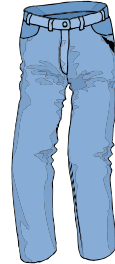


**Fitting Nutrition
into Your Genes**

Martha A. Belury, Ph.D., R.D.
Belury.1@osu.edu
Human Nutrition
The Ohio State University

Outline

- I. History (abridged) of the Study of Genetics and Nutrition
- II. “The Skinny” on Fats & Genes
- III. How Dietary Fats Work with Your Genetic Code for Health
- IV. Fitting Genetics and Fats into your Conversation with Patients and Clients



2

Making History Together - I. Sciences of Nutrition and Genetics

- 1865 – Mendel ‘*Experiments with Plant Hybrids*’
- 1930’s & 1940’s – Golden Era of Nutrition
 - Structures of Vitamins Discovered
- 1953 – ‘Era of Molecular Biology’
 - Watson & Crick discover the structure of DNA
- 1970’s – Fatty acids & eicosanoids were linked with biological activities
- 2000 – Human Genome Unraveled
- 2004 – Post Genomic Era
- 2005 – Metabolomics
- 2009 – Lipidomics

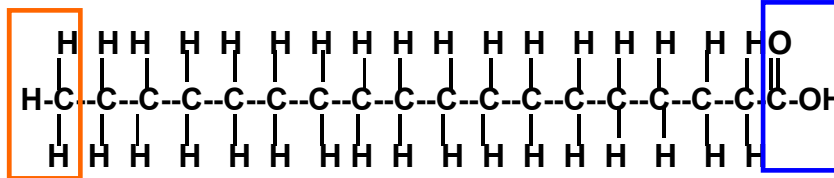
3

II. The Skinny on Lipids

- Fats & Oils
- 9 kcal/g
- Removed, if fat fraction is removed
- Types
 - Fatty Acids
 - Sterols
 - Fat Soluble Vitamins and Other Bioactive Compounds

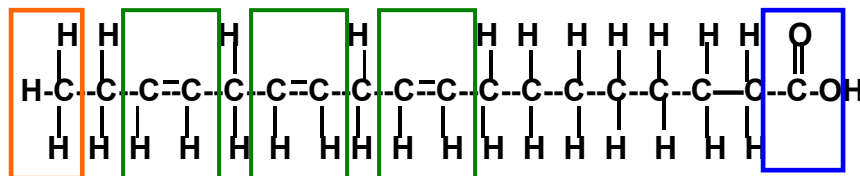
4

Saturated fat



5

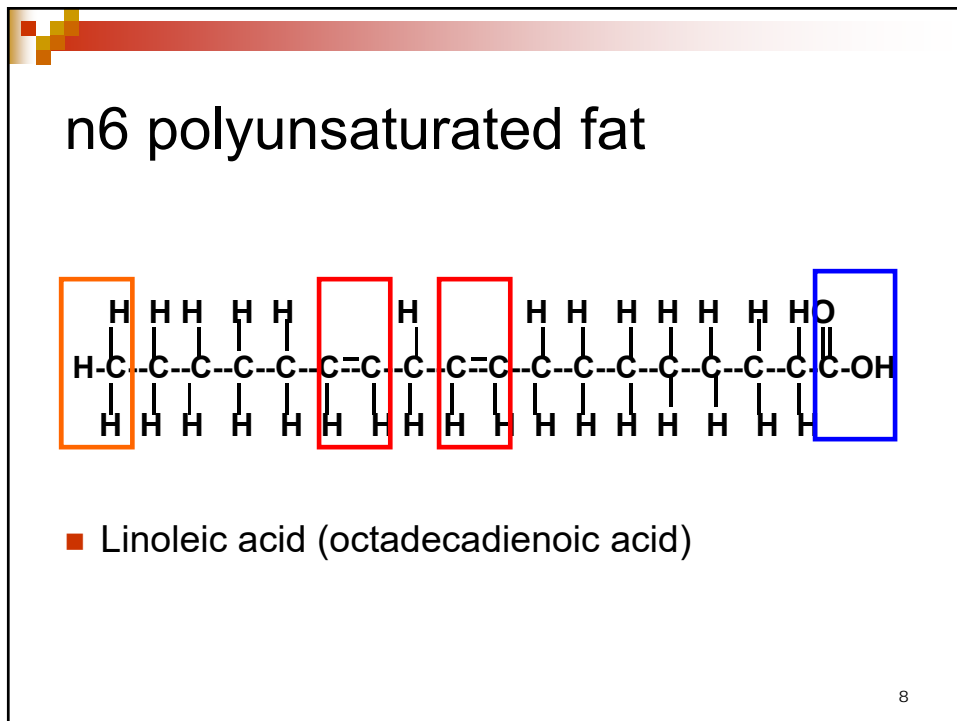
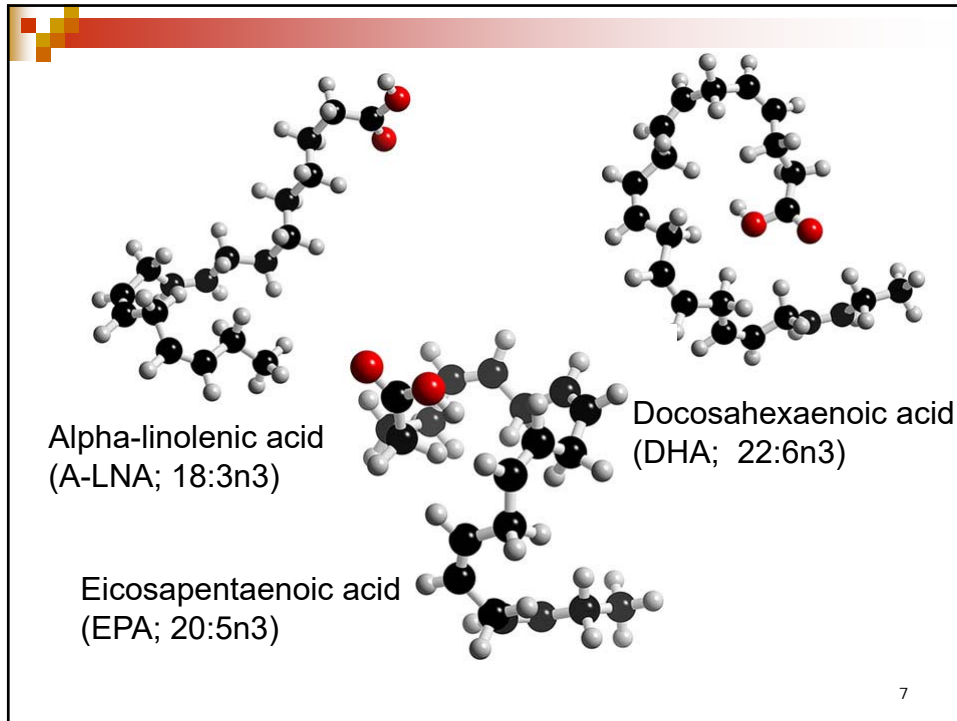
n3 polyunsaturated fats



α -Linolenic Acid

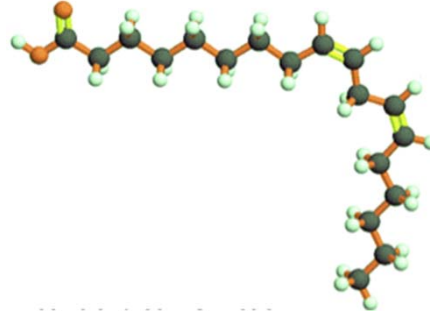
- Neuronal development and conditions
- Visual Health
- Appetite
- Inflammatory-related diseases

6



Linoleic Acid

- n6 PUFA
- Essential for growth
- Cardioprotective
- Other effects (?)
- Oils such as corn, safflower, sunflower, soybean



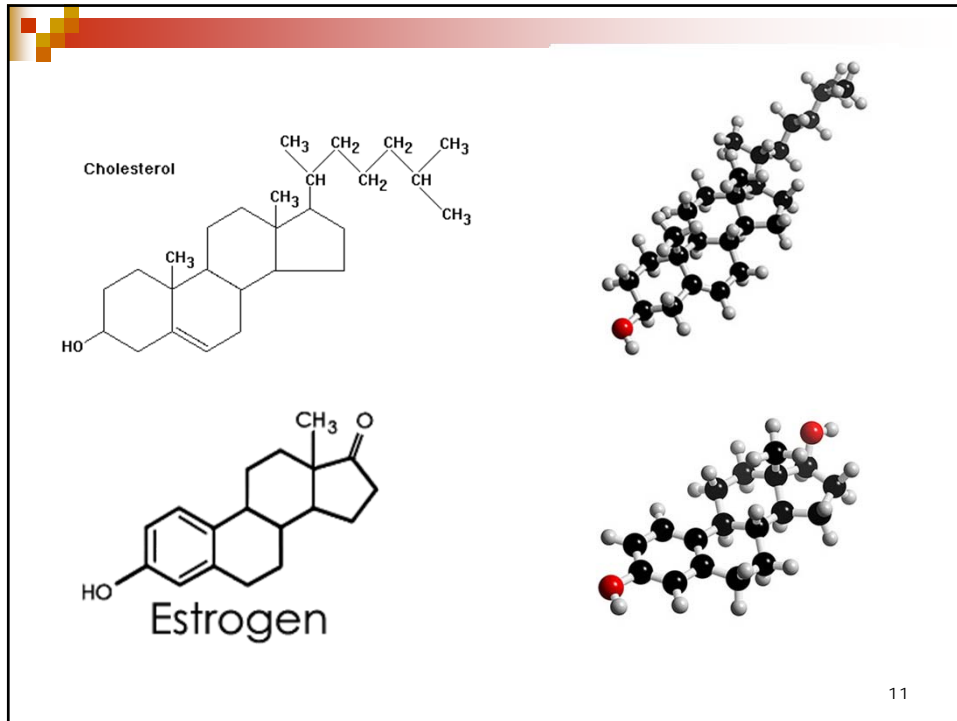
9

Sterols

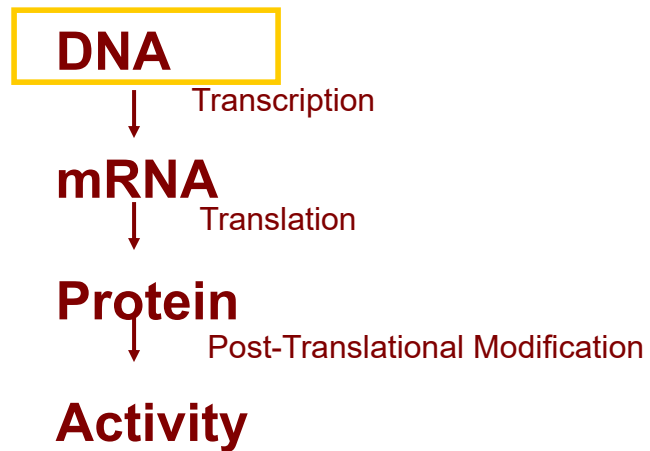


"The cracks can be fixed—it's your cholesterol level that worries me."

10



III. How Fats Work with Your Genetic Code

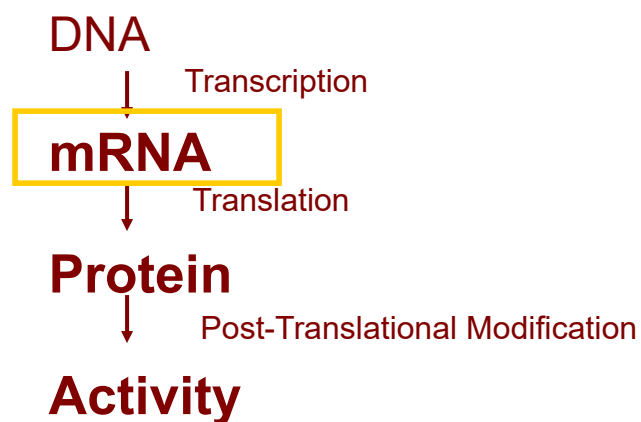


Polymorphism

- Having trait of several possible alleles that are
 - Not fatal
 - Usually exhibited as different *phenotypes*
- Single nucleotide polymorphism (SNP)
 - 'Snip'
 - One nucleotide is altered in DNA coding for mRNA & protein

13

Dietary Fats and Gene Expression



14

Nuclear Hormone Receptors as Transcription Factors

- Require **Ligand**
- Associate with Response Element (**RE**)
- Dimerizes with another Nuclear Receptor
 - (requires another molecule of estrogen or estrogen-like compound?)
- 'Turn on' **Responsive Genes**

15

Peroxisome Proliferator-Activated Receptor

Linoleic acid
18:2n6

PPAR

Target Genes code
Proteins for metabolism of
fat, glucose, and protein

Cytosol

PPRE Target Gene

Nucleus

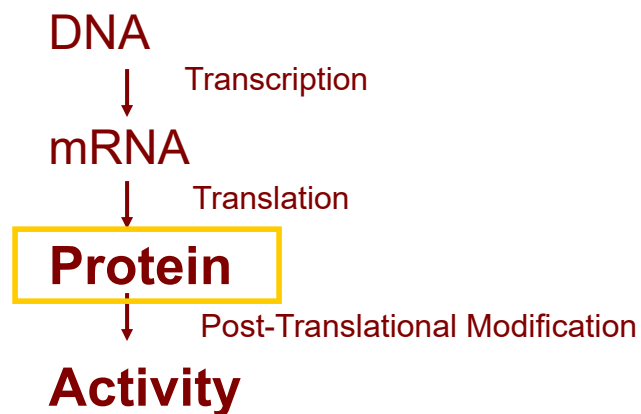
16

PPARs - A Link Between Fats and Genes

- Diabetes (Thiazolidinediones, TZDs)
 - Avandia, Actos, [Rezulin]
- Cardiovascular Disease
 - Fibrates
- Adipose Tissue Development
- Cancers of breast, colon, skin, others

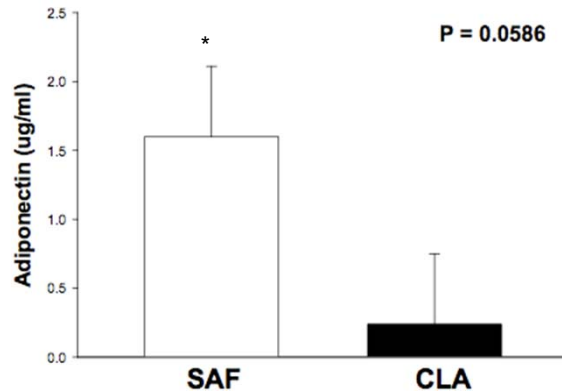
17

Dietary Fats and Gene Expression



18

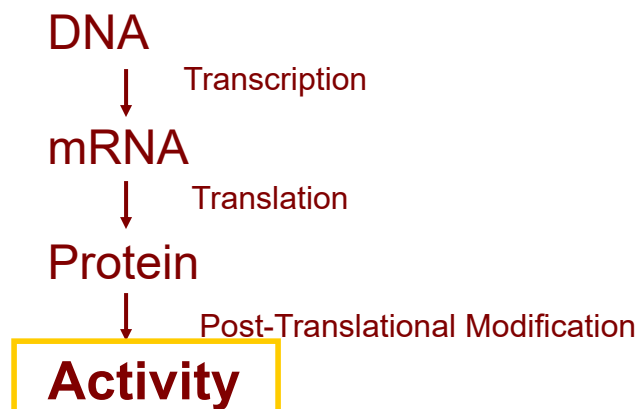
Safflower oil increases a plasma protein, adiponectin



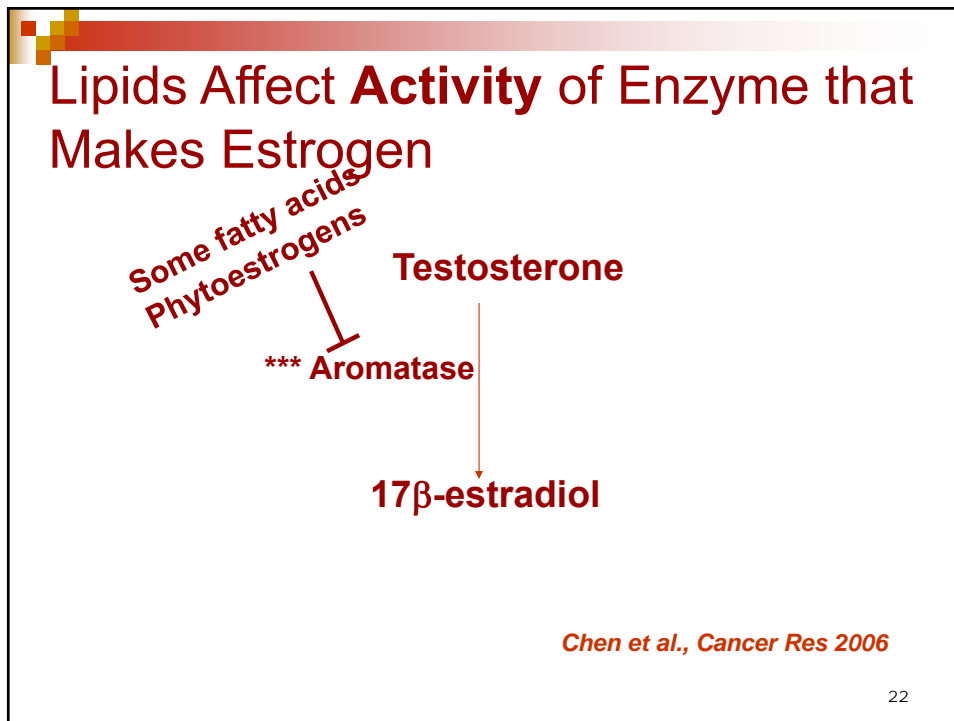
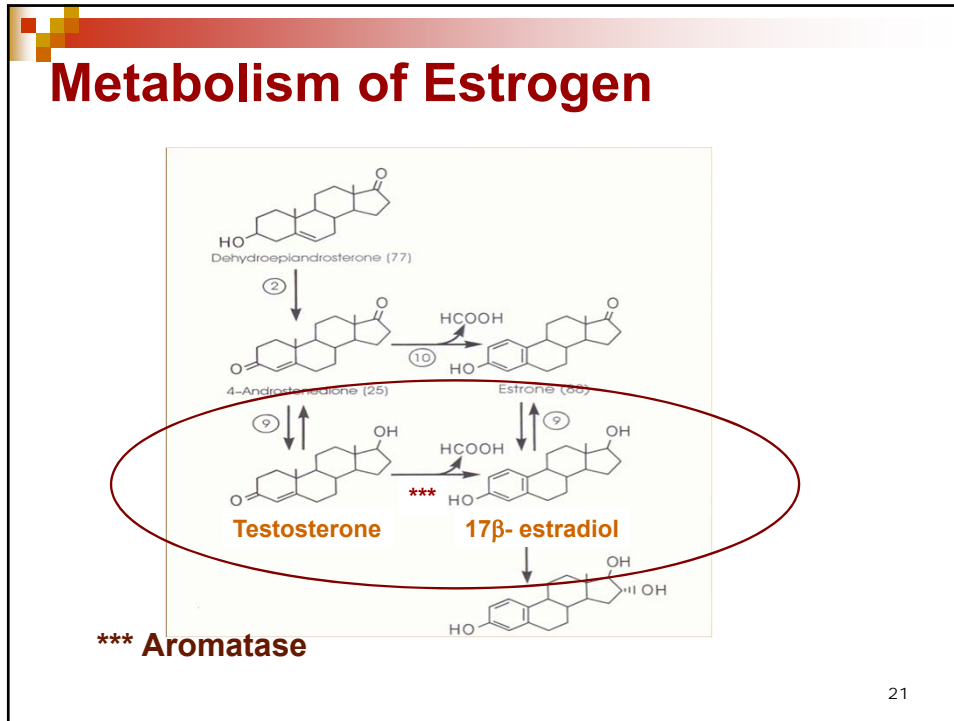
Norris et al., 2009; Asp et al., 2011

19

Dietary Fats and Gene Expression

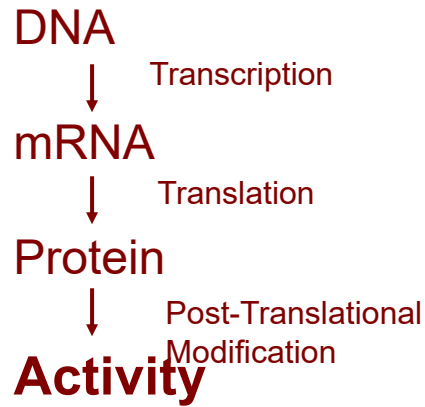


20



Summary: How Dietary Fats Affect Health by Modifying Gene Expression

1. Modify Molecular Events
2. Reduce Mediators of Inflammation
3. Change the metabolism of other compounds



23

IV. Fitting in Fats: Bringing the genetic link into your dietetics practice

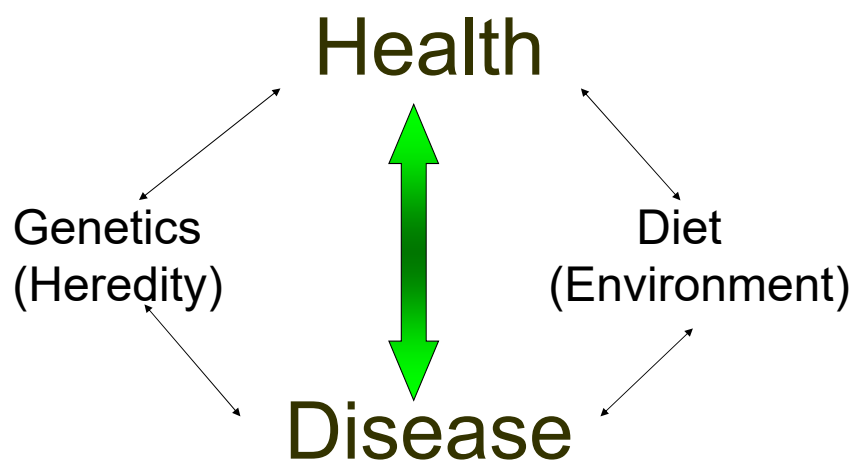
24

De-Clutter --- Consistent, Specific & Measurable

1. Keep it simple
(or “Lighten” Up)
1. Keep a Sense of Humor
2. Dive in to the Science---

25

Keeping Messages Simple

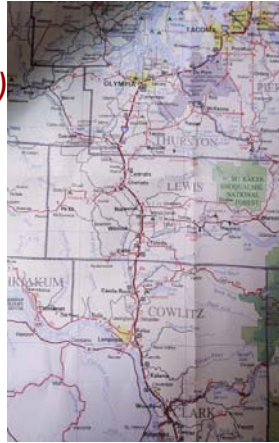


26

Keep Messages Simple

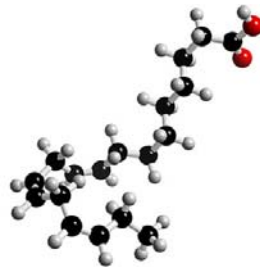
Analogies...

*Genetics (your inheritance)
Is Your Map*

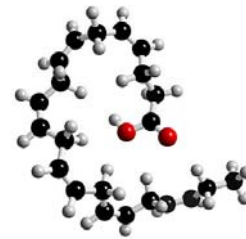


27

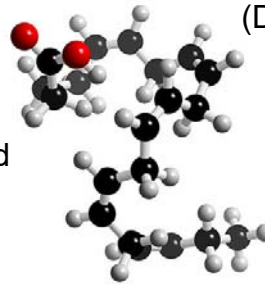
Keep a Sense of Humor



Alpha-linolenic acid
(A-LNA; 18:3n3)



Docosahexaenoic acid
(DHA; 22:6n3)



Eicosapentaenoic acid
(EPA; 20:5n3)

28

De-Clutter --- Consistent, Specific & Measurable

1. Keep it simple
2. Keep a sense of humor
3. Dive in to the science---

Research is the root of nutritional science and practice.

We dietitians are the messengers.

29

Thank You

- National Cattleman's Beef Association
- Research Organizations: American Institute of Cancer Research, American Cancer Society
- Carol S. Kennedy Professorship
- Federal Government Research Agencies for Nutrition (USDA & NIH)
- Lab people and collaborators, past and present

30