

Health Promoting Foods

**Delivering health and wellness opportunities
through foods and beverages**



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Outline

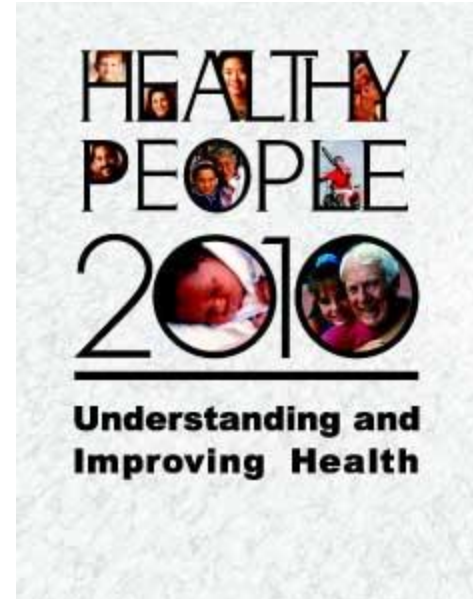
- **Nutrition at NCFST – Who we are**
 - Collaborative Initiative
 - Platform Objectives
 - Platform organization and approach
 - Facilities / Capability
 - Research Activity
- **Sprouts – Nutritious food or therapeutic supplement**
 - Important considerations when funding research



Collaborative initiative with FDA

Deliver science to support:

- Innovation and technology in Nutrition for achieving public health goals
- Health claims process
- Implementation of Dietary Guidelines for Americans
- Food industry needs by providing information and guidance for research and development imperatives
- Consumer Confidence in choosing foods / diets that promote health and QOL



Health Promoting Foods

From Farm to Fork

Platform Objectives

Provide a research platform to support scientific inquiry and **validation (in humans)** of relevant factors in/properties of foods and beverages that confer protection from illness, reduce disease risk and promote health

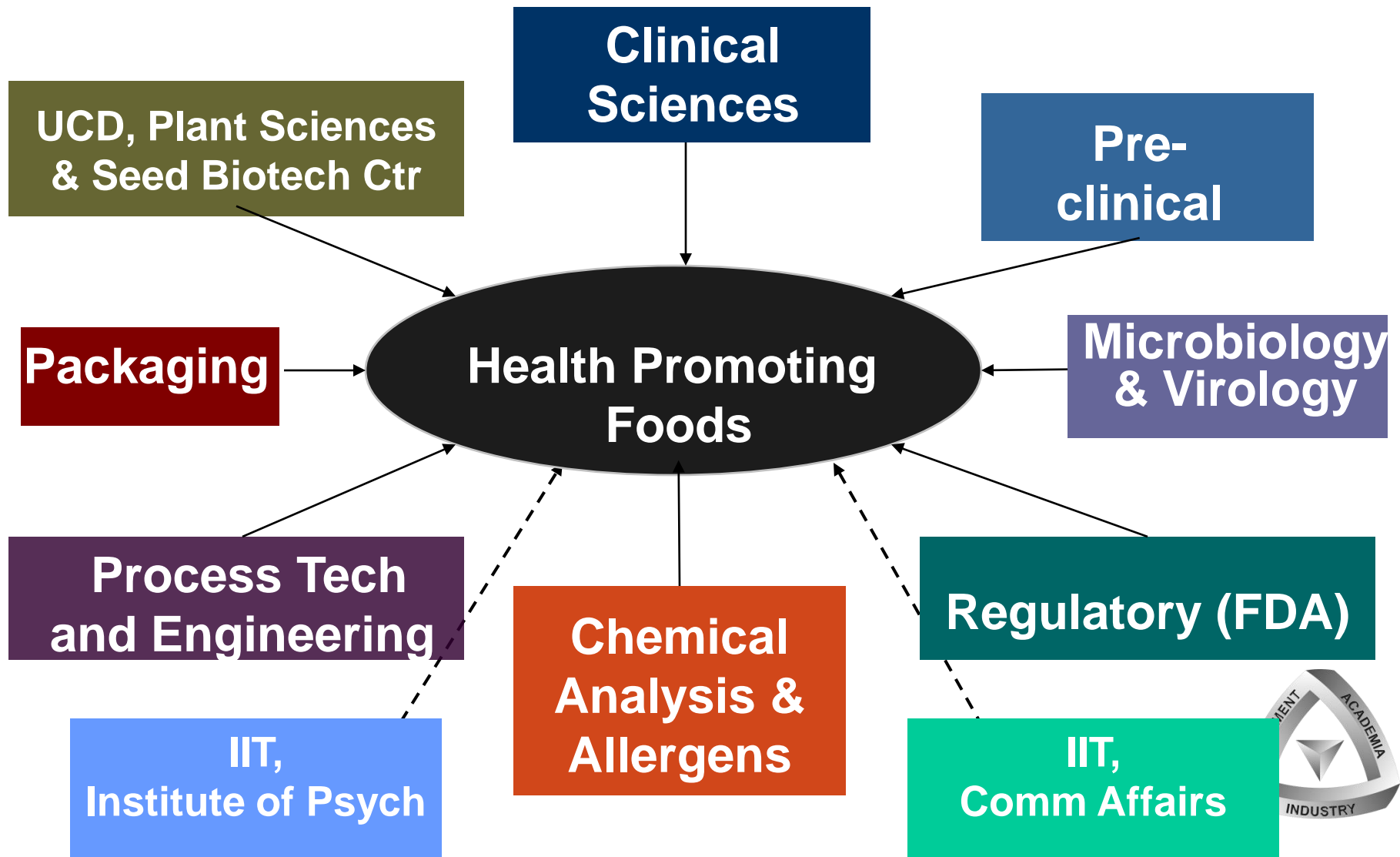
- ✱ Align Nutrition objectives with Food Safety requirements
- ✱ Enhance Government, Academic, Industry collaboration

Living well at all ages

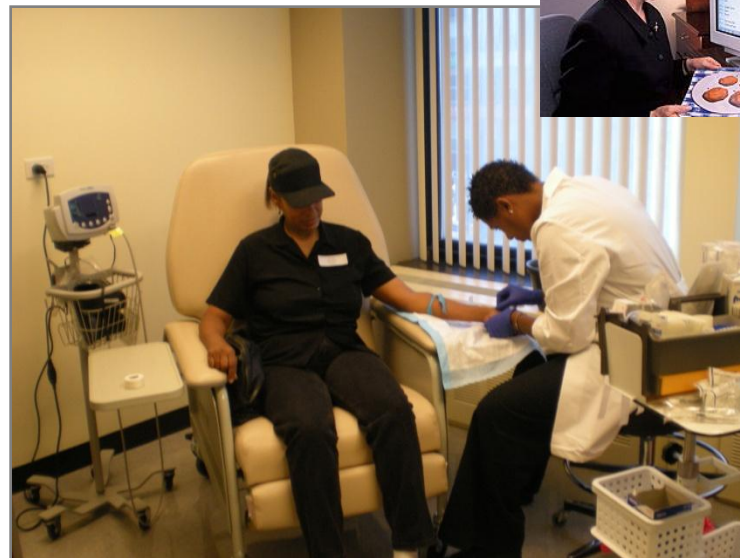


Integration of Sciences

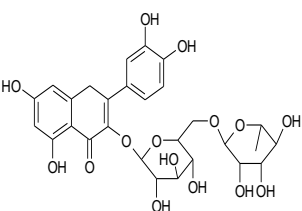
Research Components and Approach



Experimental Approach



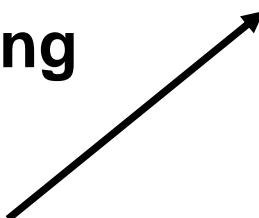
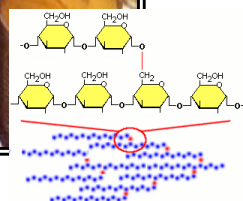
Clinical Nutrition Research



Food Processing



Chemistry



**Pre-Clinical
Screening**



Pre-Clinical Science

Screening and Defining mechanism of action

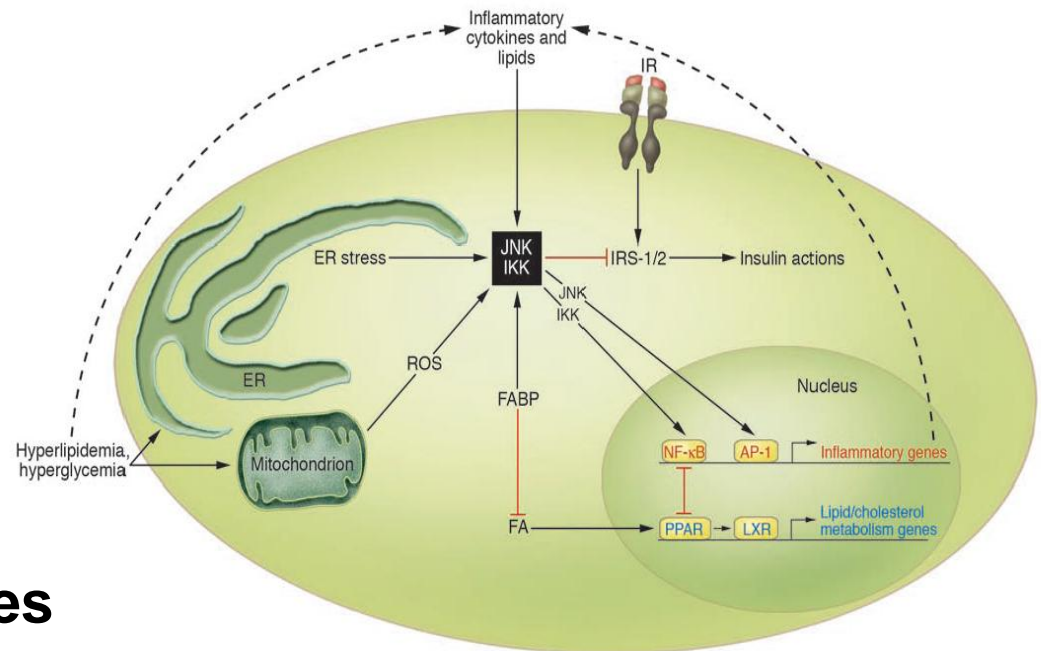
Determine relevant food constituents and properties to take forward for human validation

- **In vitro and in vivo animal models**

- Safety
- Efficacy
- Mechanism of action
- Dose Response
- PK, PD

- **Simulated GI tract**

- Rheological properties
 - gut contents



Clinical Sciences

Human Clinical Trials

Design, plan, coordinate and conduct human research

- **Determining health benefit**
 - Safety and Efficacy
 - Dose response
 - Bioavailability
 - Mechanism of Action
- **Capability**
 - 5,000 + square foot facility
 - Multiple exam rooms
 - Metabolic Kitchen
 - 2 distinct Food Intake suites
 - Specimen processing lab
 - Biochemical Lab (Moffett)

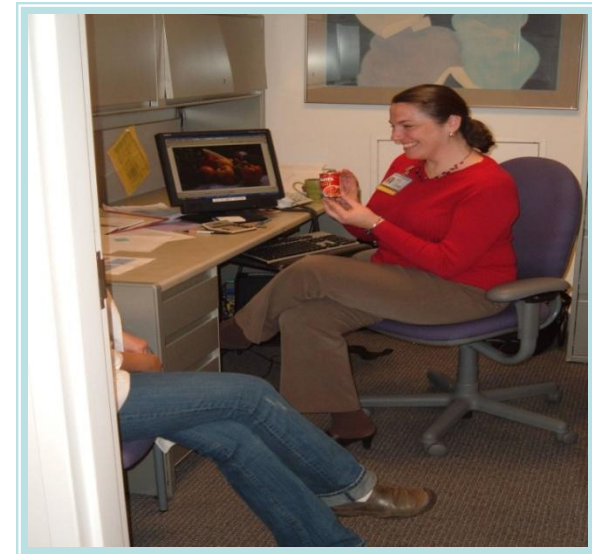


NCFST: Clinical Nutrition Research Center

IIT Tower
35th and State



Metabolic Kitchen



NCFST: Clinical Nutrition Research Center

Multiple
examination
rooms
&
food intake
suites

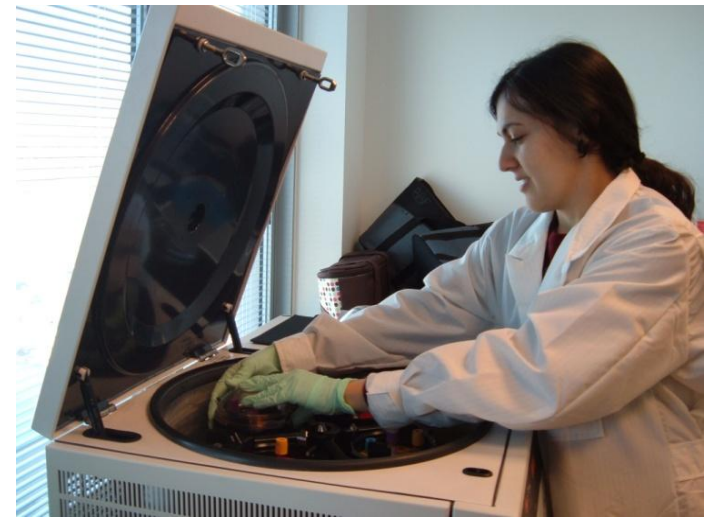


Biochemistry lab

Standard and Specialty laboratory analysis

Determining health benefit, mechanism of action, target systems

- Basic chemistries
- Lipid panel
- Metabolic Panel
- Gut hormones
- Inflammatory markers
- Oxidative stress markers
- Platelet function
- Adipokines
- Endothelial function



Research Activity

Expertise

- Obesity
 - Body Weight and Appetite Management
 - Satiety, food intake regulation
- Vascular Health
 - Endothelial function
 - Blood pressure regulation
- Metabolic Disorders / Syndrome
 - Insulin resistance



Research Activity

Body Weight, Satiety, Appetite

- Ingredients and Sensory-sensitizing dietary components for enhancing physiological mechanisms of satiety
 - Fibers
 - Starches
 - Proteins
- Influence of who I am?
 - Sex, age, life cycle status, BMI, psychological disposition (restrained, unrestrained eater)

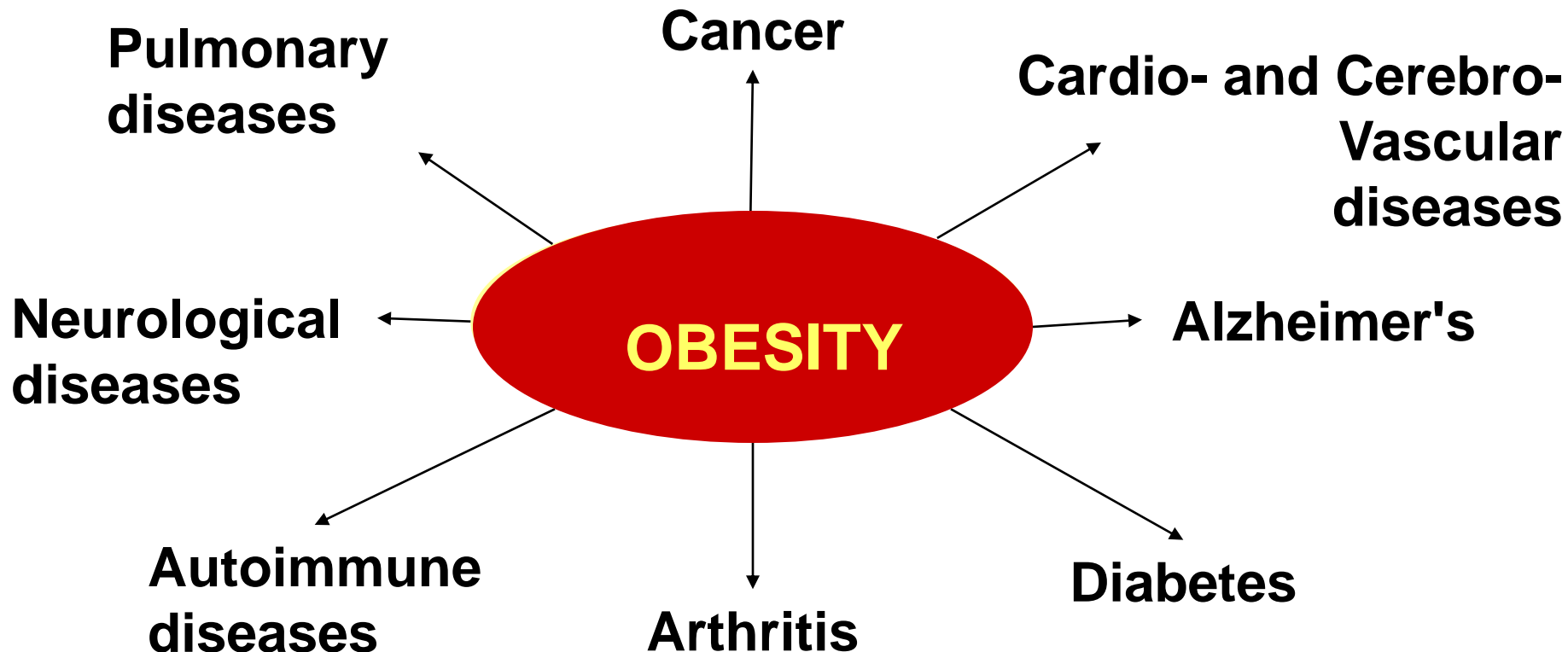




Vascular and Metabolic Health

Focused on processes underlying disease and how the diet / dietary constituents maintain or improve balance and function

Inflammation and oxidation: Processes underlying disease and targets for control



Obesity is a Pro-Inflammatory State

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 - **Important considerations when funding / investing in research**



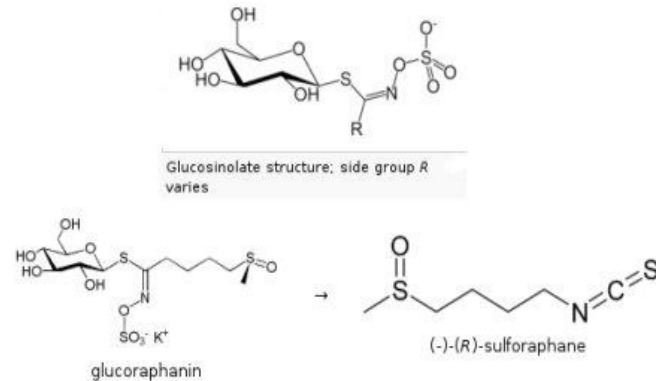
What do you want to say about Sprouts?

- Promote health
- Reduce disease risk
- Treatment for disease
- Cure disease



What do you want to sell?

- Food / Sprouts
- Components / fractions of sprouts



**The research approach will differ
depending on the answers to these
questions**



Research Approach

Treat or cure disease
DRUG

Reduce disease risk
FOOD



Research Approach

- **Knowledge of product**
chemistry
- **Specificity**
- **Dose requirements**
- **Mechanism of action**
- **Demonstration of effect / validation in humans**
population important



Plant Foods and Health

Epidemiological Evidence

✱ Supports reduction in chronic disease risk

✱ Plant Foods contain:

- Vitamins, minerals
- Fiber
- Organic acids
- Phytosterols
- Carotenoids
- Sulfur compounds
- Polyphenolic compounds

Turmeric

Curcumin

Grapes

Resveratrol

Chili peppers

Capsaicin

Honey

Caffeic acid phenethyl ester

Ginger

Garlic

Diallyl sulphide

Green tea

Cabbage

Indole-3-carbinol

Soybeans

Broccoli

Sulphoraphane

Tomatoes

Lycopene

Benefits



Benefits to plant:

- Anti- bacterial, -fungal, natural pesticide
- Attract pollinating or other seed dispersing insects
- Pigmentation and UV light protection

Benefits to humans:

- Serve as anti-oxidants
- Serve as anti-inflammatory agents
- Enhance cell-to-cell communication
- Alter estrogen metabolism
- Cause cancer cells to die
- Repair DNA damage
- Detoxify carcinogens

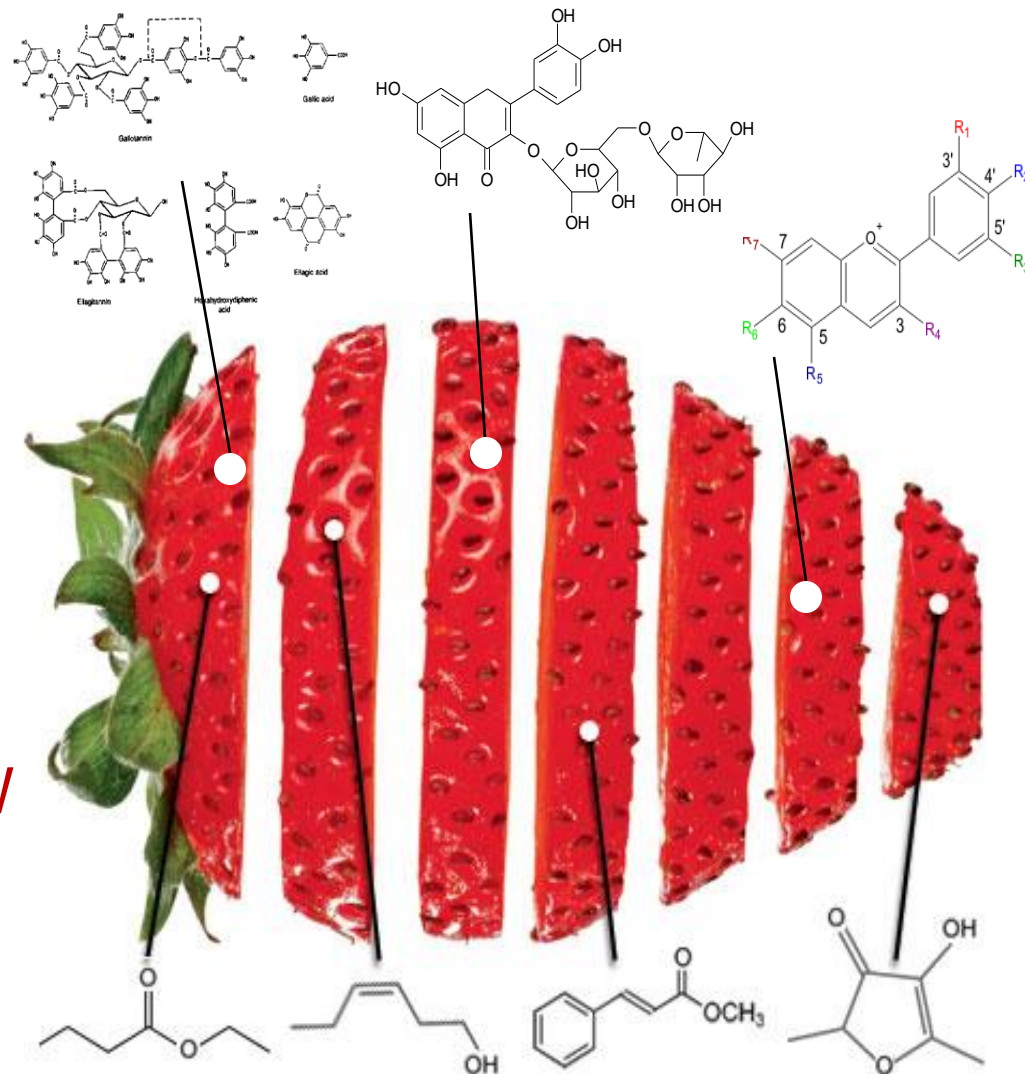


Strawberry

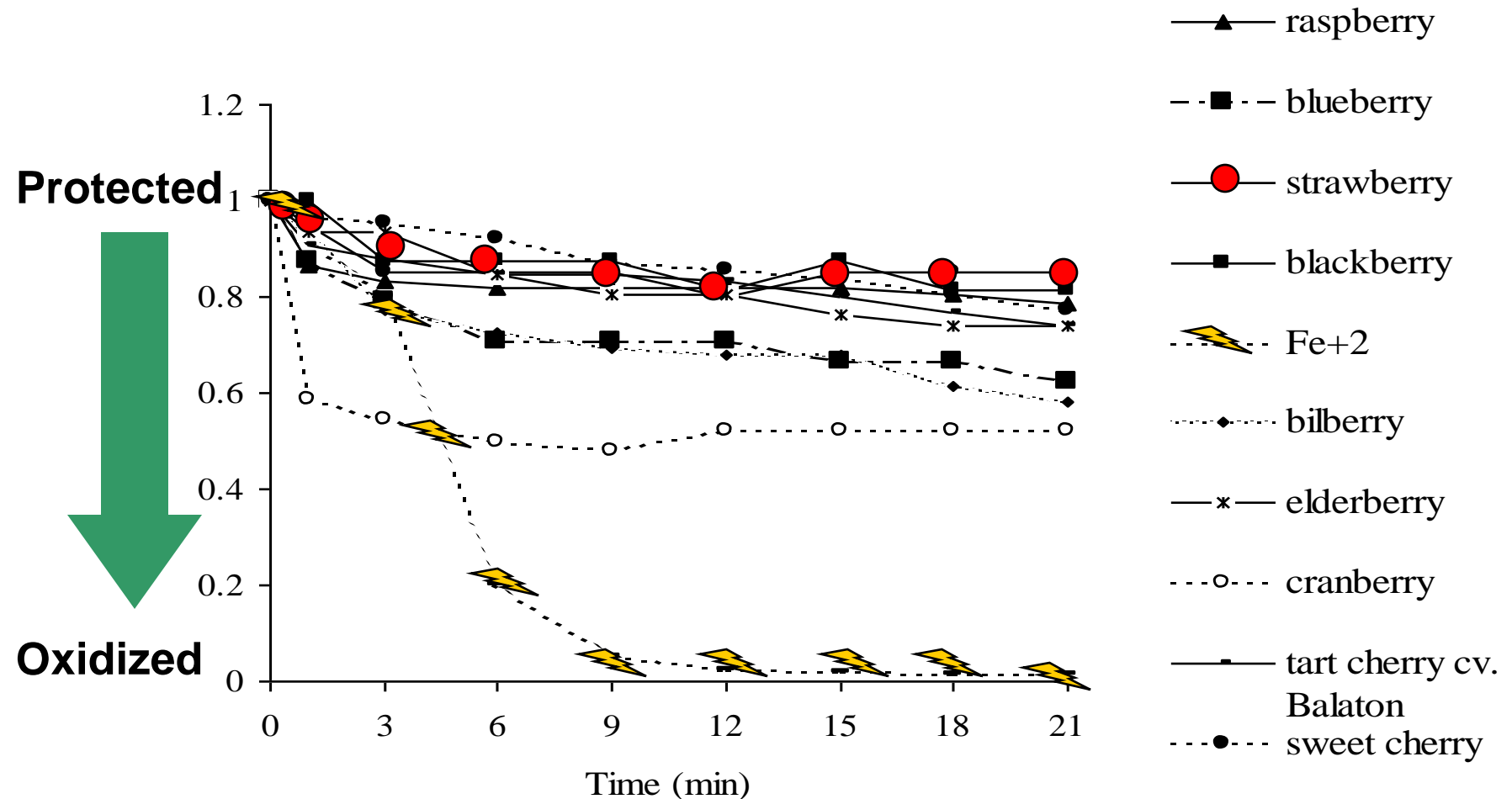
- Anthocyanins
- Ellagitannins, Ellagic acid
- Quercetin
- Kaempferol
- Phenolic acids

12.6 mg/g total phenols DW

High antioxidant capacity
3.6 mmol TE/serving



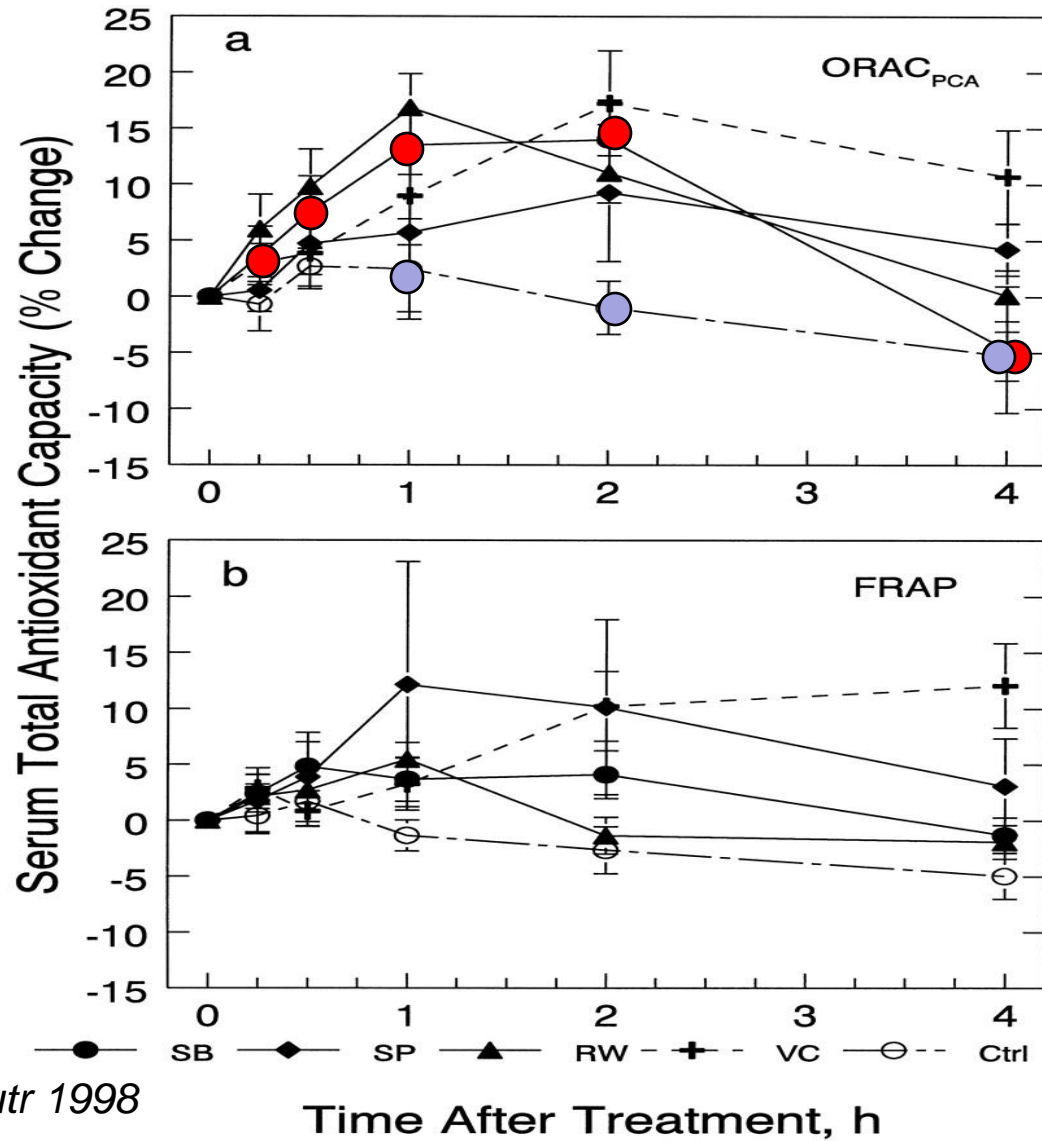
Berry extracts protect lipids (fats) from oxidizing in a test tube



Seeram NP et al; *Phytomedicine*, 2001, 362-9.



Antioxidant capacity of blood increases with strawberry



LDL (the “bad” cholesterol) is more harmful to your vessels when oxidized; therefore protecting LDL from oxidation protects your vessels from damage

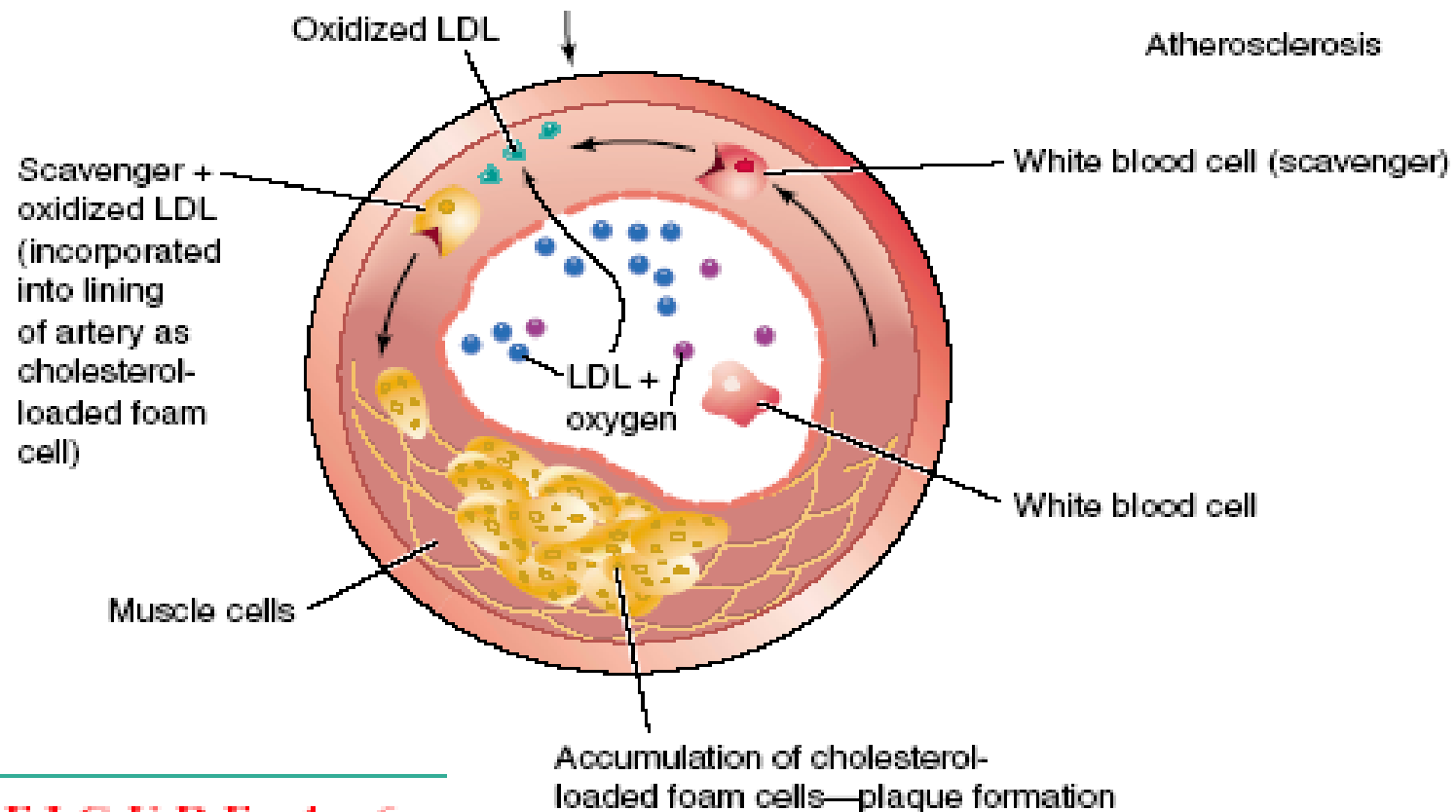
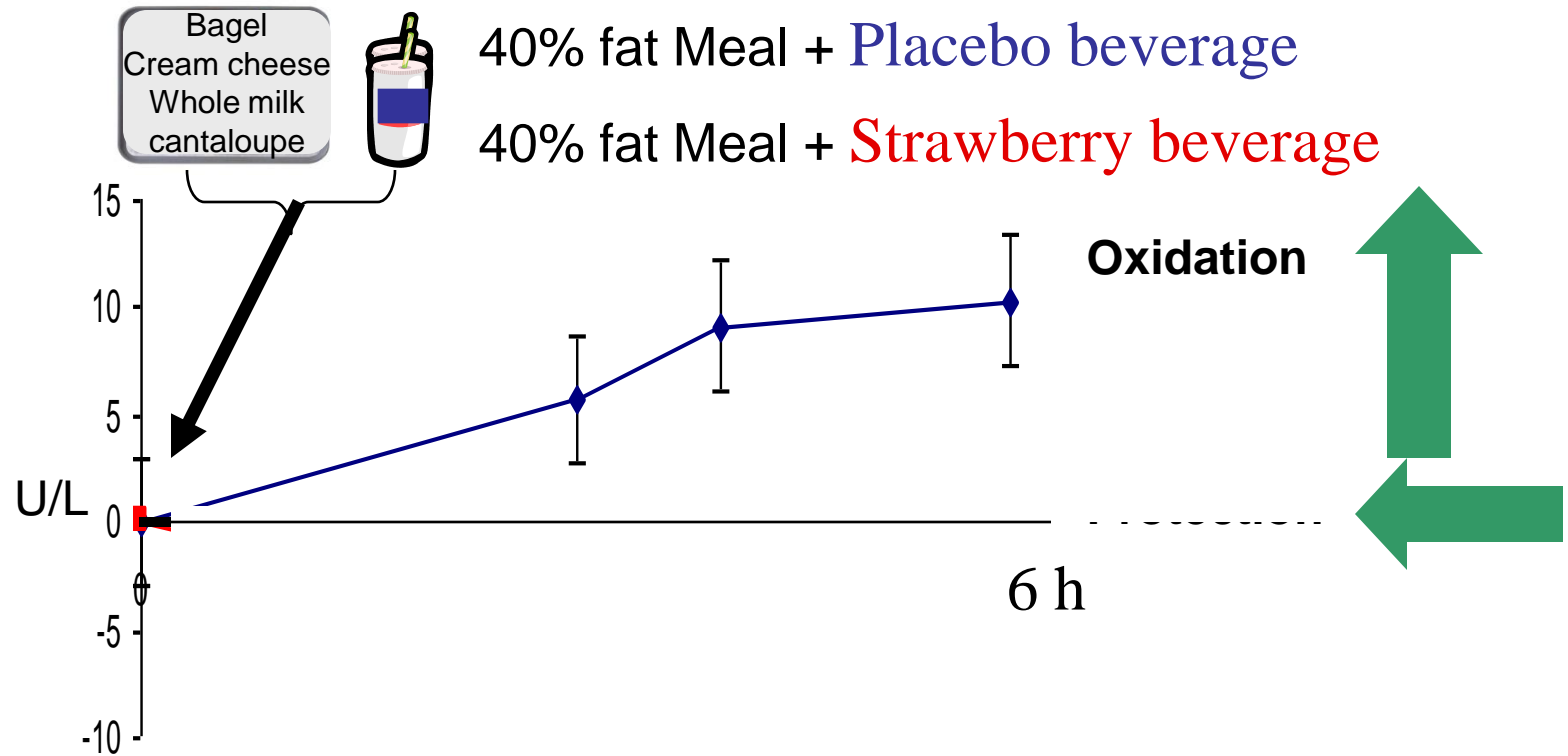


FIGURE 4 - 6

Strawberry phenolics prevent oxidation of LDL in men and women

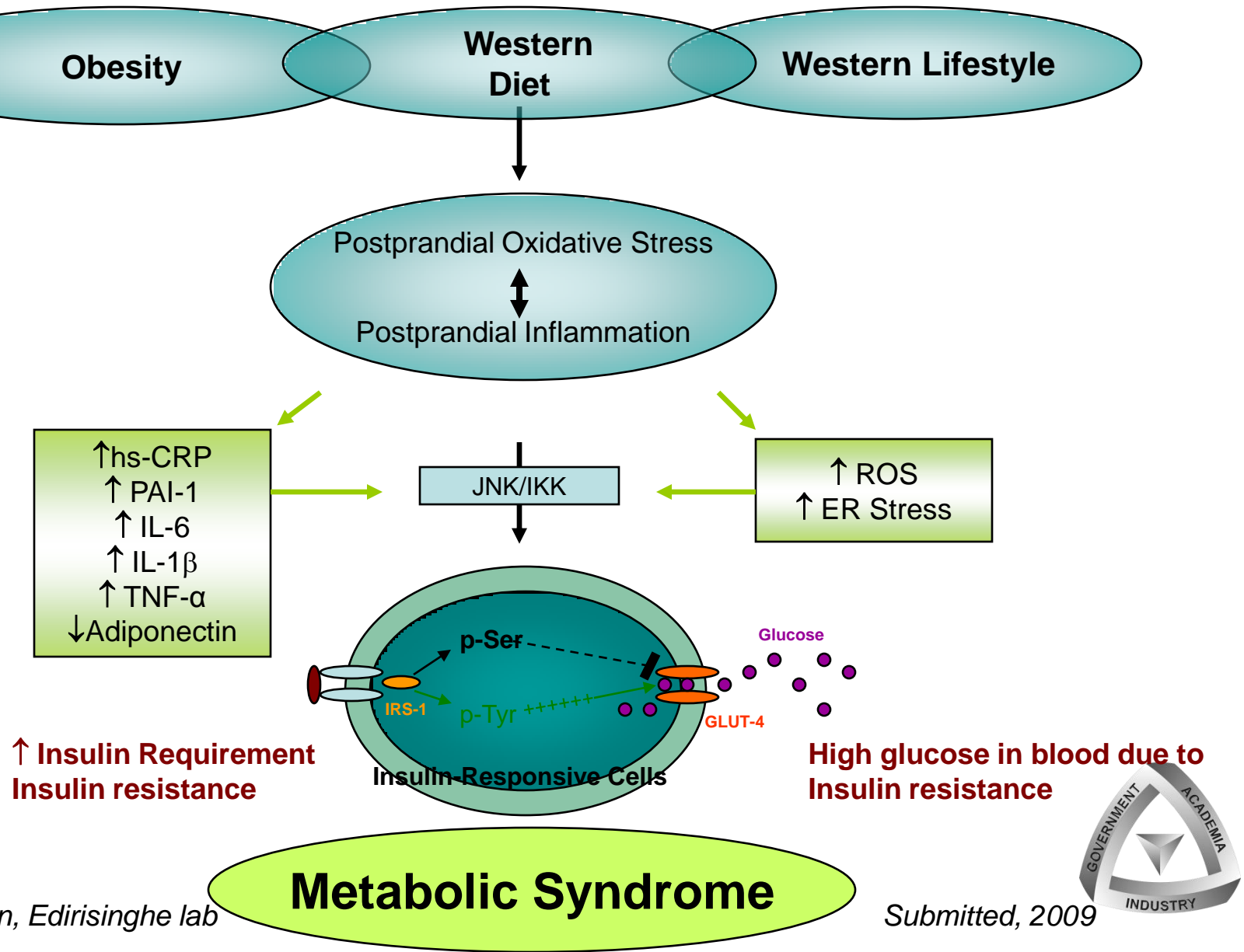


Burton-Freeman et al. in press

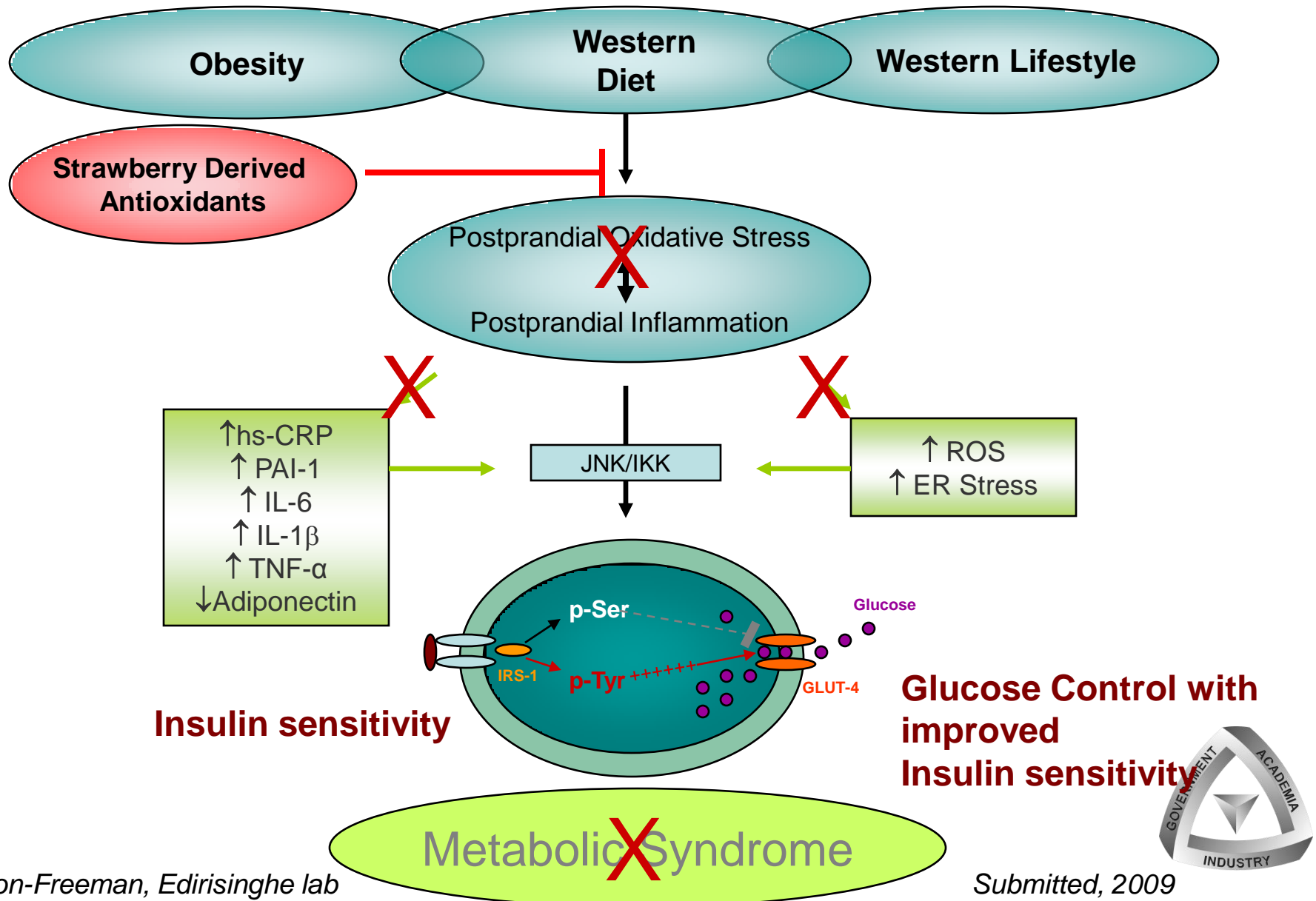
Treatment, $p < 0.0008$

Time, $p = \text{NS}$

Inflammation, Oxidative stress: Resistance to insulin and Metabolic Syndrome



Polyphenolic modulation of insulin activity



Concluding Remarks

- NCFST – a place for tackling food safety issues and defining nutritional benefits for people
- Research strategy built with the end in mind
 - what you want to be able to say and sell with the scientific backing
- Comprehensive story, easy to talk about, makes sense, holds weight.



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Plant Foods and Health

