

BI 121 Lecture 5



**...DietController!
More fun in Lab!!**



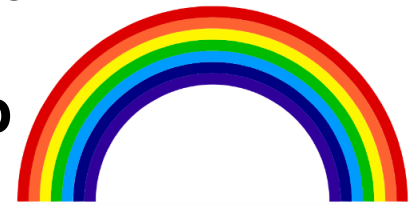
**I. Announcements Nutrition Analyses this Thursday!
Please record diet on p 3-7 LM. Bring flash drive. Q?**

II. Introduction to Genetics LS 2012 ch 2 p 20-1 + Appendix C

- A. How does DNA differ from RNA? pp A-20 thru A-22
- B. Genetic code? pp A-22, A-23
- C. How & where are proteins made? fig C-7, C-9
- D. Class skit: Making proteins @ ribosomes!

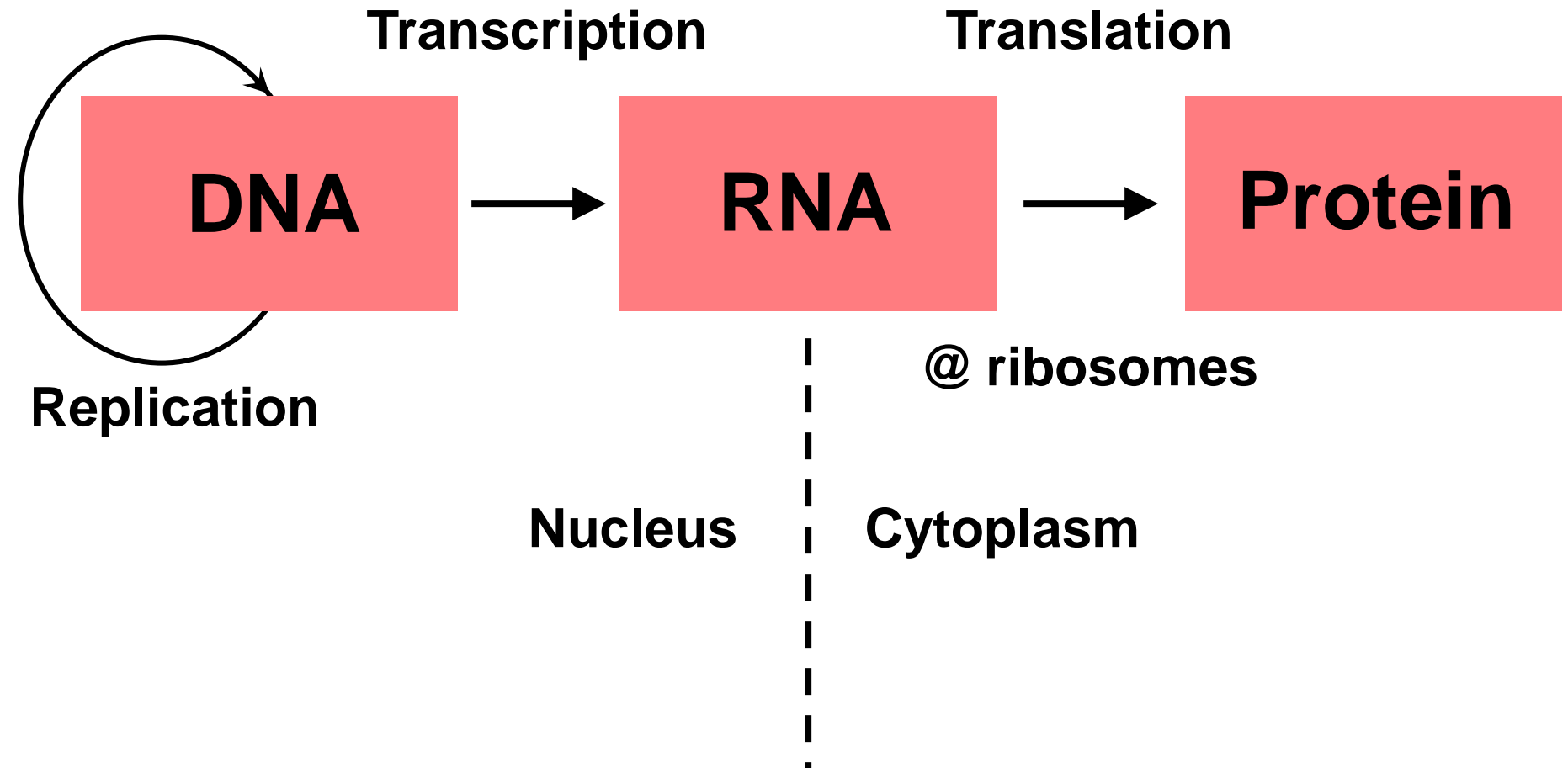
III. Nutrition PrimerSizer & Whitney (S&W) Sci Lib

- A. Essential Nutrients: H₂O, 1^o Carbohydrates, 2^o Fats, 3^o Proteins, Vitamins, Minerals; Macro- vs Micro-?
- B. Dietary Guidelines: USDA, AICR, Eat Like the **Rainbow!**
- C. **Blue Zones?** Pondering Paleo, Marlene Zuk, NAHL 2015...
- D. How much protein? Excess animal protein & disease?
- E. Carbohydrate confusion. Minimize what? Simple sugars
- F. Anti-aging diets, total vs intermittent fasting? NAHL 2018
- G. **Beware of Nutrition Quackery** S. Kleiner & Monaco
- H. Best diets? Exercise? Practical guidelines for wt loss!



IV. Introduction to Digestion Steps + hydrolysis

What does DNA do, day-to-day?



DNA vs RNA?

1. Double-stranded

2. Deoxyribose
(without oxygen)

3. A, T, C, G
Thymine

4. Self-replicative
(can copy itself)

5. Nucleus
(+mitochondria)

1. Single-stranded

2. Ribose
(with oxygen)

3. A, U, C, G
Uracil

4. Needs DNA as
template

5. 1^o Cytoplasm
(but Nucleus origin)

6. mRNA, rRNA, tRNA

*Triplets of bases code for amino acids,
the building blocks of proteins*

DNA

mRNA

tRNA

code word

codon

anti-codon

TAT

AUA

UAU

ACG

UGC

ACG

TTT

AAA

UUU

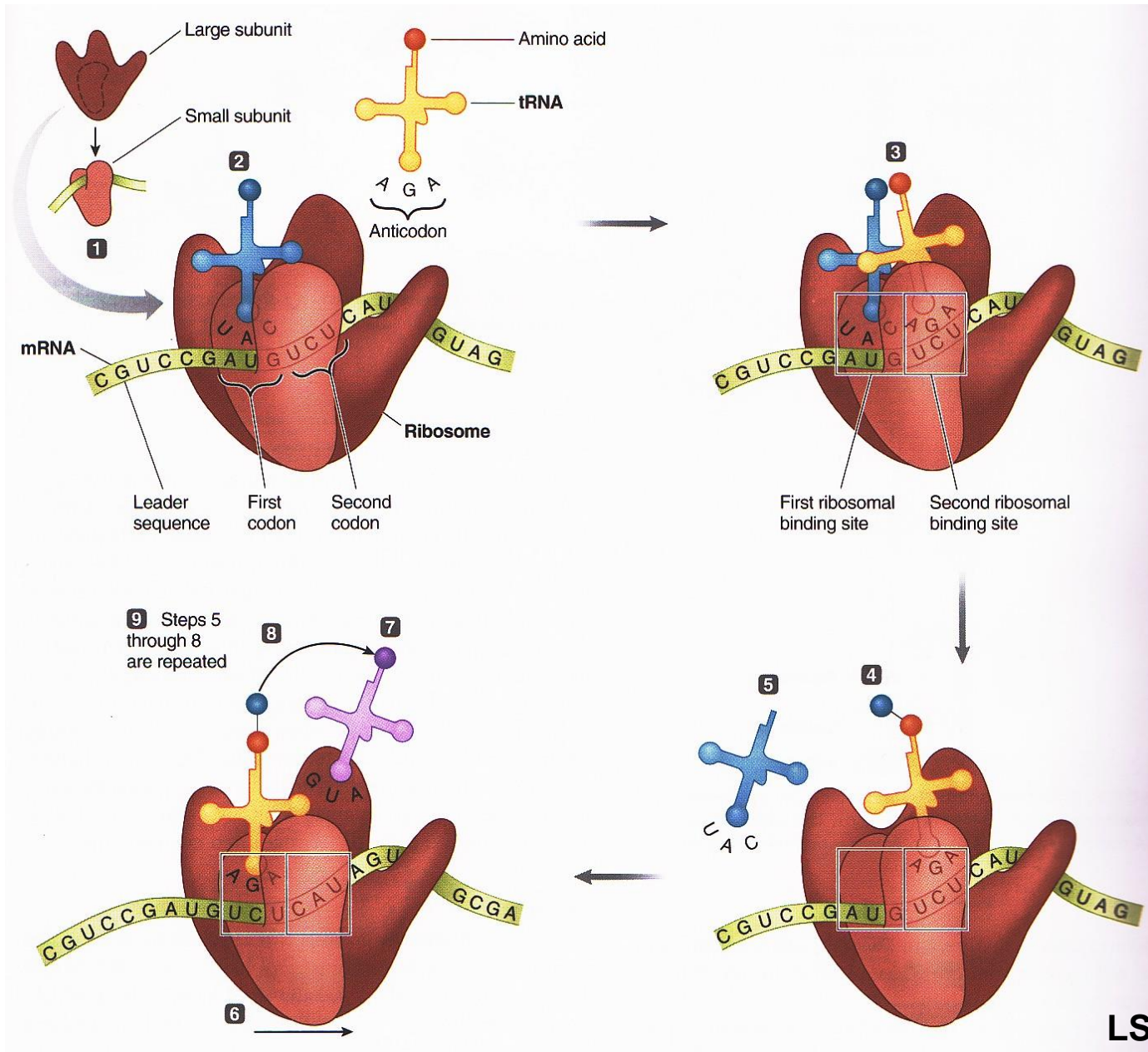
TAC

AUG

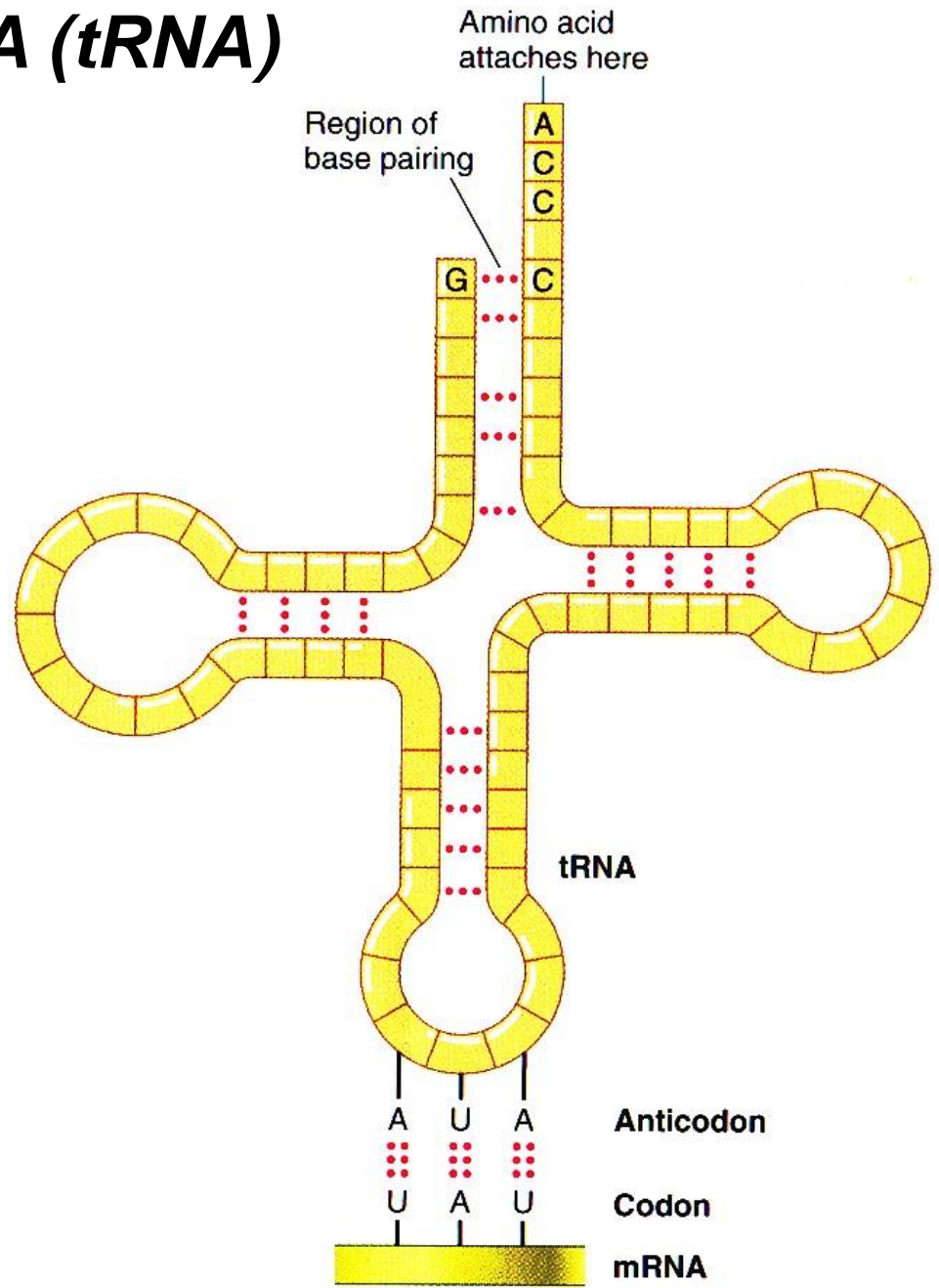
UAC

		Second base of codon							
		U	C	A	G				
First base of codon	U	UUU } Phe UUC } UUA } Leu UUG }	UCU } Ser UCC } UCA } UCG }	UAU } Tyr UAC } UAA } Stop UAG } Stop	UGU } Cys UGC } UGA } Stop UGG } Trp	U	C	A	G
	C	CUU } Leu CUC } CUA } CUG }	CCU } Pro CCC } CCA } CCG }	CAU } His CAC } CAA } Gln CAG }	CGU } Arg CGC } CGA } CGG }	U	C	A	G
	A	AUU } Ile AUC } AUA } AUG } Met Start	ACU } Thr ACC } ACA } ACG }	AAU } Asn AAC } AAA } Lys AAG }	AGU } Ser AGC } AGA } Arg AGG }	U	C	A	G
	G	GUU } Val GUC } GUA } GUG }	GCU } Ala GCC } GCA } GCG }	GAU } Asp GAC } GAA } Glu GAG }	GGU } Gly GGC } GGA } GGG }	U	C	A	G

Translation? Ribosomes Make Proteins

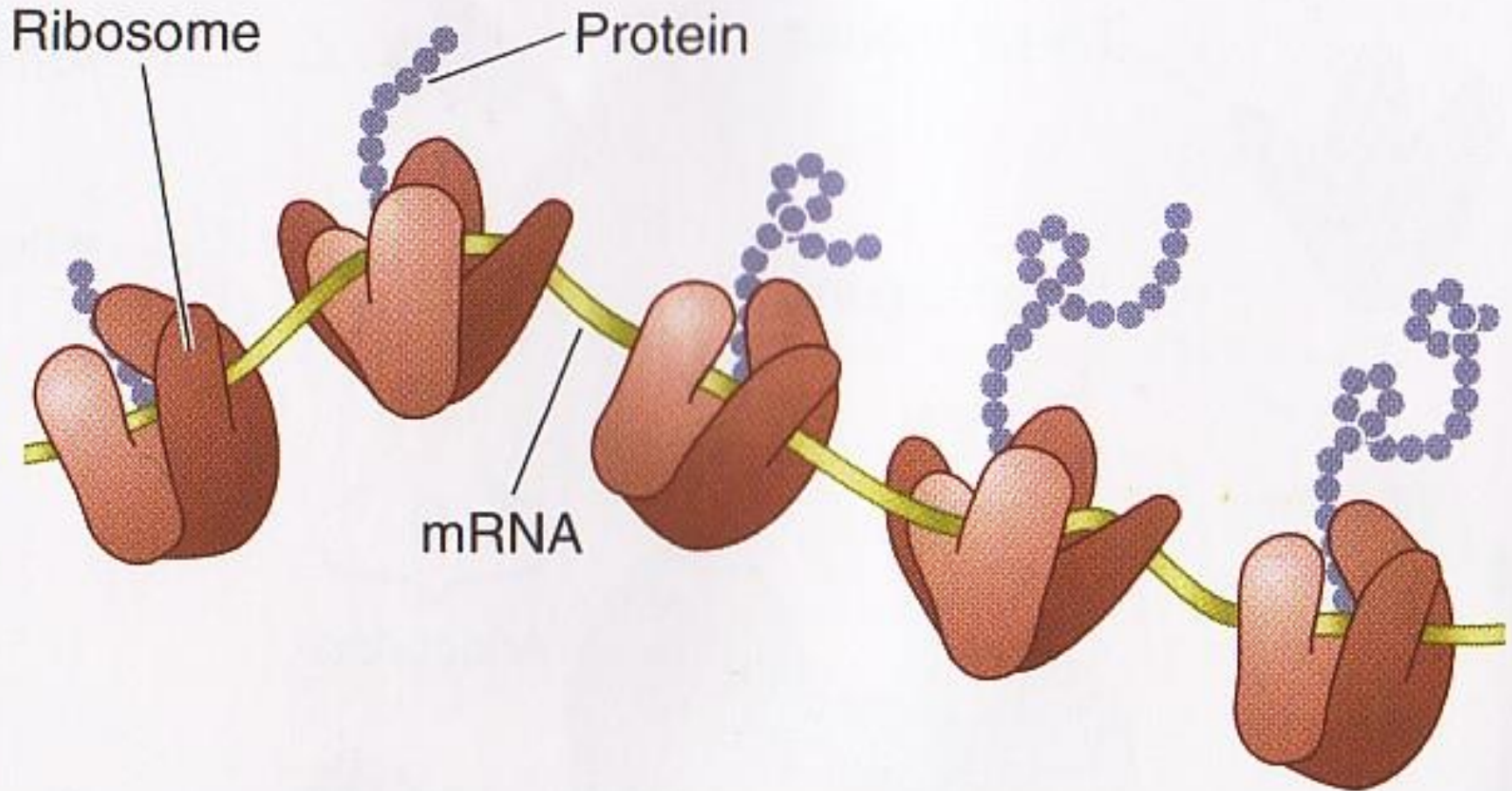


Transfer RNA (tRNA)



LS fig C-8

A Polyribosome. Which Way is Synthesis?



Class Skit on Translation!



A *protein* synthesizing factory, where *translation* takes place!

What's a ribosome?



You rock, baby!



Questions + Discussion



Macronutrients & Micronutrients Essential for Life

Macronutrients

H₂O/Water

✓ 1^o Carbohydrates

✓ 2^o Fats/Triglycerides/Lipids

✓ 3^o Proteins

Micronutrients

Vitamins (A, D, E, K; C + B)

Minerals (K⁺, Na⁺, Ca²⁺, Mg²⁺,
Fe²⁺, Zn²⁺,...)

✓ *Energy nutrients = yield ATP*

Sample Food Sources

Water, other drinks, fruits
& vegetables

Grains, vegetables, fruits,
dairy products

Meats, full-fat dairy
products, oils

Meats, legumes, dairy
vegetables

NB: Need only minute quantities!

Vegetables, vegetable oils,
fruits, citrus, grains, dairy

Fruits, vegetables, grains,
nuts, dairy, meats,
processed foods



MyPlate launched June 2, 2011

2. Focus on fruits.
Whole fruit preferable to juice, but any fruit counts!
Fill $\frac{1}{2}$ your plate with fruits & vegetables!

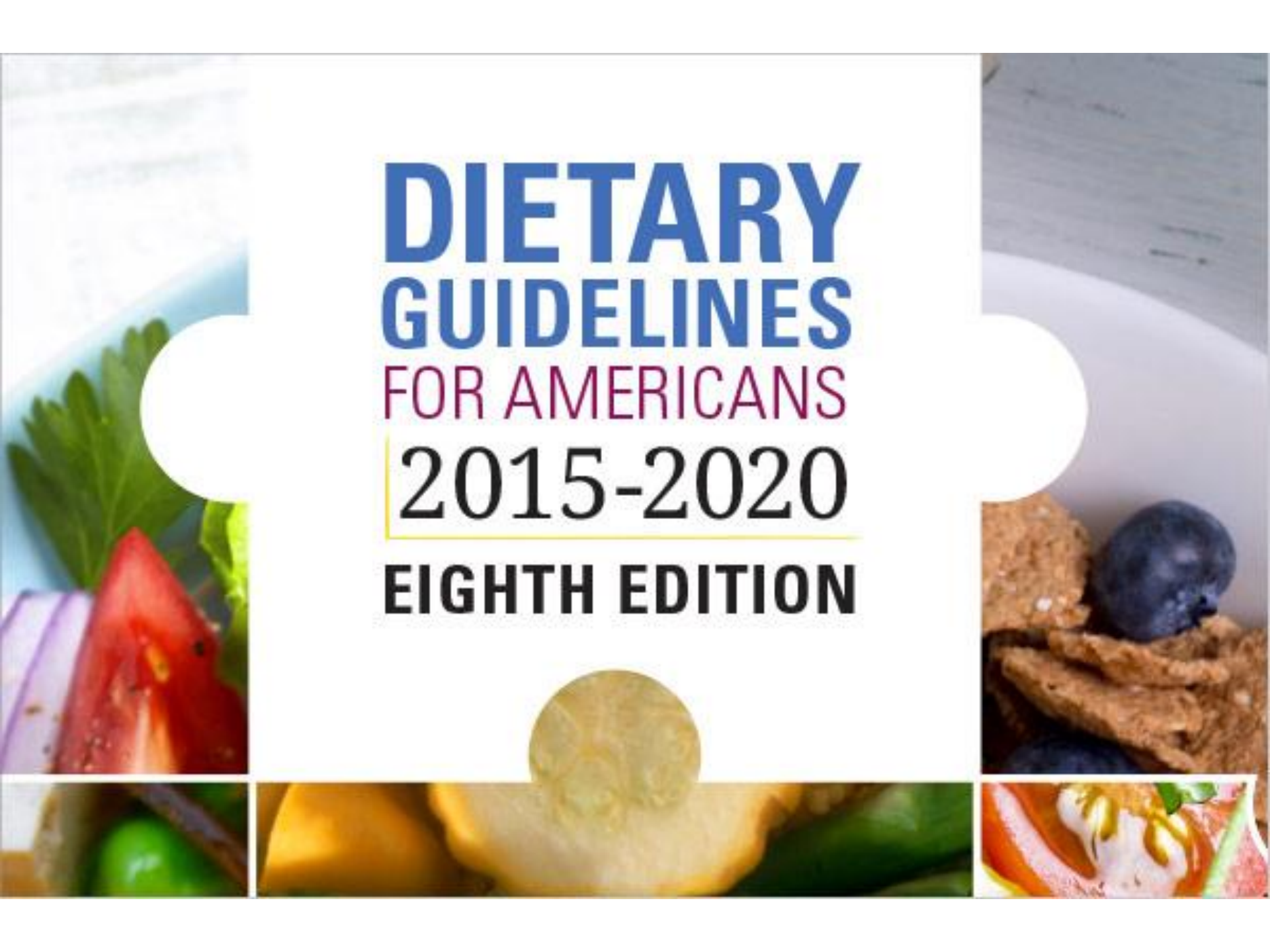


3. Make at least $\frac{1}{2}$ of your grains whole grains!

5. Get your calcium-rich foods. Buy skim or 1% milk. Go easy on cheese!

1. Vary your veggies.
Fill $\frac{1}{2}$ your plate with fruits & vegetables!

4. Go lean with protein. Keep protein to $< \frac{1}{4}$ plate! Nuts, beans, peas, seeds, poultry, lean meat, seafood,...



**DIETARY
GUIDELINES**
FOR AMERICANS
2015-2020
EIGHTH EDITION

Dietary Guidelines for Americans 2015-2020

Released January 7, 2016

A healthy eating pattern includes:

- **Variety of vegetables** from all subgroups: dark green, red & orange, legumes, starchy & other
- **Fruits**, especially whole fruits
- **Grains**, at least half of which are whole grains
- **Fat-free or low-fat dairy**, including milk, yogurt, cheese &/or fortified soy beverages
- **Variety of protein foods** including seafood, lean meats & poultry, eggs, legumes & nuts, seeds & soy products
- **Oils** (healthy)

A healthy eating pattern limits:

- **Saturated fats** & **trans fats**, added **sugars** & **sodium**
- **Balance calories with physical activity** to manage weight.

<http://health.gov/dietaryguidelines/2015/>

Diet & Health Guidelines for Cancer Prevention

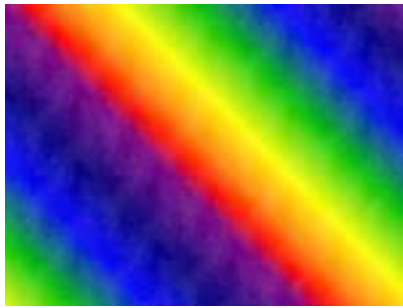
- 1. Choose a diet rich in variety of plant-based foods.**
- 2. Eat plenty of vegetables & fruits.**
- 3. Maintain a healthy weight & be physically active.**
- 4. Drink alcohol only in moderation, if at all.**
- 5. Select foods low in fat & salt.**
- 6. Prepare & store food safely.**

And always, remember...

Do not smoke or use tobacco in any form.



American Institute for Cancer Research (AICR)



Eating the Rainbow Hawaiian Style!!



Your plate should be the size of a Frisbee, not a manhole cover.

When it comes to colorful foods, Fruit Loops don't count.

A surprising number of people get 1/5 of their calories from sodas or other liquids.

If you look at the label & need a chemistry degree to read it, put the item back on the shelf!



SOURCE: P. Rath, *Honolulu Advertiser*, Sept 11, 2008 citing D. Chong & N. Kerr.



The World's Longest-Lived People!

○ Blue Zones! ○



<https://www.cbsnews.com/news/blue-zones-do-people-who-live-in-certain-areas-live-longer/>, Aug 2013.

Buettner, D. *National Geographic*, Nov 2005.

M Poulain & Coworkers. *Experimental Gerontology*, Sep 2004

Loma Linda, United States

Plant-based!

1. Eat a little bit better!
2. Move a little bit more!
3. Socialize more!
4. Strong sense of purpose!



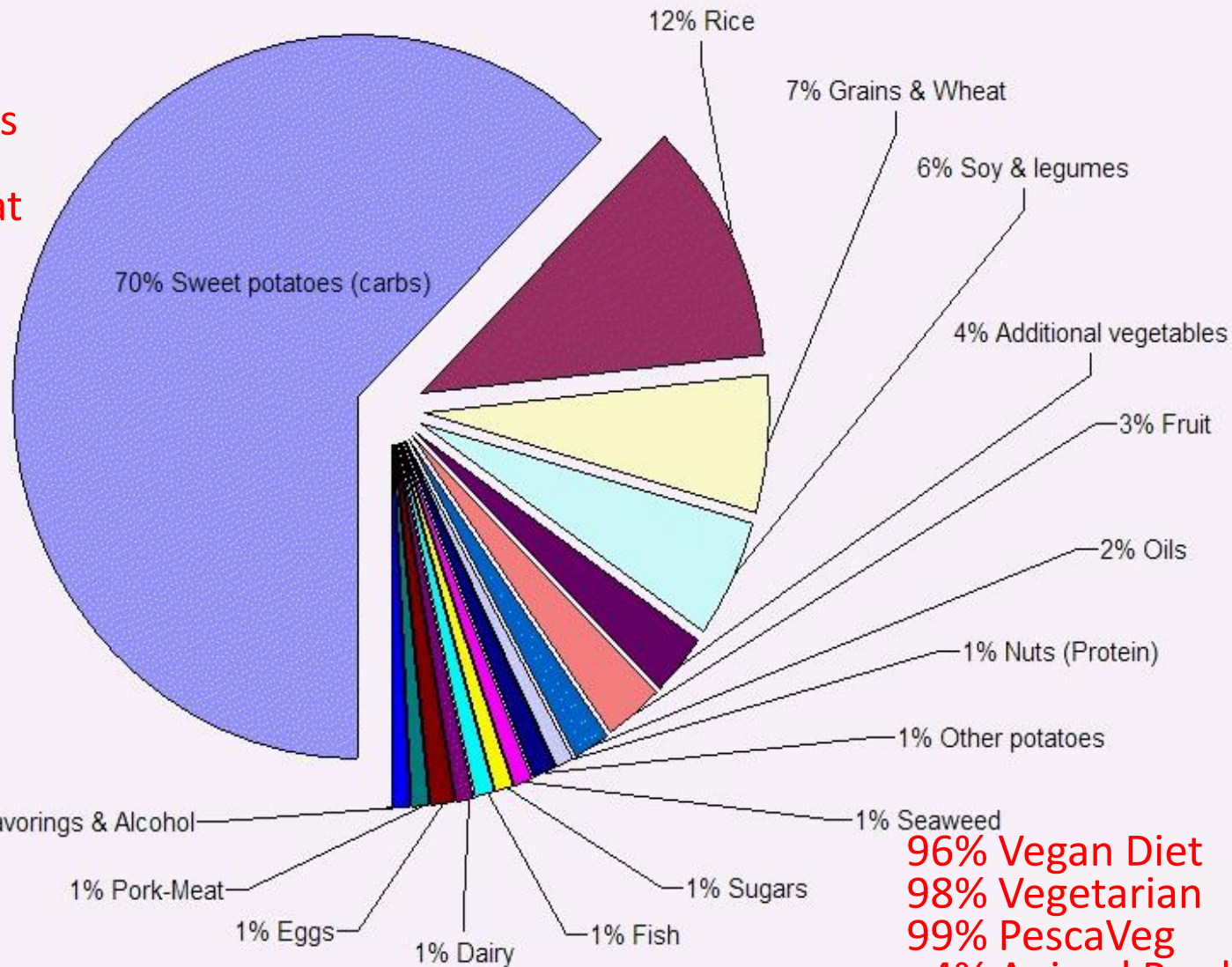
https://en.wikipedia.org/wiki/Blue_Zone

<https://bluezones.com/>

<http://www.sciencedirect.com/science/article/pii/S0531556504002141>

OKINAWA LONGEVITY DIET

- 70% Sweet Potatoes
- 12% Rice
- 7% Grains & Wheat
- 6% Soy & legumes
- 4% Additional vegetables
- 3% Fruit
- 2% Oils
- 1% Nuts (Protein)
- 1% Other potatoes
- 1% Seaweed
- 1% Sugars
- 1% Fish
- 1% Dairy
- 1% Eggs
- 1% Pork-Meat
- 1% Flavorings & Alcohol



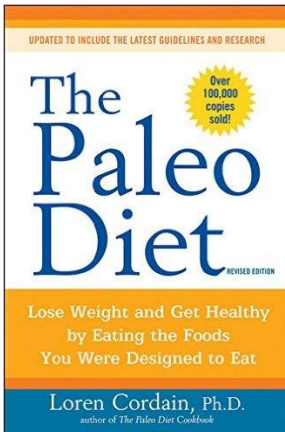
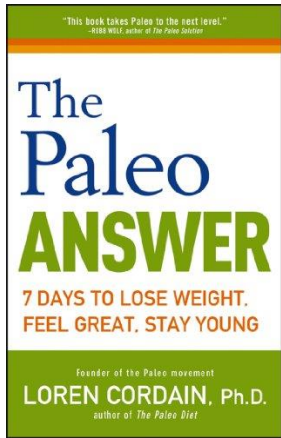
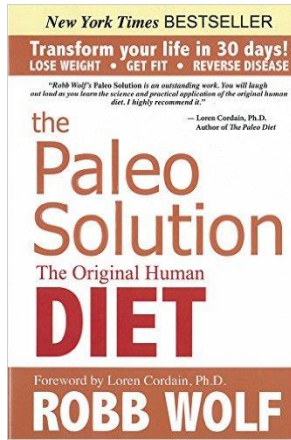
85% Carbohydrates
 9% Protein
 6% Fat
 85-10-5
 1785 Calories

96% Vegan Diet
 98% Vegetarian
 99% PescaVeg
 <4% Animal Prod
 <1% Fish
 <1% Meat-Pork

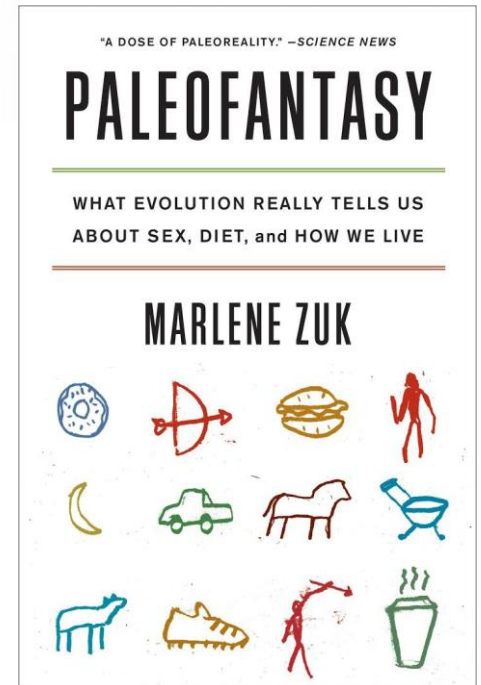
SCIENTIFIC STUDY: "The Diet of the World's Longest-Lived People and Its Potential Impact on Morbidity and Life Span"
 JOURNAL: Annals of the Academy of Sciences - Volume 1114: 434-455 (2007).

Note: These are the Actual Food Measurements of the Centenarians, not the diet of All island Okinawans or the ones who died, but the ones who lived.

Pondering Paleo?



**Evolutionary Biologist
Behavioral Ecologist
U Minnesota**



<http://www.nutritionaction.com/daily/how-to-diet/pondering-paleo/>

How much protein do you need?

Not much! 0.8 g/kg or 0.36 g/lb of body wt/d

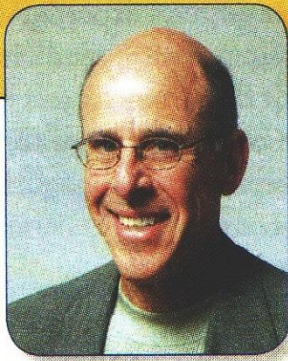
50 kg or 110 lb female ? ~ 40 g/d

80 kg or 176 lb male ? ~ 64 g/d



**Boneless,
skinless,
cooked
chicken
breast 6-8 oz,
53 -70 g of
protein!**

**Average US woman gets 35% > RDA!
Average US man 65% >RDA!**



John Swartzberg, M.D.
Chair, Editorial Board

WHO says to cut down on meat?

When I saw the headlines in October that meat was linked to cancer, I braced myself for the inevitable brouhaha. The news was that the International Agency for Research on Cancer (IARC), part of the World Health Organization (WHO), concluded that processed meats like hot dogs, bacon, and ham almost certainly increase the risk of colorectal cancer—by 18% per daily serving—and that red meat probably does as well.

But we've heard about this link many times before. Over the past 20 years, many observational studies have found that people who regularly eat red or processed meats have higher rates of several cancers, notably of the colon and rectum. And lab studies have shown that compounds formed when meat is processed (that is, smoked, salted, or cured) or cooked at high temperatures can cause cancer in animals or cells. All that research served as the basis of the IARC conclusions. But even in 2007 the World Cancer Research Fund, another key group of experts, concluded that there was "convincing" evidence that these meats increase the risk of colorectal cancer. And since 2002, WHO has advised people to moderate their consumption of processed meat, as do the still-pending 2015 Dietary Guidelines for Americans.

What elicited the most heated reaction in the press and blogosphere and especially from the meat industry was the fact that the IARC put processed meats in its Group 1—"carcinogenic to humans"—which includes tobacco smoking and asbestos. (It put red meats in Group 2A—"probably carcinogenic.") The IARC clearly explained that this classification merely indicates the strength of the evidence that something causes cancer, not the *degree* of risk. In fact, it said that the increased risk

from red or processed meat is "small" for individuals, though potentially important for public health since so many people eat meat.

What about that 18% increase in risk? The IARC estimated that for every serving of processed meat (just under 2 ounces) or red meat (3½ ounces) eaten daily for years, the lifetime risk of colorectal cancer goes up by about 18%. But this is what's known as relative risk, which can be misleading. For instance, the lifetime risk of developing colorectal cancer in the U.S. is about 5%. An 18% increase does not mean $5\% + 18\% = 23\%$, but rather $5\% + (18\% \text{ of } 5\%) = 6\%$. That means one extra case of colorectal cancer per 100 meat eaters. In contrast, smoking increases the lifetime risk of lung cancer by roughly 2,000%—from about 1 per 100 people to about 20 per 100. So while IARC may classify both processed meat and smoking as Group 1 carcinogens, there's no comparison in their risks.

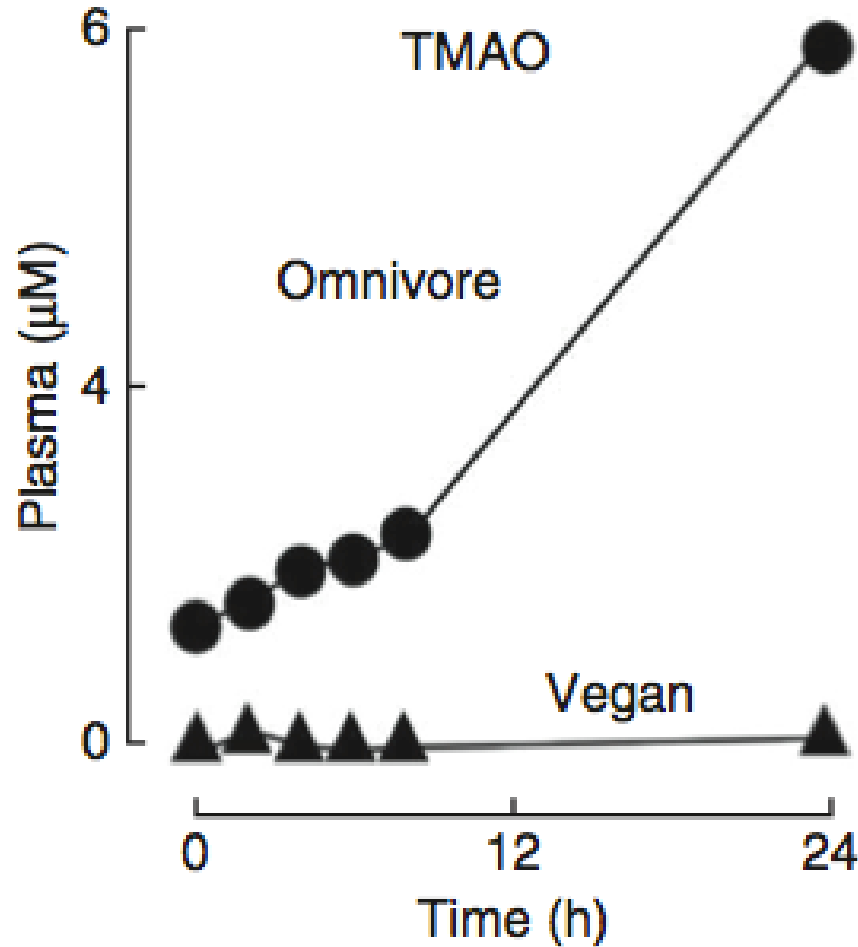
In fact, IARC cited estimates that 34,000 cancer deaths per year worldwide can be attributed to diets high in processed meat. In contrast, tobacco causes nearly 2 million cancer deaths per year.

I should add that I don't think it has been clearly established that meat causes cancer. Proving that foods cause or help prevent cancer is difficult for many reasons. Notably, the observational studies upon which the IARC classifications were largely based can only find associations—they cannot prove cause and effect.

That said, there are plenty of other reasons to moderate your intake of red meats and limit processed ones. There's strong evidence linking them to cardiovascular disease and a variety of other disorders, though it's not clear which compounds in them are the possible culprits. What's more, eating more plant-based foods and less meat is better for the planet, resulting in less greenhouse gas production.

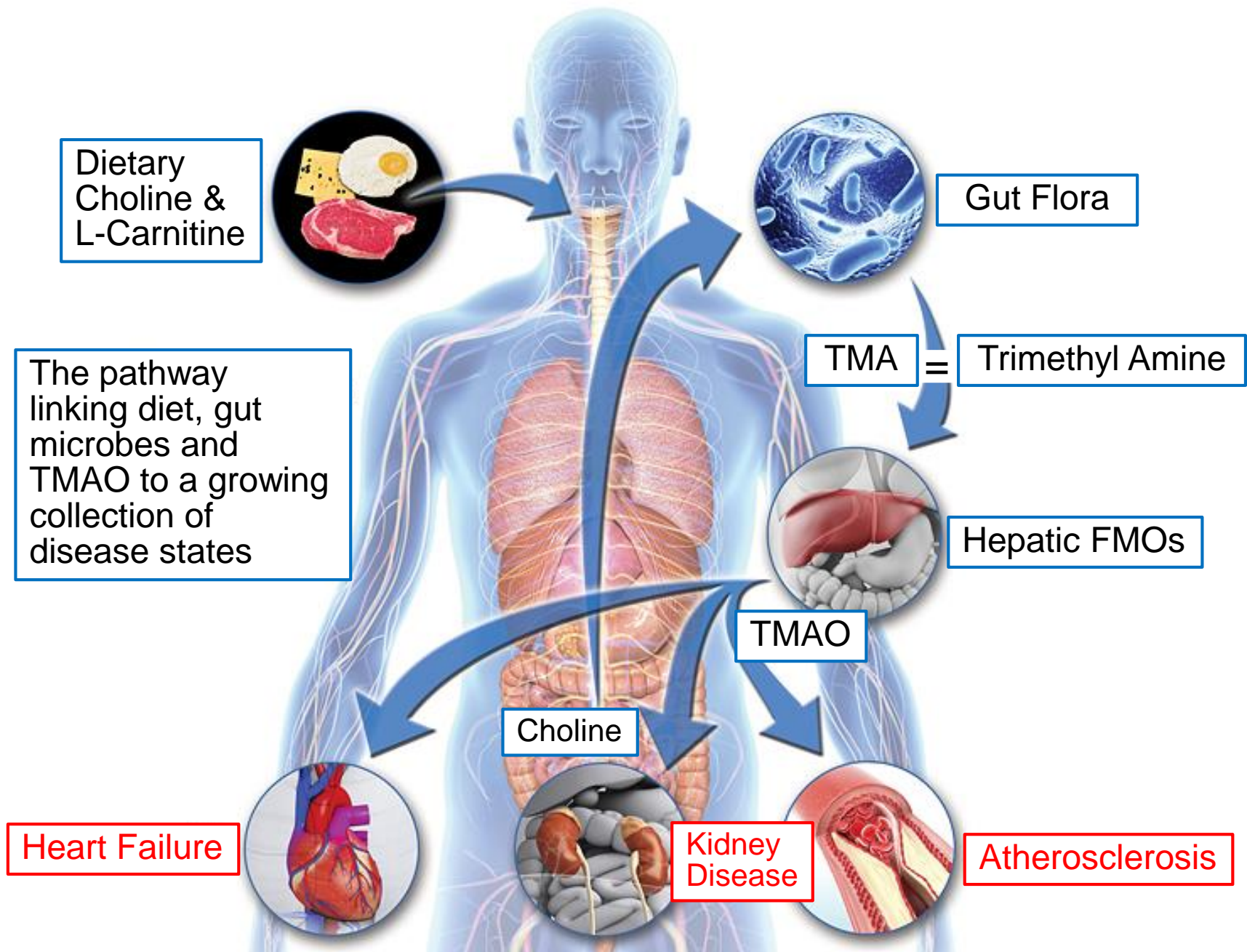
And there's a far surer way to reduce the risk of colorectal cancer than tinkering with your diet: Get screened.

Gut Bacteria Involved in **Inflammation & Atherosclerosis**?

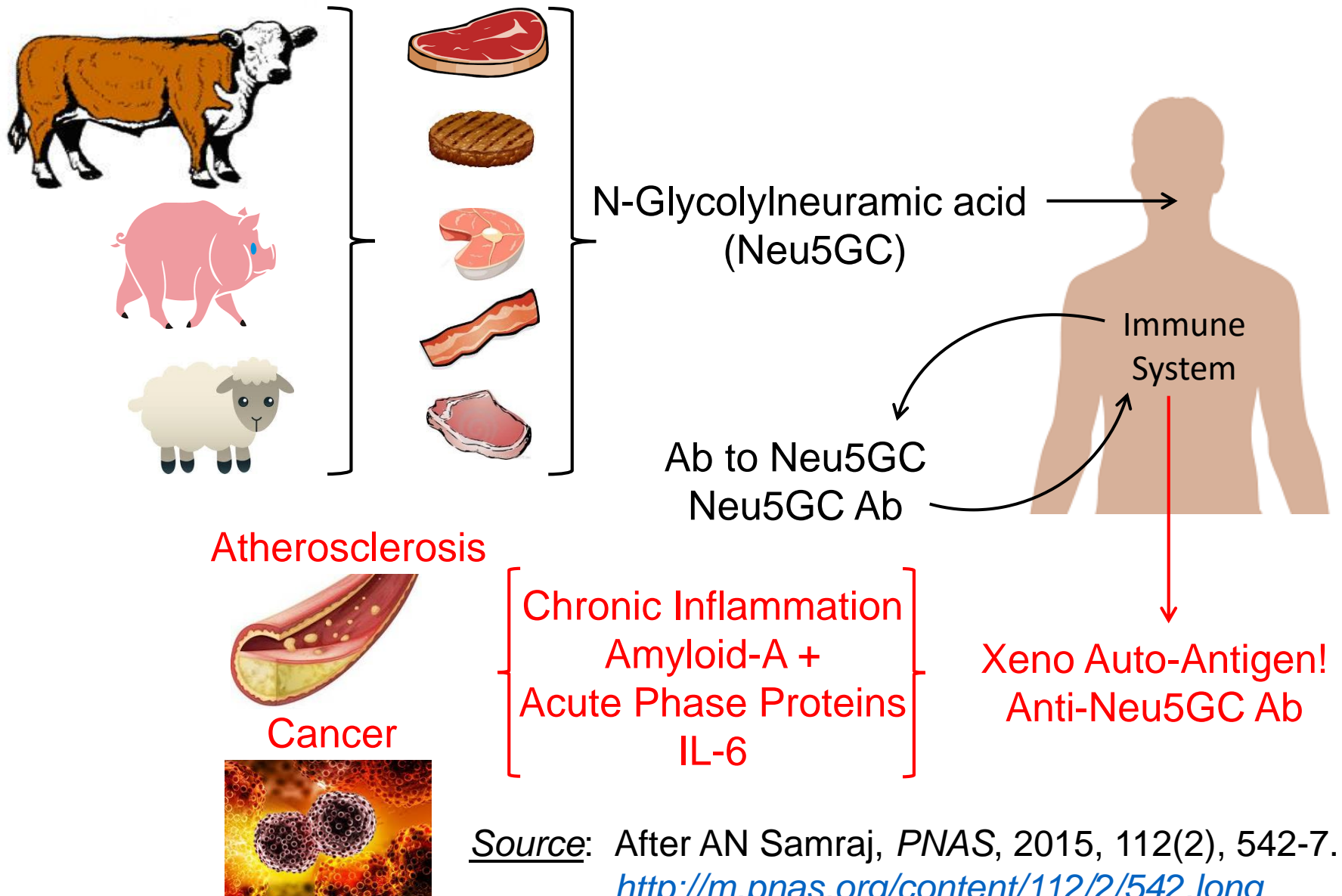


Meat & Eggs → L-Carnitine & Choline → Trimethyl Amine (TMA) →
TMAO → **Inflammation & Atherosclerosis**

<https://consultqd.clevelandclinic.org/2015/02/gut-flora-dependent-tmao-new-studies-extend-its-reach-beyond-the-arteries-to-the-heart-and-kidneys/>



Red Meat-Derived Glycan Promotes Inflammation & Disease



Source: After AN Samraj, *PNAS*, 2015, 112(2), 542-7.
<http://m.pnas.org/content/112/2/542.long>

Nutrition *Action*

OCTOBER 2016 \$2.50

HEALTH LETTER®
CENTER FOR SCIENCE IN THE PUBLIC INTEREST

Carbohydrate Confusion

Should you avoid carbs
at all costs?



No, ↑ *complex*
↓ *simple!*
Emphasize a
plant-based
diet!

Our Planet
AT RISK

The Best
SPREADS

3 Veggie
Dips

Actor Halle Berry "swears by the ketogenic diet,"
according to *Women's Health* magazine.

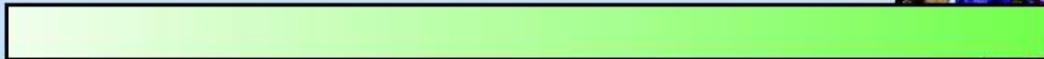
Dietary Composition & Physical Endurance

eg, Atkins!

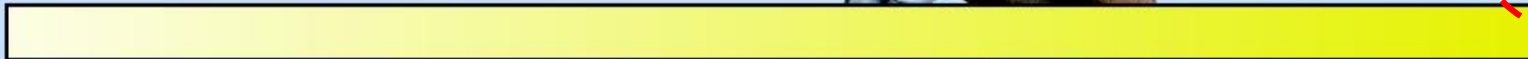
High-fat diet



Normal mixed diet



High-carbohydrate diet



~ 1/3 endurance!

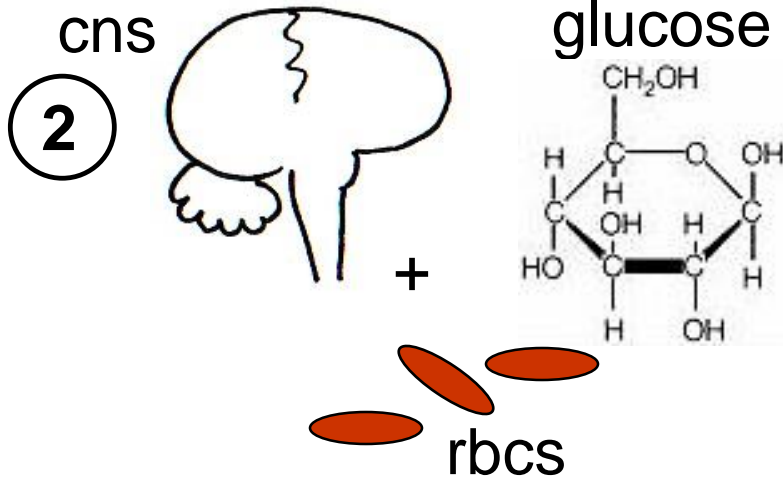
Maximum endurance time:

57 min

114 min

167 min





Negative Effects of Low Carbohydrate

1



- ① ↑ fatigue/exhaustion central & peripheral!
- ② ↓ glucose – brain+spinal cord, rbcs thrive upon.
- ③ ↓ variety which reduces intake of phytochemicals, vitamins, minerals & fiber.
- ④ ↑ risk of respiratory infections.

4



+ gall stones,
↓ thermoregulation...

We're better at storing fat vs carbohydrate!

Dietary Fat



3 % Kcal

Body Fat



23 % Kcal

**Dietary
Carbohydrate**



**To Help Lower Body Wt & %Fat
EXERCISE!! + *Minimize* These!!**

FAT 9 Kcal/g

ETOH 7 Kcal/g

CARB 4 Kcal/g

PRO 4 Kcal/g

**DIETFITS (2018)
+ Pounds Lost
Trial (2009)
indicate that
reducing overall
calories is more
important than
macronutrient
composition of
the diet!**

**NB: Minimize not Eliminate!
Moderation not Abstinence!!**

<https://www.ncbi.nlm.nih.gov/pubmed/29466592>

<https://www.ncbi.nlm.nih.gov/pubmed/19246357>

***I'm not sure I believe you!
Why can't I just starve to
lose weight?***



TOTAL FAST =
No Energy Nutrients
(No Carbohydrates, Fats
or Proteins)

ONLY

- 1. Water**
- 2. Vitamins**
- 3. Minerals**

60-day Fast???

Lost 60 lb!! Wow!!

Yet

26 lb Water

20 lb Lean Body Mass

14 lb Fat

Fat < $\frac{1}{4}$ total wt loss!

> $\frac{3}{4}$

***You can lose weight by
starving – but it's mostly
water & muscle! Also, there
can be complications!***



Potential Complications of Total Fasting

**Nausea, diarrhea, persistent vomiting,
postural hypotension, nutritional
deficiencies, menstrual irregularities,
and...sudden death.**

Positive Aspect??

**General loss of appetite within
first 2 days, maintained
throughout fasting period.**

The Filthy Food Act, p. 2

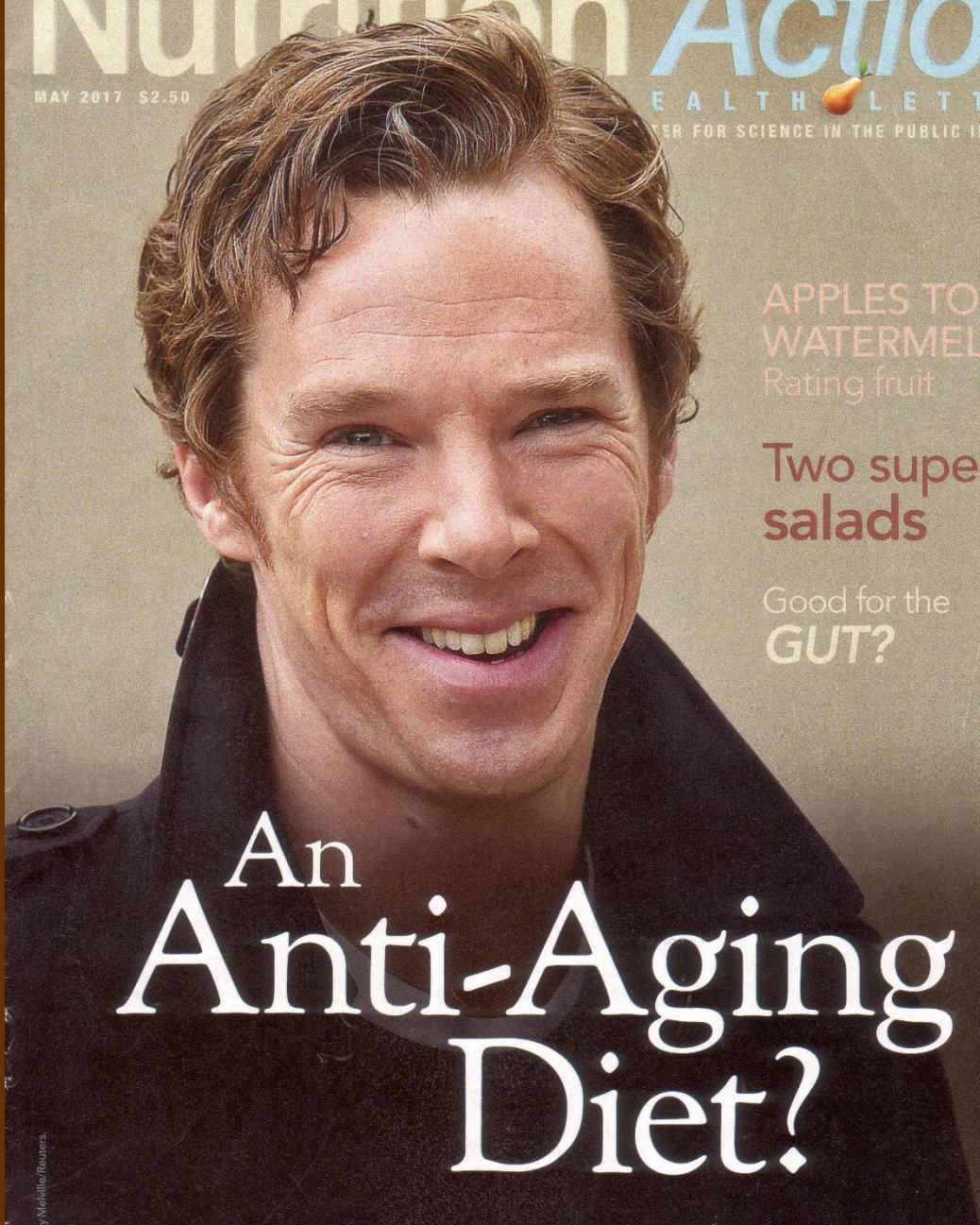
Vitamin D, calcium, & cancer, p. 8

Almond creamers, back cover

Nutrition Action

MAY 2017 \$2.50

HEALTH LETTER®
FOR SCIENCE IN THE PUBLIC INTEREST



APPLES TO
WATERMELON
Rating fruit

Two super
salads

Good for the
GUT?

An Anti-Aging Diet?

© 2017, Toby Melville/Reuters



CALERIE STUDY

Comprehensive Assessment of Long-term
Effects of Reducing Intake of Energy



- 2-yr kcal restriction, assess biomarkers longer, healthier life
- 218 people, 21 – 51 yr, ½ ~ overweight, ½ normal wt
- Usual diet or cut kcal by 25% (achieved ~ 12% so < ½ goal)
- If cut calories, lost 10% body wt ~ 17 lb & kept off for 2 yr
- Cardiometabolic Δ s: ↓ Cholesterol, ↓ Inflammatory markers,
↑ control blood sugar control w/o
adverse sexual or immune function Δ s

Some bone loss, but attributed to weight loss.



National Institute
on Aging



Das SK, Roberts SB, Bhapkar MV & coworkers.
Am J Clin Nutr 2017 Apr, 105(4):913-927.

<https://www.ncbi.nlm.nih.gov/pubmed/28228420>

5:2 Intermittent “Fasting”

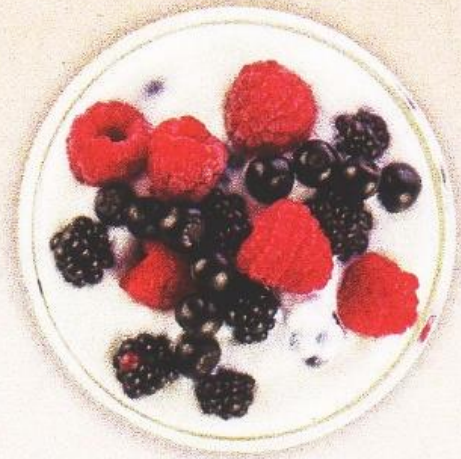
2 Days a Week

500-CALORIE DAY

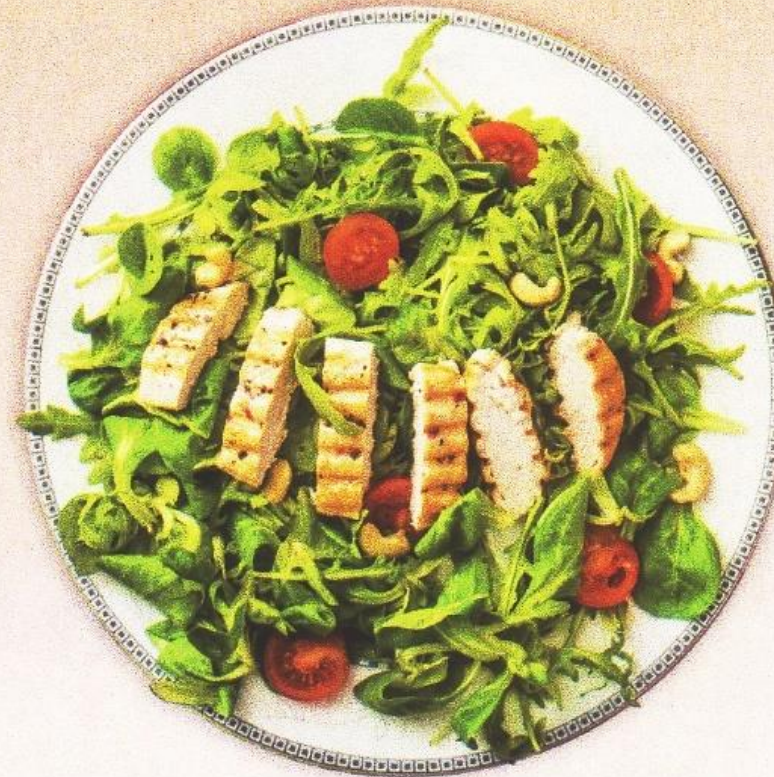


Breakfast

*Plain low-fat yogurt
with berries*
200 calories



NAHL 2017 May

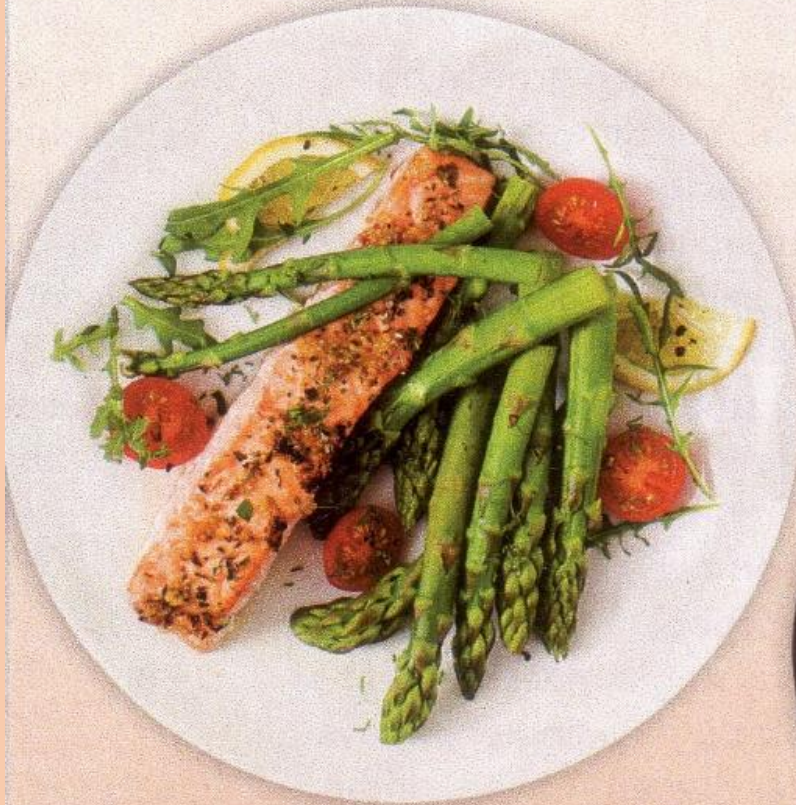


Dinner

*Mixed greens
with grilled chicken*
300 calories

5:2 Intermittent “Fasting”

600-CALORIE DAY



Dinner

*Baked salmon with
asparagus and
tomatoes*

350 calories

Breakfast

*Oatmeal with
peaches, berries,
and milk*

250 calories



Human Intermittent Fasting Studies

- ~100 overweight or obese women
- ½ cut 25% kcal every day
- ½ ate normally 5 d, but only 650 kcal/d for 2 d/wk
- After 3 – 6 mo, each group lost ~ same amount of wt but women on 5:2 diet had better insulin function!
- Likely easier for most humans to restrict for only 2 d/wk!

The Nightingale Centre
Wythenshawe Hospital
Southmoor Rd
Manchester
M23 9LT



UHSM
Your Hospital

Harvie M, Wright C, Pegington M and coworkers. *Br J Nutr* 2013 Oct,110(8): 1534-47. <https://www.ncbi.nlm.nih.gov/pubmed/23591120>

Harvie M, Peginton M, Mattson M and coworkers. *Int J Obes* (London), 2011 May, 35(5):714-27. <https://www.ncbi.nlm.nih.gov/pubmed/20921964>

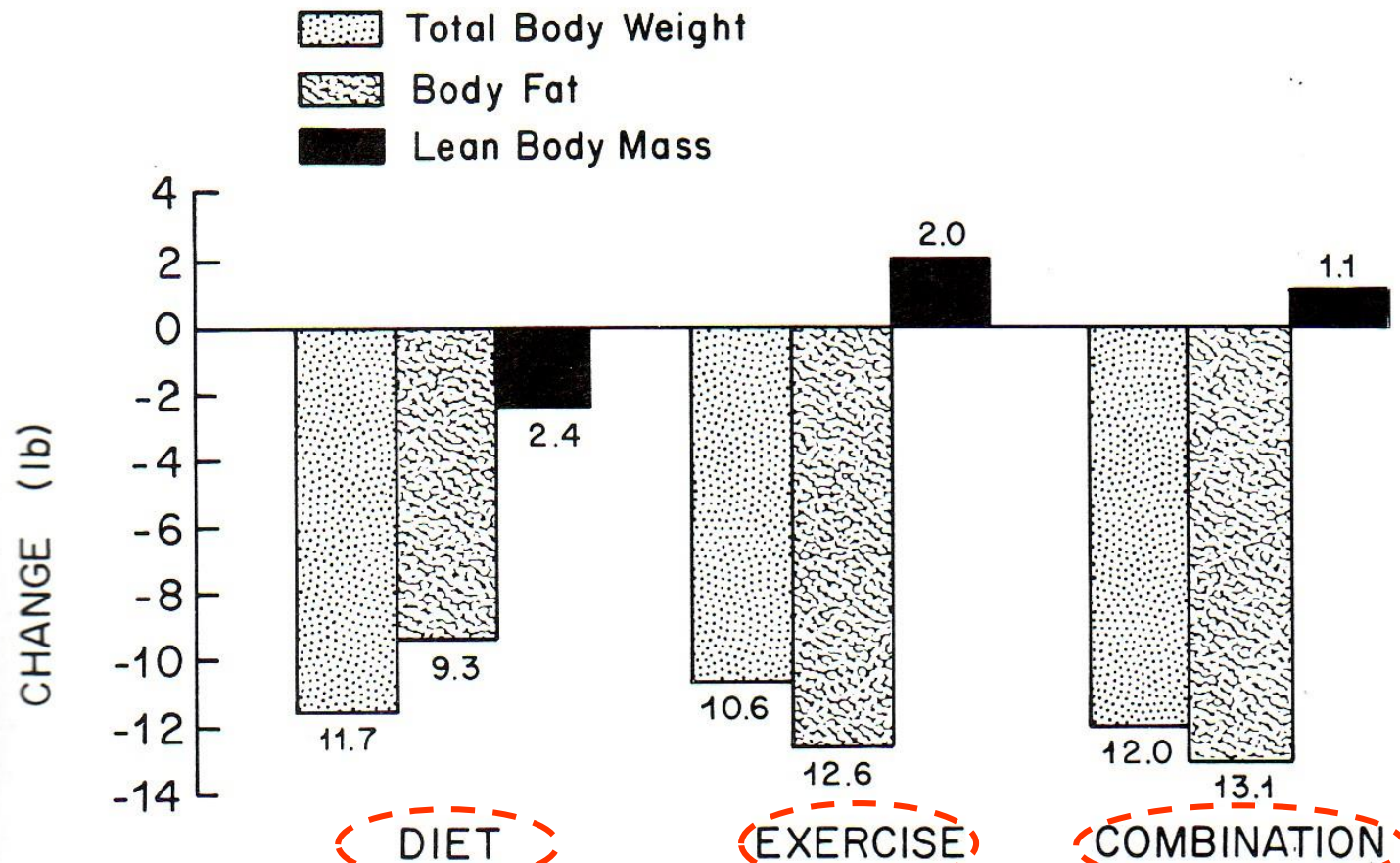


Figure 4-9. Changes in body weight, body fat, and lean body weight for diet, exercise, and combination groups. (From Zuti W. B., and Golding, L. A.: Comparing diet and exercise as weight reduction tools. *Phys. Sportsmed.* 4:49-53, 1976.)

NB: Each group 500 kcal deficit/day, 16 weeks



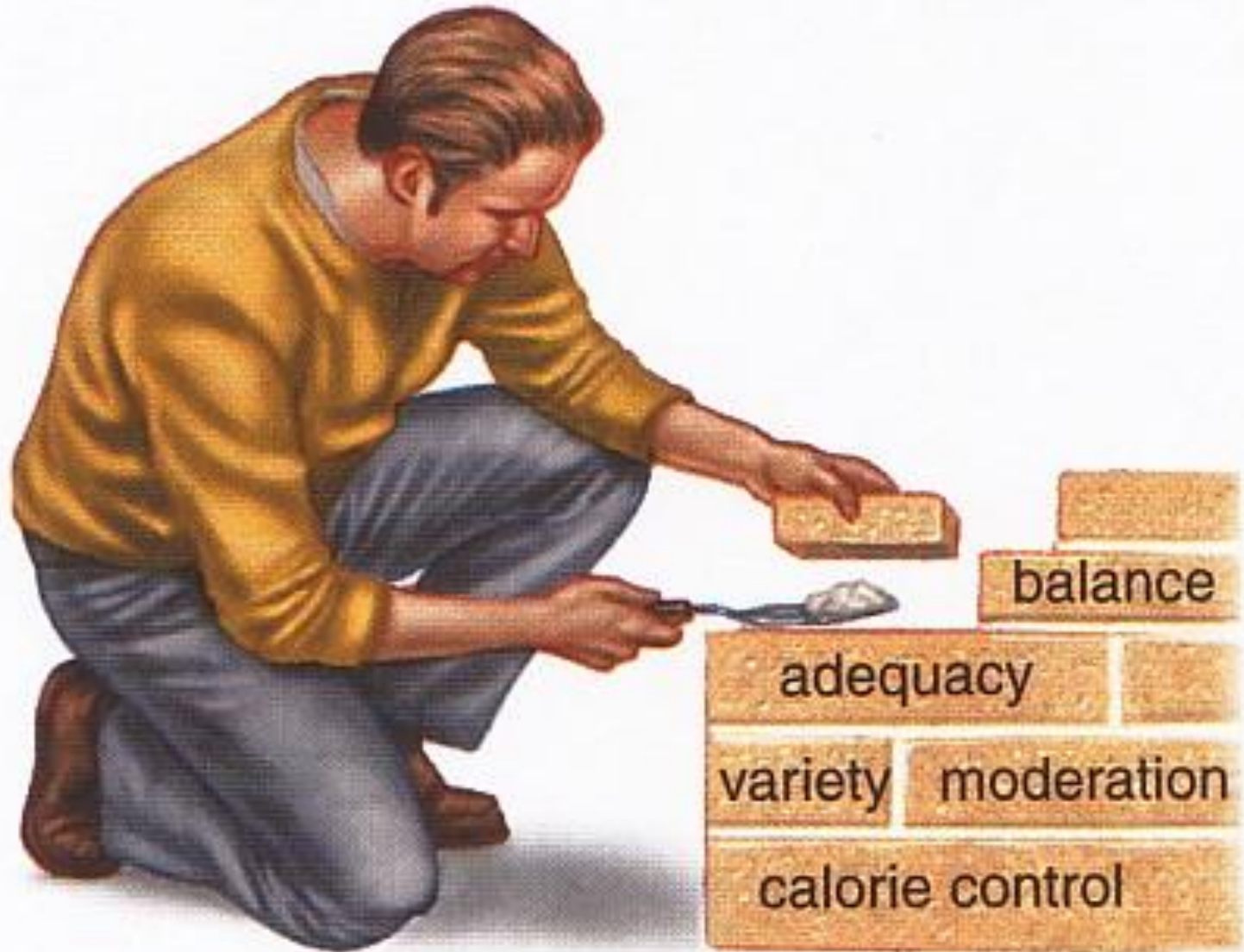
Exercise is better than dieting in lowering body fat & preserving muscles!



Emphasize ABCs + Variety & Moderation!



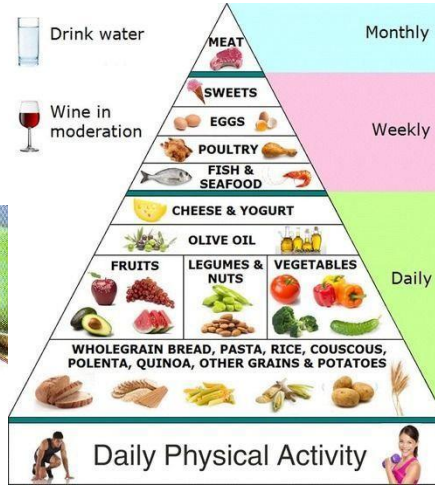
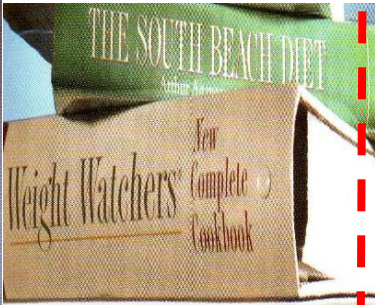
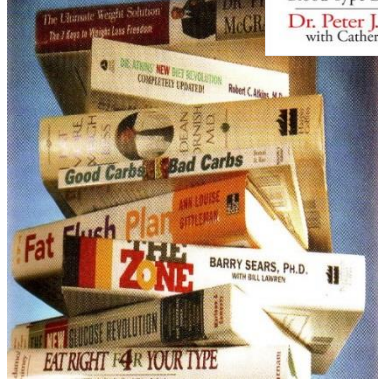
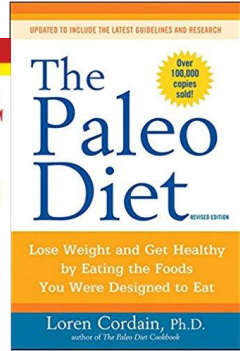
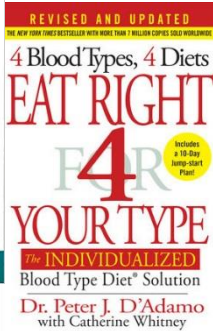
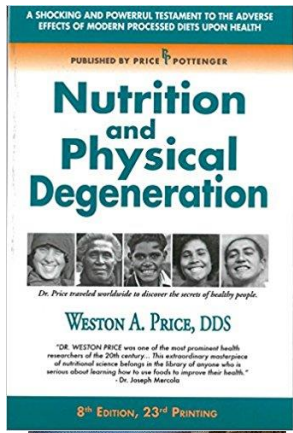
*All of these factors help to build
a nutritious diet.*



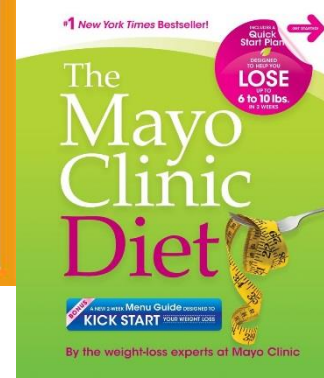
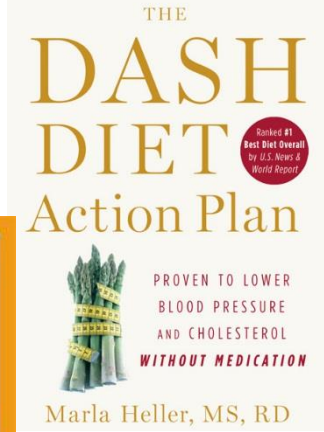
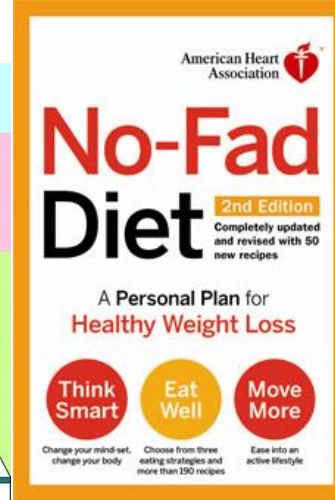
Kleiner's & Monaco's Top 10 Hit List for Nutrition Quackery

1. Treatment based on unproven theory calling for non-toxic, painless therapy.
2. Author's/purveyor's credentials aren't recognized in scientific community.
3. No reports in scientific, peer-reviewed literature but rather mass media used for marketing.
4. Purveyors claim medical establishment is against them & play on public's paranoia about phantom greed of medical establishment.
5. Treatments, potions, drugs manufactured according to secret formula.
6. Excessive claims promising miraculous cures, disease prevention or life extension.
7. Emotional images rather than facts used to support claims.
8. Treatments require special nutritional support including health food products, vitamins and/or minerals.
9. Clients are cautioned about discussing program to avoid negative.
10. Programs based on drugs or treatments not labeled for such use.

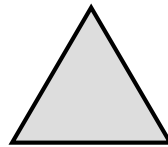
Which Diets are Best?



Mediterranean Diet



Not Plant-based
Lower Carbohydrate



Plant-based
Lower Fat



Not Peer-Reviewed = Trade Book
→ Opinion



Peer-Reviewed = Text Books
→ Research

Nutrition *Action*

JULY/AUGUST 2018 \$2.50

HEALTH LETTER®
CENTER FOR SCIENCE IN THE PUBLIC INTEREST

How Did We Get Here?



Explaining the obesity epidemic

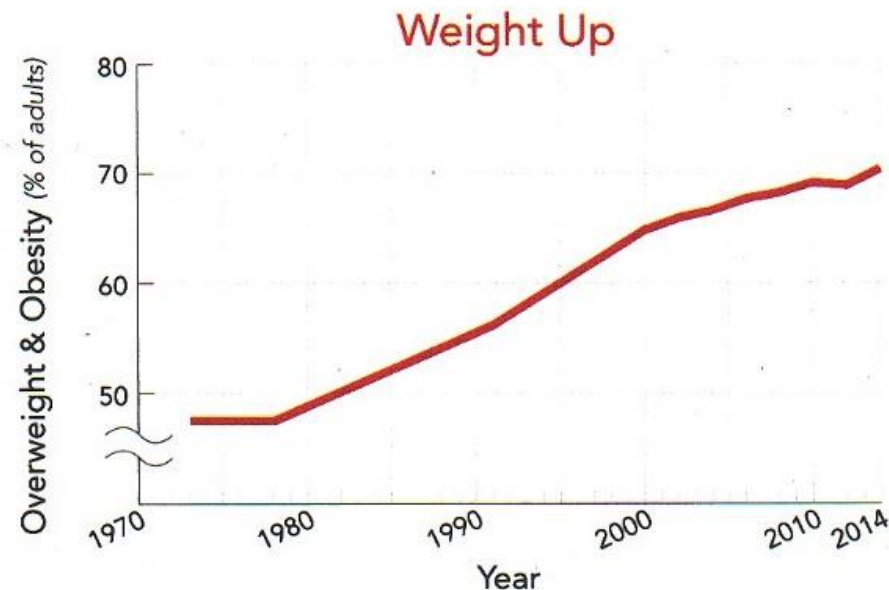
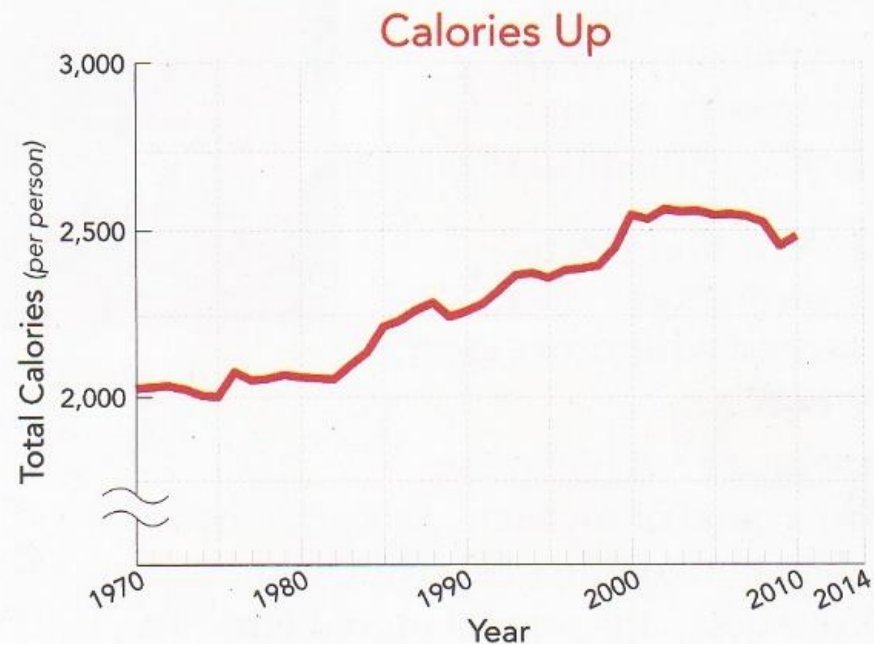
HOW TO
EAT LESS

2018
**Xtreme Eating
Awards**

**Trans Fat
R.I.P.**

Photo: iStockphoto.com/stevegrace

Calories in the food supply have risen consistently since the onset of the obesity epidemic!



SOURCE: Liebman B & Hall H. How did we get here? Explaining the obesity epidemic. *Nutrition Action Health Letter*, 2018 Jul-Aug, 3-8.

Cheap, but
calorie & fat
dense!

\$5 **HOT-N-READY LUNCH COMBO** **1640 kcal!**



\$1 Any Size Soft Drink
All items only

\$2 Small McCafé
Smoothies, Frappés & Shakes

290 kcal!

530 kcal!



Watch out for
drinking your
calories!

5 times per wk? \equiv 106,600 calories/yr \equiv \pm 30.5 lb fat/yr



\equiv



Starbucks
Cinnamon
Dolce Latte,
whipped cream
Venti (20 oz.)

410 calories

Jogging | **50 min.**

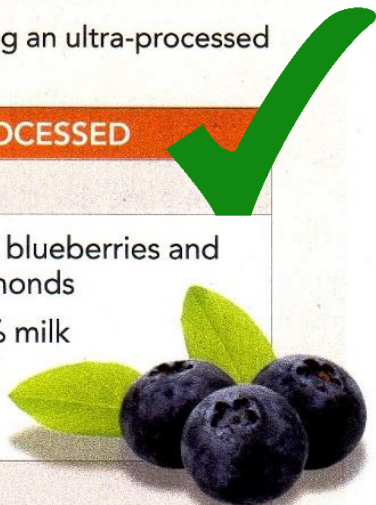


**Better
choices!**

What's an Ultra-Processed Diet?

Here are two sample menus from Kevin Hall's study pitting an ultra-processed diet against an unprocessed diet.

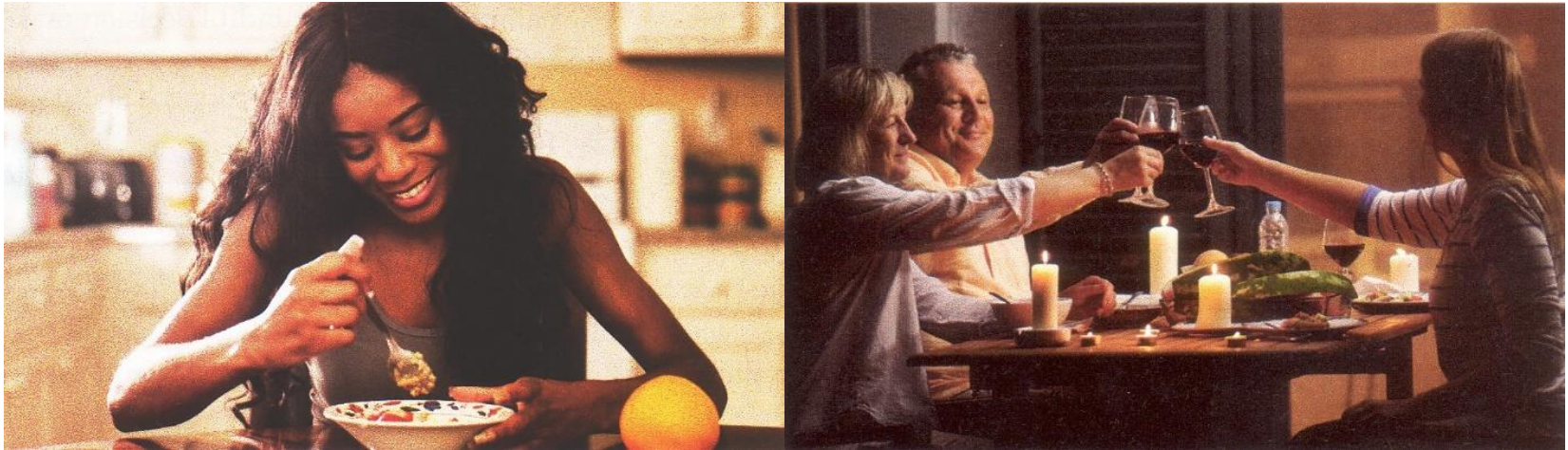
ULTRA-PROCESSED	UNPROCESSED
Breakfast	
Pancakes with margarine and syrup Turkey sausage Tater tots Apple juice	Oatmeal with blueberries and almonds 2% milk
Lunch	
Turkey sandwich with American cheese and mayo on white bread Baked potato chips Diet ginger ale	Entrée salad with grilled chicken breast, farro, apples, grapes, and lemon vinaigrette
Dinner	
Cheeseburger French fries and ketchup Diet ginger ale	Beef tender roast Couscous with lemon and garlic Green beans Side salad with honey vinaigrette
Snack	
Sweetened greek yogurt Canned peaches in heavy syrup	Carrots Black bean hummus



For more information: *BMJ Open* 2016. doi:10.1136/bmjopen-2015-009892.

SOURCE: Liebman B & Hall H. How did we get here? Explaining the obesity epidemic. *Nutrition Action Health Letter*, 2018 Jul-Aug, 3-8.

Eat Breakfast, Eat Early, Downsize, Go Low!



Eating early & less late (< ~ 6:30 pm) may help insulin work efficiently!

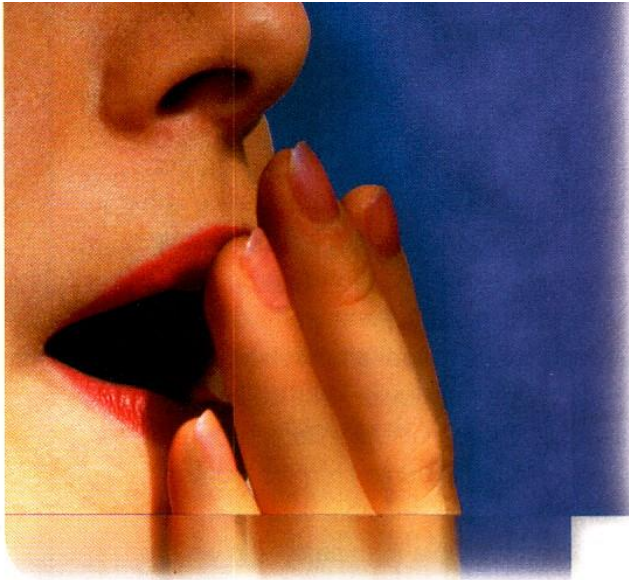


Smaller amount vs plate size!



**Fruits & vegetables for
low-calorie density!**

SOURCE: Dow C. How to eat less. What works. What doesn't.
Nutrition Action Health Letter, 2018 Jul-Aug, 6-8.



Sleep More, Eat Less

Wondering why you're so hungry? Maybe it's because you're not getting enough sleep.

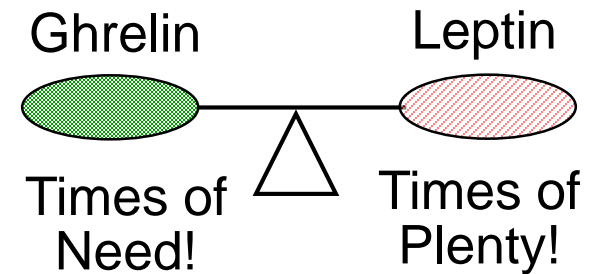
Researchers allowed 12 healthy young lean men to sleep for either four or eight hours in a laboratory. After one night of

four hours of sleep, the men ate 22 percent more calories the next day than they did after eight hours. They also reported being more hungry before breakfast and dinner.

In a separate study, scientists found that a single night with only four hours of sleep led to insulin resistance in nine healthy lean men and women in their 40s. After the night of restricted sleep, the participants were less able to move blood sugar into their cells, which suggests that their bodies were at least temporarily resistant to insulin. Insulin resistance can lead to heart disease, diabetes, and possibly breast cancer.

What to do: Get enough sleep. Most adults need 7 to 8 hours a night. (School-aged children need at least 9 hours.) Other studies that limit adults' sleep find higher levels of ghrelin (which makes people hungry) and lower levels of leptin (which makes people feel full) in their blood. Changes in ghrelin, leptin, and insulin resistance may explain why studies find a higher risk of obesity, heart disease, diabetes, and high blood pressure in people who get too little sleep.

**promotes
Leptin
release!**



<http://www.vivo.colostate.edu/hbooks/pathphys/endocrine/gi/ghrelin.html>

Successful Dieting – National Weight Control Registry

- 5000 people, ≥ 30 lb weight loss, ≥ 5 yr
- High-carbohydrate (55-60%), low-fat (24%) diet with the rest (~ 16 -21%) from protein
- Wholesome vs. high-sugar carbohydrates including fruits, vegetables, high-fiber foods

- Conscious of calories knowing that total calories count, no matter what diet type

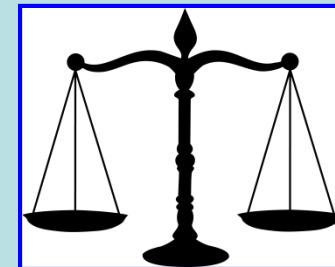
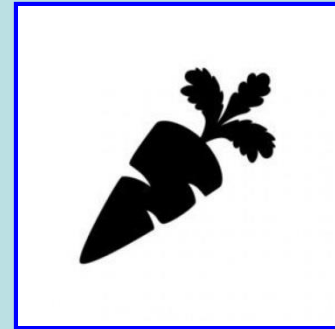
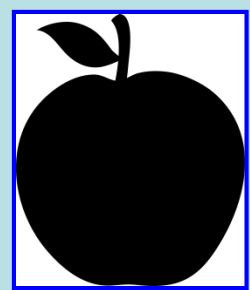
- Eight of 10 ate breakfast daily which may help better manage calories during the day

- Self-monitor, weigh themselves ≥ 1 x/wk & many still keep food dairies

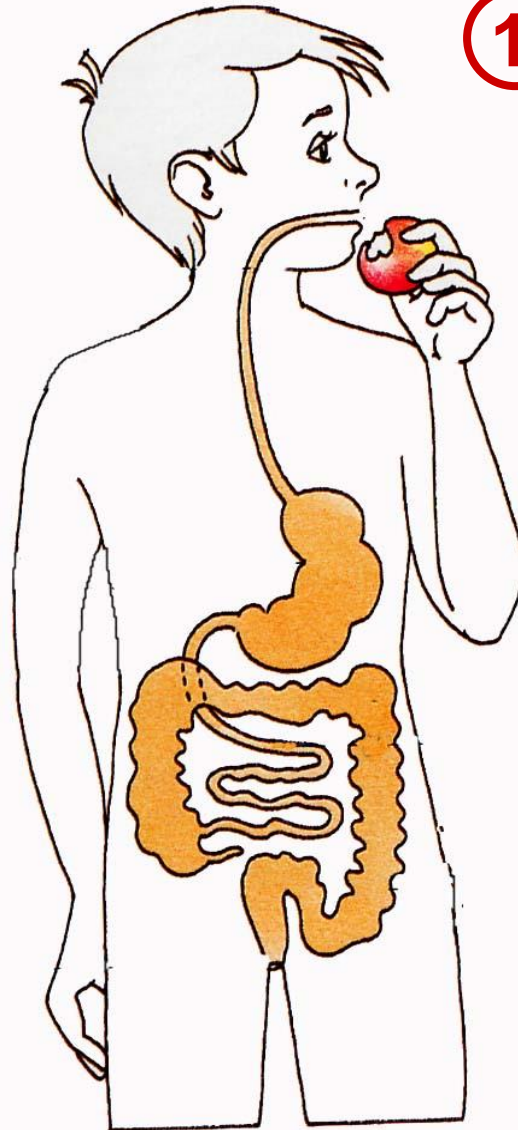
- Much planned physical activity, 60-90 min/d, 1⁰ walking + looked for other ways to be active

<http://www.nwcr.ws/Research/published%20research.htm>

UC Berkeley Wellness Engagement Calendar, September 2013



Digestion Steps



- ① Ingestion
- ② Mechanical Digestion
- ③ Chemical Digestion
- ④ Peristalsis
- ⑤ Absorption
- ⑥ Storage
- ⑦ Defecation

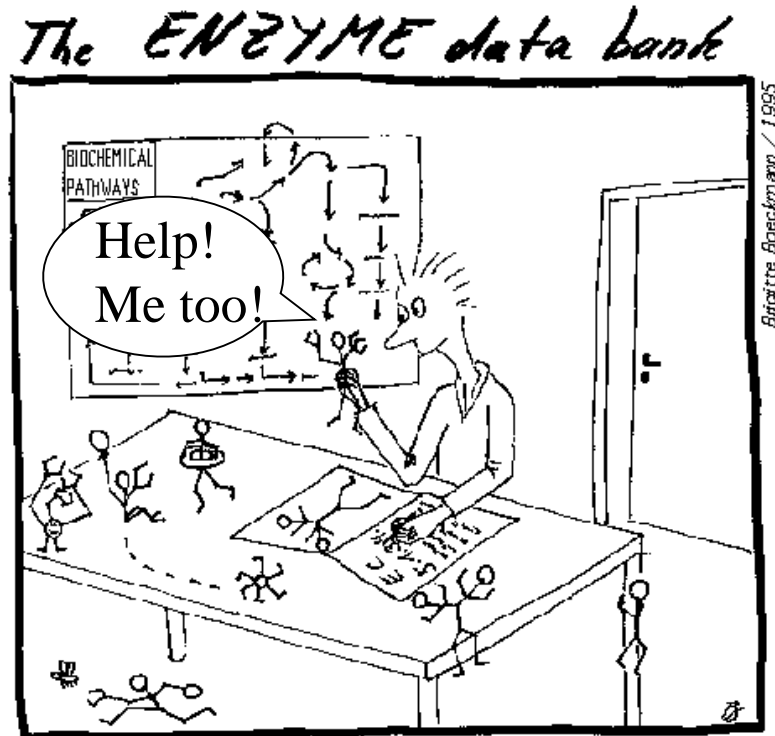
SOURCE: Dr. Eugene Evonuk, 1989. cf. L Sherwood, 2012 pp 437-8.

Hydrolysis of Energy Nutrients

Hi gang!!
You need me
for digestion!!



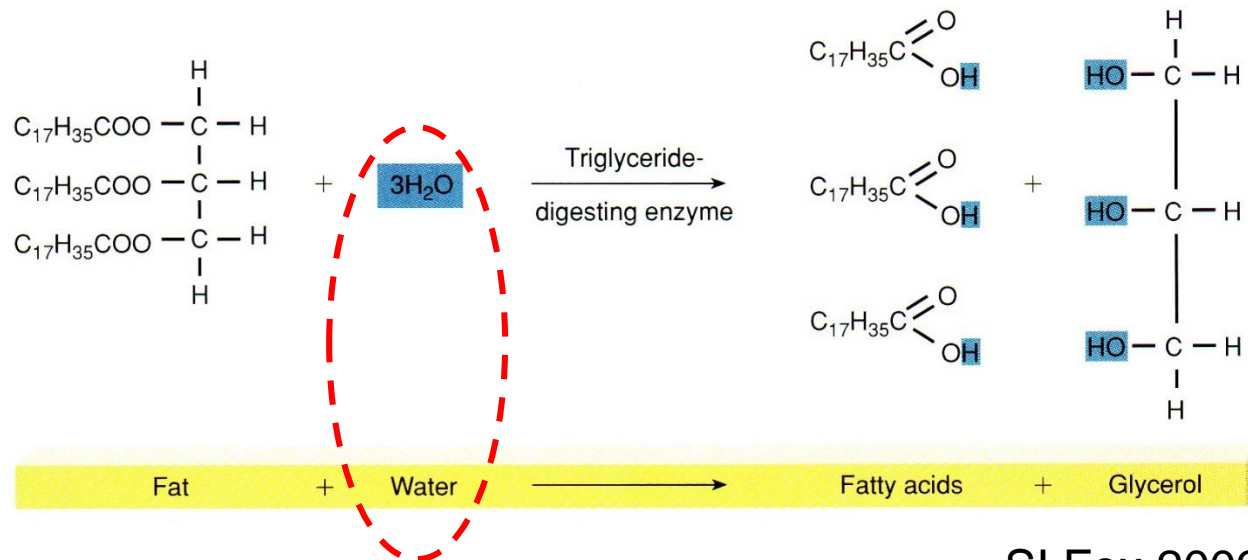
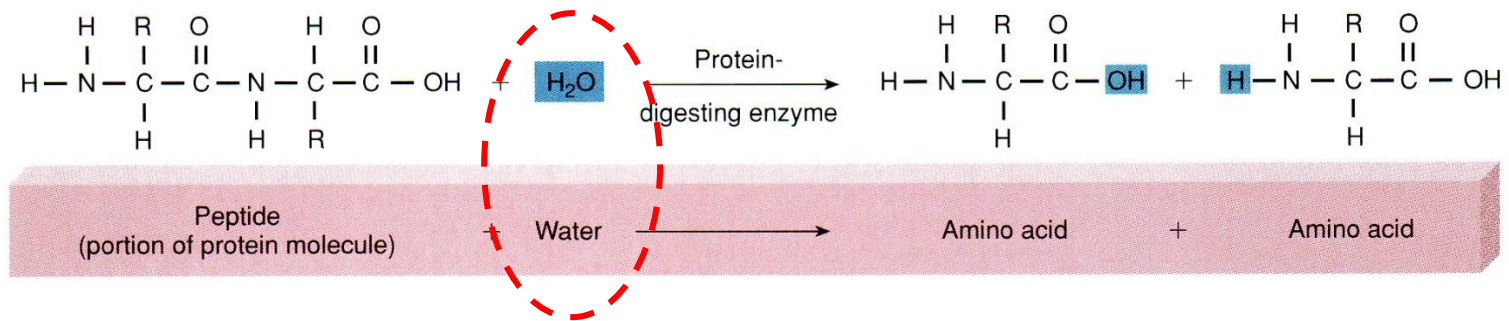
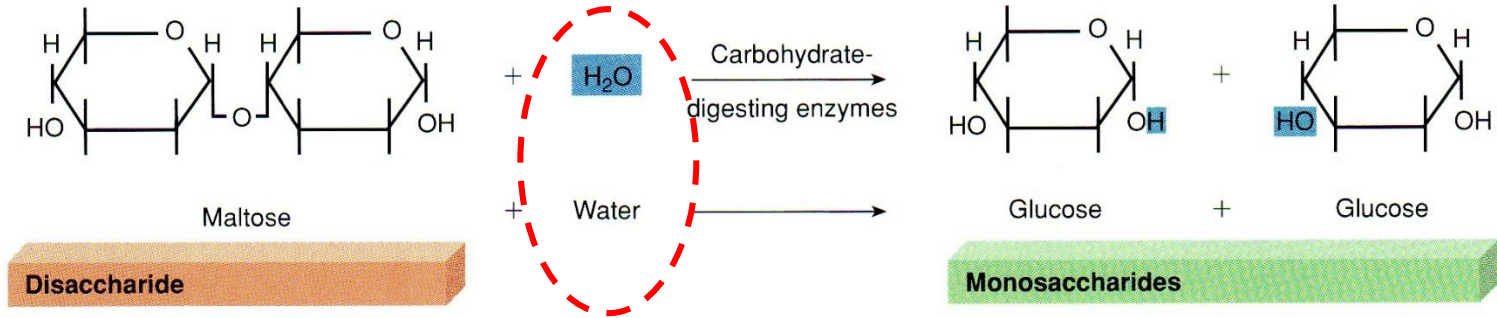
+



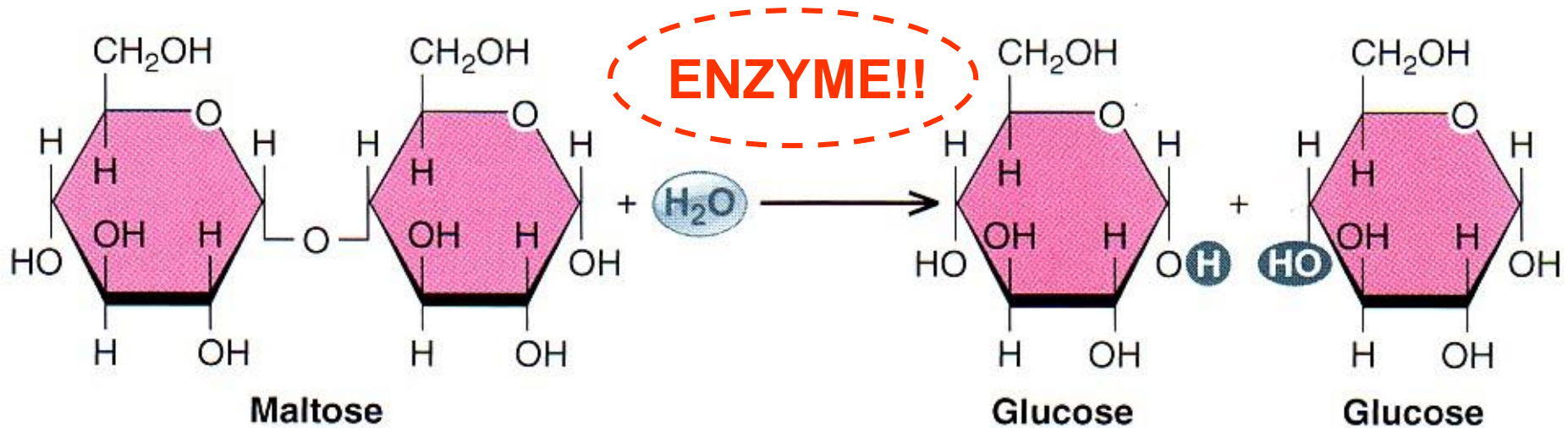
H₂O

+

Enzyme



What's missing?

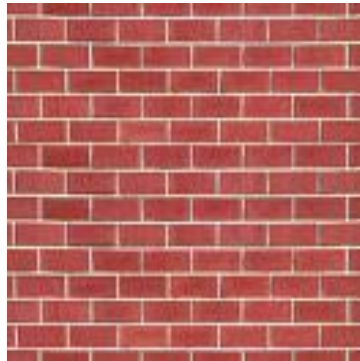


● **FIGURE 15-1** An example of hydrolysis. In this example, the disaccharide maltose (the intermediate breakdown product of polysaccharides) is broken down into two glucose molecules by the addition of H₂O at the bond site.

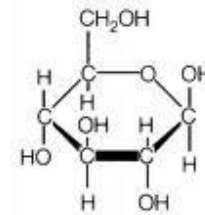
Polymer to Monomer (Many to One)



...Central-linking theme!!

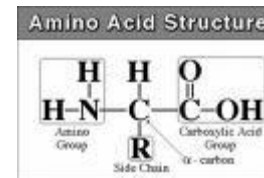


Carbohydrate

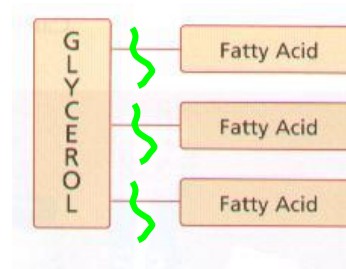
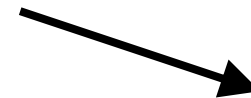


Glucose

Protein
+
Fat



Amino Acids



Fatty Acids
+
Glycerol