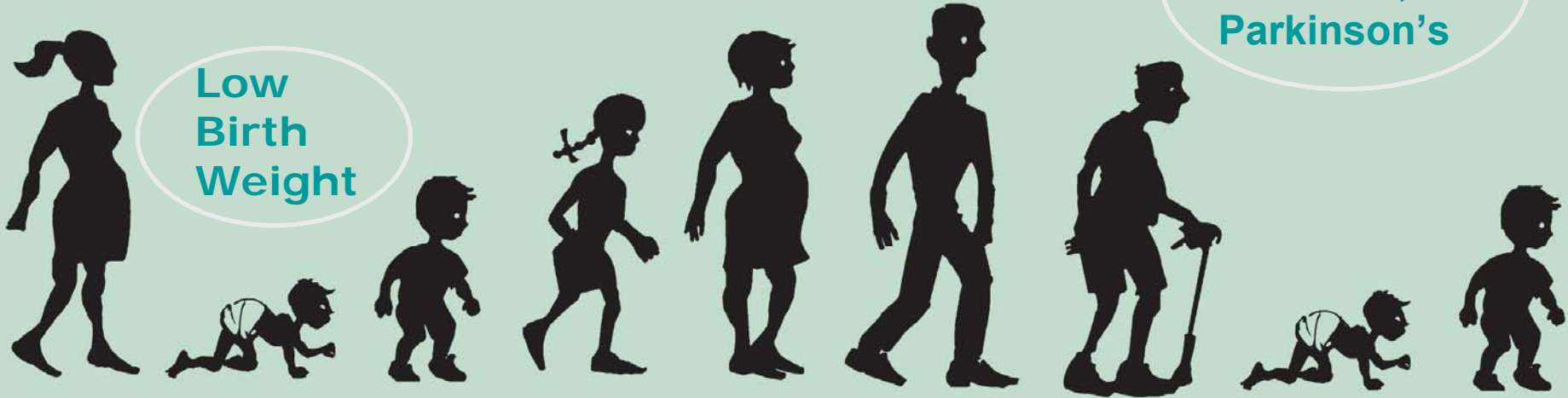
Early life experiences can influence later-life health, disease.

Toxic exposures
Oxidative stress

Obesity, Hypertension,
Cardiovascular Disease,
Diabetes

Alzheimer's,
dementia,
Parkinson's

Low
Birth
Weight



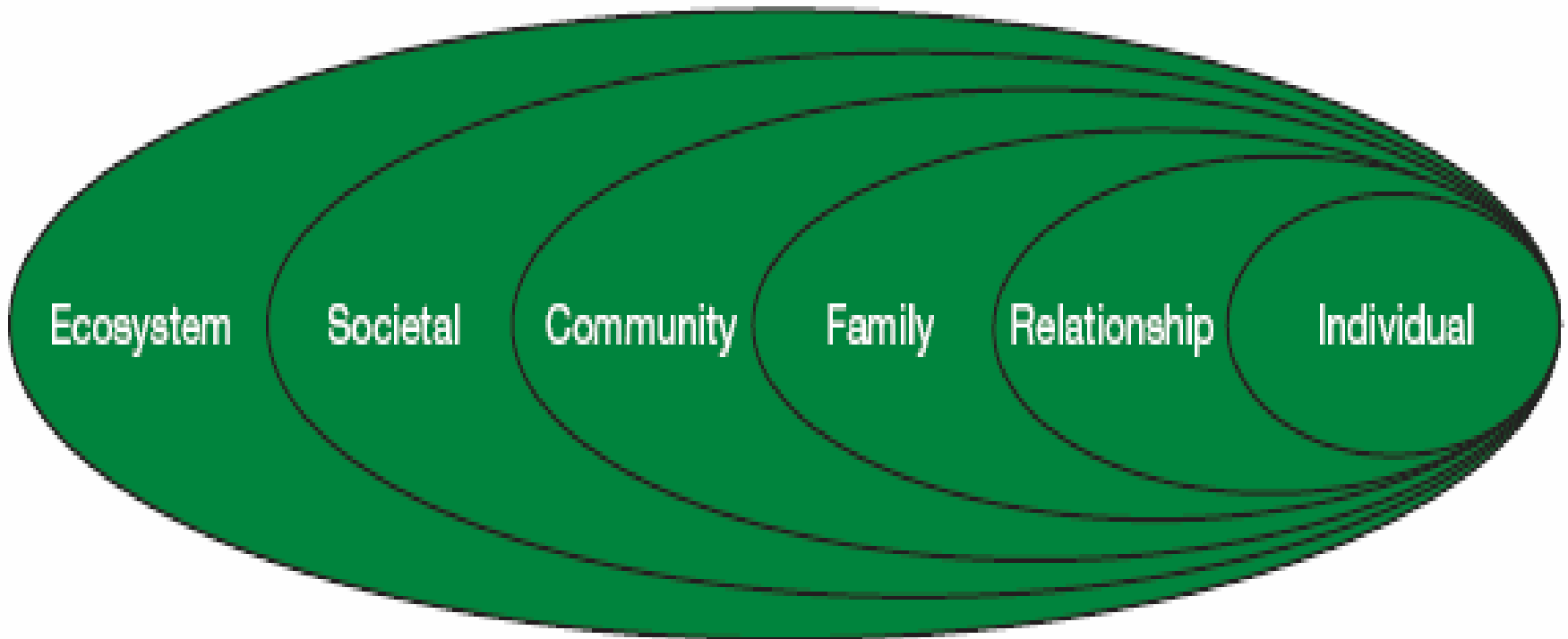
Aging Begins At Conception

Multiple factors interact to influence health & disease



Environmental Threats to Healthy Aging. J. Stein, T. Schettler, B. Rohrer, M. Valenti, Greater Boston Physicians for Social Responsibility 2008.

An ecological health framework considers the individual in the context of family, community, society and ecosystem.



Environment Drives Chronic Disease



- Inflammation
- Disrupted Insulin Signaling
- Oxidative Stress

Mechanism
of Action

Classical Concept of Inflammation

Defined by appearance.

“Calor, dolor, rubor, tumor.”

Heat, pain, redness, swelling.



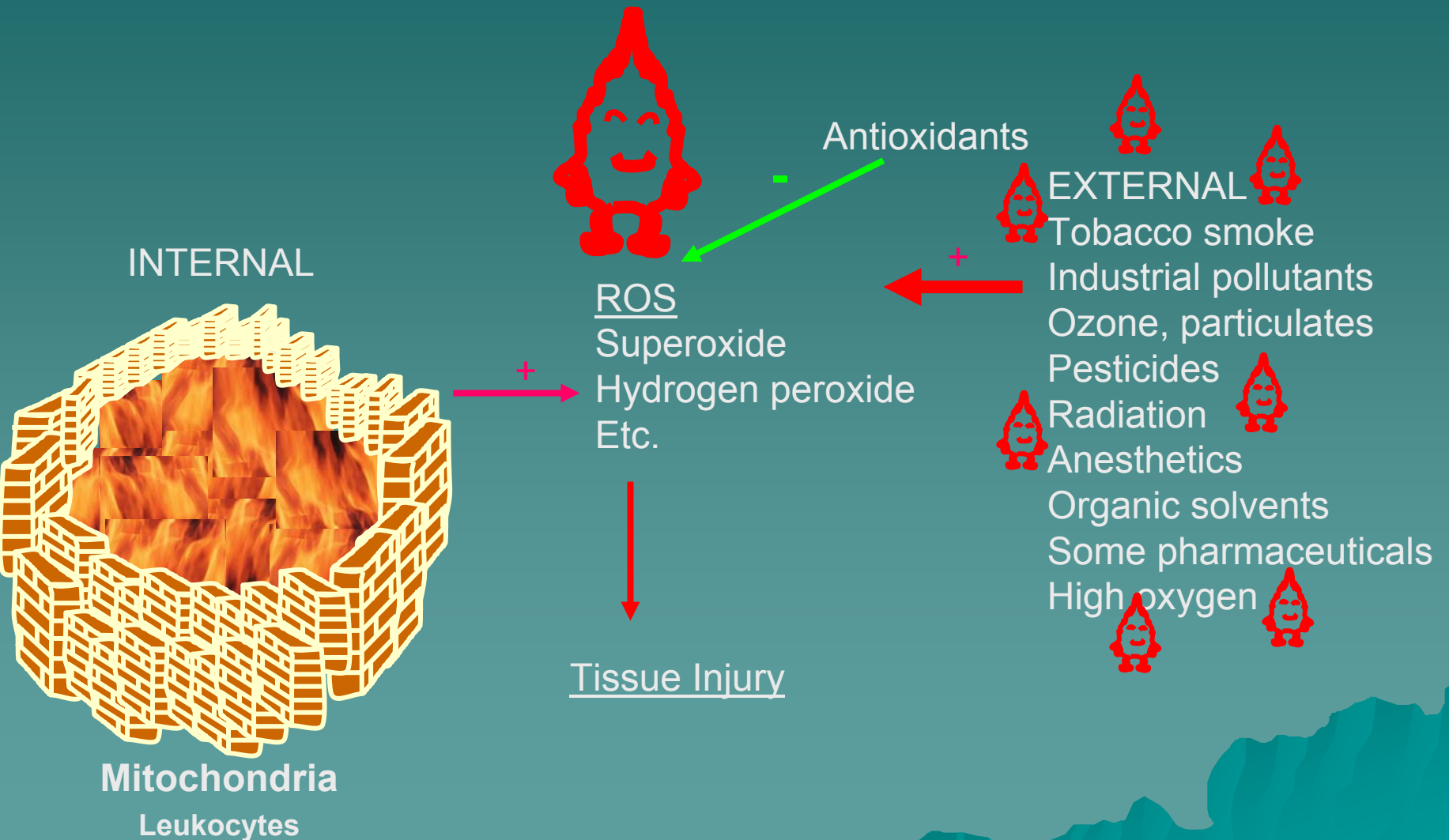
The New Concept of Inflammation



“Atherosclerosis is an inflammatory disease.”

- Ross, Russell. Atherosclerosis – An Inflammatory Disease. New England Journal of Medicine 340(2); 115-126. 1/14/99

Oxidative Stress



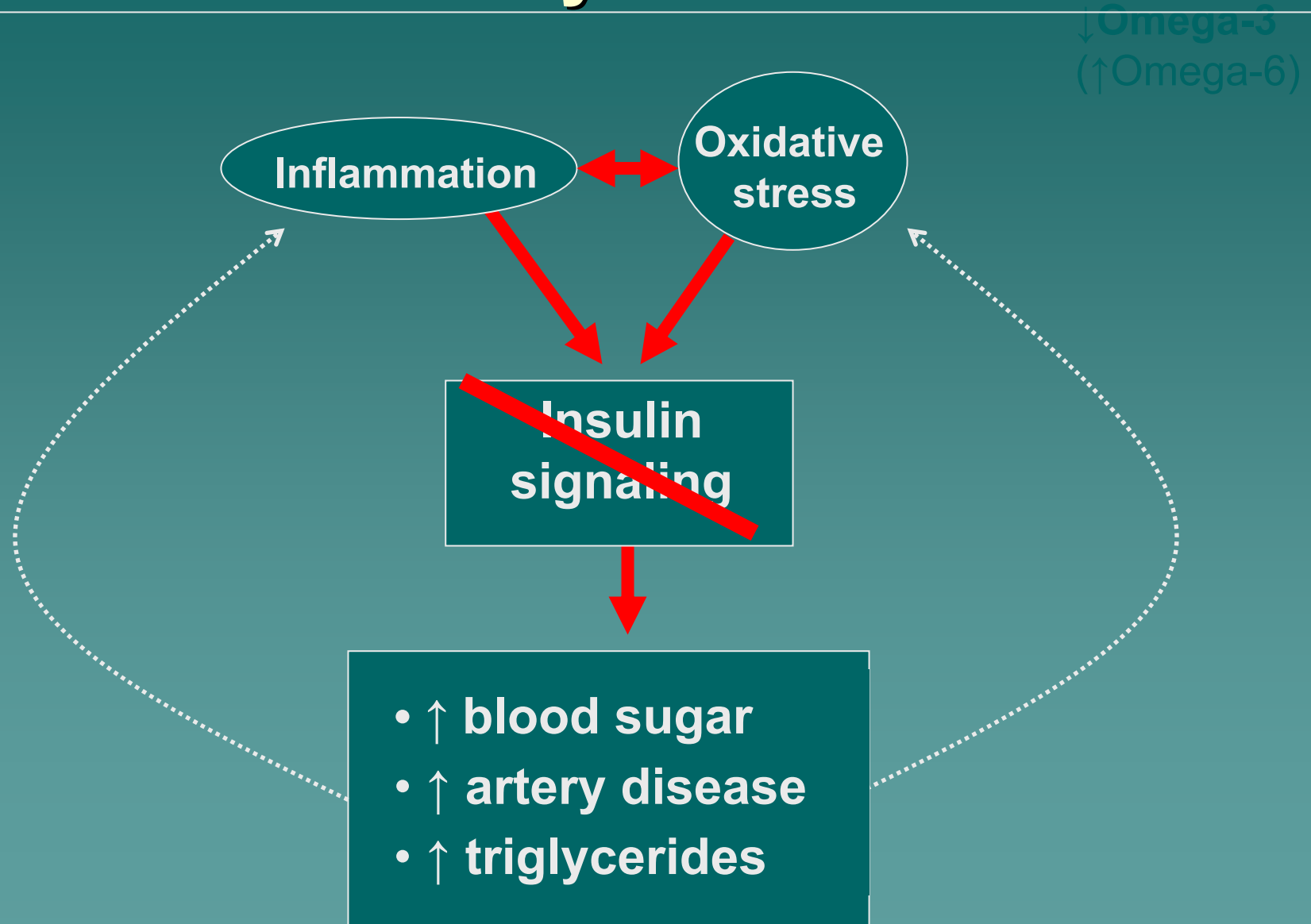
Insulin Signaling = Normal Metabolism

**Insulin
signaling**



- ↓ **blood sugar**
- ↓ **artery disease**
- ↓ **triglycerides**

Disrupted Insulin Signaling = Inflammatory Metabolism

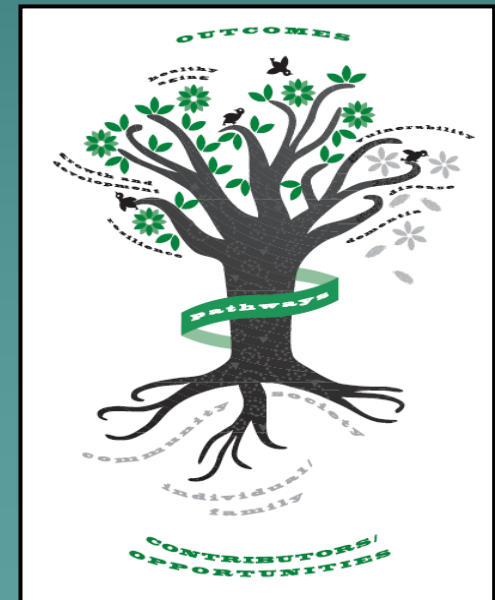


Summary

- ◆ **During the past century, human activity has altered virtually all aspects of the world's ecosystems, and changed important determinants of human health.**
- ◆ **Environmental factors drive the Western disease cluster, a group of illnesses that cluster within western societies and within individuals.**
- ◆ **These environmentally-driven illnesses are major components of the modern public health burden.**
- ◆ **The mechanisms linking environmental drivers with disease outcomes include inflammation, oxidative stress, and disrupted insulin signaling.**

Module 3: Common Drivers, Common Solutions

- ◆ Environmental factors are major determinants of health. They include:
 - Food system/nutrition and diet
 - Toxic chemicals
 - Built environment / physical activity
 - Socioeconomic stress
- ◆ A variety of cross cutting solutions dramatically improve human and ecological health.



Acknowledgements

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