

# Dietary Guidelines for American I/II Evidence-based Policies for Creating a Healthy Eating Pattern

### **AGSC 5540: Food Policies and Regulations**

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### Todays content

- Food Safety Modernization Act, Overview
- National Nutrition Monitoring and Related Research Act
- USDA Dietary Guideline, Part I/II
- Class Exercise 1
- Class Exercise 2
- Discussions on term paper topics
- Discussions on assignment that was due today



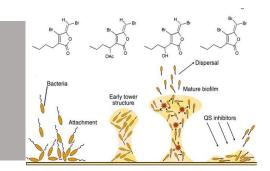
# Infectious Diseases in Animals and Human is a Moving Target...

- It is estimated only 1% of microbial community has been identified.
- Currently etiological agent of 80.3% of foodborne illnesses, **56.2% of hospitalization**, and 55.5% of deaths remain unknown.

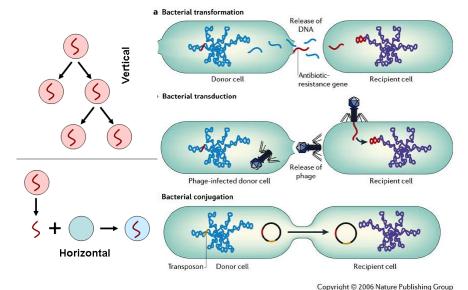
### "Emerging" Pathogens:

- Vertical and horizontal gene transfer spores and biofilm formation
- Quorum sensing and cell to cell communication

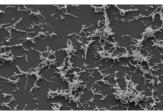
"It is the microbes who will have the last word."
-Louis Pasteur



#### Photo Courtesy: http://www.jci.org/articles/view/20074/figure/2









Nature Reviews | Microbiology

Photo Courtesy: http://www.microbiologybytes.com/blog/category/biofilms/ http://www.ifenergy.com/50226711/boosting\_microbial\_fuel\_cells\_with\_biofilm.php http://micro-writers.egybio.net/blog/?tag=antibiotic-resistance

### Epidemiology of Foodborne Diseases

• Based on data from 1990s: (Mead et al., 1999)

76 million illnesses, 323,000 hospitalizations, **5,200 deaths** in the United States.

• More recent estimates show: (Scallan et al., 2011)

47.8 million illnesses, 127,839 hospitalizations, and more than **3,037** deaths in the United States.

- 9.4 million illnesses, 55,961 hospitalizations, and 1,351 deaths are cause by 31 known foodborne agents.
- In addition to consumer insecurity, foodborne diseases cause around \$77.7 billion for losses in productivity and economical losses.
- Approximately 30% of population are especially "at risk" for foodborne diseases (The **YOPI**'s: The young, the old, Pregnant, and Immunocompromised)

# Significant foodborne pathogens... based on Mead et al., 1999 and Scallan et al., 2011 studies

- Leading etiological agents for illnesses: *Norovirus* (58%), Nontyphoidal *Salmonella* serovars (11%), *Clostridium perfringens* (10%), and *Campylobacter* spp (9%).
- Leading etiological agents for hospitalization: Nontyphoidal Salmonella serovars (35%), Norovirus (26%), Campylobacter spp (15%), and Toxoplasma gondii (8%).
- Leading etiological agents for death: Nontyphoidal *Salmonella* serovars (28%), *T. gondii* (24%), *Listeria monocytogenes* (19%), and *Norovirus* (11%).

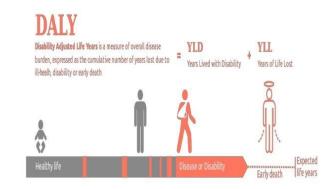
# Signs and Symptoms of Foodborne Diseases

- Mild illness (no medical care sought)
- Guillain–Barré syndrome (Campylobacter and Salmonella)
- Post-infectious irritable bowel syndrome (Campylobacter and Salmonella)
- Reactive arthritis (Campylobacter and Salmonella)
- Haemolytic uraemic syndrome (E. coli O157)
- End-stage renal disease (E. coli O157)
- Death

# Significant Foodborne Pathogens of Public Health Concern: Considering DALY and QALY (Scallan et al., 2015)

- Disability Adjusted Life Year (DALY). Loss of life and health due to illness compared with 'perfect' health
- Non-typhoidal Salmonella (329000)
- Toxoplasma (32700)
- Campylobacter (22500)
- Norovirus (9900)
- Listeria monocytogenes (8800)
- Clostridium perfringens (4000)
- Escherichia coli O157 (1200)

62% bacterial agents; 29% parasitic agents; 9% viral agents



- Mild illness (no medical care sought)
- Guillain–Barré syndrome (Campylobacter and Salmonella)
- Post-infectious irritable bowel syndrome (Campylobacter and Salmonella)
- **Reactive arthritis** (*Campylobacter* and *Salmonella*)
- Haemolytic uraemic syndrome (E. coli O157)
- End-stage renal disease (E. coli O157)
- Death

# CDC Estimates of Food Safety Burden

http://www.cdc.gov/foodborneburden/attribution-image.html#foodborne-illnesses



<sup>\*</sup>Chart does not show 5% of illnesses and 2% of deaths attributed to other commodities. In addition, 1% of illnesses and 25% of deaths were not attributed to commodities; these were caused by pathogens not in the outbreak database, mainly Toxoplasma and Vibrio vulnificus.

# Climate Change and Public Health Microbiology

#### Non-typhoidal Salmonella enterica serovars

- o **Global death:** 50,000 global death in 2010 (WHO, 2020)
- Public Health Burden in the U.S.: >1 million annual cases in 2011 (CDC, 2011)

#### **Climate Change:**

- 1 °C increase: 5 to 10% increases in Salmonellosis (WHO, 2010)
- o 2500 to 5000 additional global death
- 50,000 to 100,000 U.S. morbidity

#### At our current rate:

- $\circ$  >1.5 °C by 2040
- o >4.8 °C by 2100







Editoria

### Safety of Food and Water Supplies in the Landscape of Changing Climate

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In response to evolving environmental, production, and processing conditions, microbial communities have tremendous abilities to move toward increased diversity and fitness by various pathways such as vertical and horizontal gene transfer mechanisms, biofilm formation, and quorum sensing [1,2]. As such, assuring the safety of water and food supplies from various natural and anthropogenic microbial pathogens is a daunting task and a moving target. Recent outbreaks of Listeria monocytogenes in South Africa associated with a ready-to-eat product (affecting close to 1000 individuals) and the 2018 outbreak of Shiga toxin-producing Escherichia coli O26 associated with ground meat in the United States (leading to the recall of more than 132,000 pounds of products) are bitter reminders of the devastating influences of foodborne diseases on the public health and food manufacturing [3,4].

Recent epidemiological studies of world populations indicate that 420,000 people lose their lives every year due to foodborne diseases, with around one-third of those being 5 years of age or younger. It is further estimated that every year, 1 in 10 individuals experience foodborne diseases around the globe, leading to an annual loss of 33 million healthy life years [5]. These episodes of food and water

# Food Safety Modernization Act (FSMA)

- Signed to law in January of 2011, FSMA is the largest expansion of U.S. food safety authorities since the 1930s.
- Many sectors of agriculture and manufacturing will undergo strict regulations for the **first time in the history of the country**.
- Shifting responses from food safety problems from reaction to proactively prevent the episodes
- FSMA, a large and comprehensive legislation broaden FDA's ability to:
  - Mandatory recall of contaminated food products
  - Enhanced surveillance to investigate foodborne illness outbreaks [PFGE and WGS]
  - Established **new preventive controls** and **food safety plans** at some food processing facilities and farms
  - Enhanced FDA's traceability capacity
  - Increased inspection frequencies of high-risk food facilities (both domestic and foreign facilities)
  - Expanded authority and oversight capabilities with regard to foreign companies

# Regulatory Landscape of Food Industry Before FSMA

### Very small companies:

Exemption from federal requirements, need to follow state policies

### **Restaurant operations:**

Exemption from **federal requirements**, need to follow **state policies** (food code)

### Food Safety Inspection Service (FSIS) of USDA:

Meat, Poultry and Egg products, HACCP requirements

### **Food and Drug Administration:**

High-risk Foods: Juices, seafood, and shell egg, HACCP requirements

### Farmers and other food products:

No federal regulation

# Mandated by FSMA

- Food manufacturing (processors)
- Farmers and growers (producers)
- Transportation, retailers
- Imported foods
- Third party laboratories
- Local, state, and federal agencies
- Foreign governments

### Not mandated by FSMA

- FSMA does not directly address sectors under pre-existing jurisdictions. HACCP will remain the dominant regulation for:
- Meat, poultry, and egg products (USDA-FSIS)
- Juices, seafood, and shell eggs (DHHS-FDA)
- Very small producers and processors could receive exception from FSMA requirements (cottage industry).
- FSMA does not mandate GM products, antibiotic resistant organisms, organic production, and pesticide and fertilizer use.

## FSMA Implementation Schedule

FSMA was signed into law on January, 2011

Regulations were supposed to be finalized within one to two years of enactment (roughly January 2012 and January 2013)

Revised implementation dates: (all drafts are currently publically available)

- Preventative controls FSMA §103(a) and(c): August 30, 2015 [Human Food and Animal Food]
- Produce safety Rule: FSMA §105(a): October 31, 2015 [Water requirement in 2021]
- Accreditation of third-party auditors: FSMA §307): October 31, 2015
- Sanitary transportation practices for food and feed: FSMA §111: March 31, 2016
- Foreign supplier verification program: FSMA §301(a): October 31, 2015
- Intentional adulteration of food: FSMA §106(b): May 31, 2016. [15% of country food]

# Produce and Preventive Rules and Land-grant Institutions

- Standards for the Growing, Harvesting, Packing, and Holding of Produce for Human Consumption (**Produce Rule**): **Producers**
- Current Good Manufacturing Practice and Hazard Analysis and Risk-Based Preventive Controls for Human Food (Preventive Rule): Processors
- Large producers and processors
- Small and medium size producers and processors
- Very small (hobbyists) producers and processors (local and cottage industry)
- Many of small and medium size entrepreneur will require assistance from the nations 75 land-grant institution for safe and economical access to market.

### Produce Rule: Overview

- Regulate "farms," and "farm-type facilities"
- Emphasizes on regulating fruits or vegetable to be consumed raw (high-risk produce) e.g. berries, celeries, most leafy greens, tomatoes, peppers, etc.
- Certain vegetables and fruit (low-risk produce) are except, those requiring preparation as "kill step," before consumption e.g. pumpkins, potatoes, squash, green beans etc.
- **Sprouts** are subjected to "special rule," requiring seed treatment, and a frequent pathogen testing
- Low and high-risk categories have been subject of criticism, and had been a moving target throughout the revisions.

### Requirements of Produce Rule

- Worker's training (similar to HACCP pre-requisite program, supervisor and workers)
- Health and hygiene training (similar to HACCP GMP's)
- Agricultural water (monthly test of sub-surface and weekly test of surface water; treatment and monitoring of water source)
- Biological soil amendment of animal origin (validated treatment, no visible contamination, harvest time)
- Domesticated and wild animals (waiting period for grazing during harvest time, required fence)
- Equipment, tools, buildings, and facilities (storage, pathogens, and extensive documentation)
- Sprout rule (seed treatment and enhanced pathogen testing for irrigation water)

### Produce Rule: Implementation and compliance dates

- Implementation date: October 31, 2015
- Compliance date:
  - Very small farms (\$25\*k and below): <u>Exempt</u>
  - Small farms (\$25k-250K): 4 years (December 2019)
  - Medium farms (\$250-500K): 3 years
  - Large farms (\$500k and above): 2 years

Water testing requirements will be effective after additional 2 years. [now until 2021] **Effective dates** are 60 days after implementation dates

\*three-year average revenue; categories are no longer based on number of employee, the categories differ in preventive and produce rules.

# Preventive Control for Human Food Rule: Overview

- Regulate "processors"
- Under the regulation all "facilities" have to be registered with FDA
- The rule has **two sections: HARPC and GMP**, facilities obligated to have one or both.
- Exemptions: Juice, seafood, and shell egg sectors and businesses that store agricultural comities. (differs with preventive rule)

### **Modified Requirements:**

- Three-year average sales less than \$500K, AND
  - Direct sales to restaurants and consumers within 275 mile radius, or
  - Within states sales in 275 mile radius. Reason=?

# Requirements of Preventive Rule CGMP-Current Good Manufacturing Practices

- Similar to prerequisite program in HACCP
- Nearly all facilities are required to follow this section of the rule

### Exemption:

- (1) Businesses that store agricultural commodities
- (2) Businesses that selling directly to a manufacturing facility like canning operation (vertically integrated farms)
- Main GMP Requirements:
- Sanitation
- Employee training by PC QI
- Environmental control and training
- Recall contingency plan
- Allergen control
- Supplier verifications
- Sanitary transportation



# Requirements of Preventive Rule Hazard Analysis and Risk-Based Preventative Controls (HARPC)

- Previous a 7-step plan for FSIS HACCP, 12-step plan for Codex HACCP, and currently 5-step plan for HARPC:
- Hazard analysis
- Identification and implementation preventive controls.
- Monitoring the performance of controls.
- Developing corrective actions for preventative deviation.
- Verification and recordkeeping of preventative controls effectiveness
- 2.5 day workshop Preventive Control Qualified Individuals (PC QI)

### Preventive Rule: Implementation and compliance dates

- Implementation date: August 30, 2015
- Compliance date:
  - Very small facility (\$2.5\*m and below): 3 year
  - Small facility (less than 500 employee and does not qualified for exception): 2 years
  - "Other" facilities: 1 years

### **Modified Requirements:**

- Three-year average sales less than \$500K, AND
  - Direct sales to restaurants and consumers within 275 mile radius, or
  - Within states sales in 275 mile radius.

\*Total annual sale; the categories differ in preventive and produce rules.

# National Nutrition Monitoring and Related Research Act of 1990

An evidence-based legislation





conducted in 1971, and in 1999 the surveys became an annual even



# National Nutrition Monitoring and Related Research Act of 1990

- Poor diet and physical inactivity
- Epidemic of overweigh and obesity
  - Men, women and children
  - All segments of the society
- Poor diet and physical inactivity: a leading cause of premature morbidity and mortality
- Absence of harmonized national policy and guidelines for food, nutrition and health
- Lead to enactment of:

### National Nutrition Monitoring and Related Research Act of 1990

(Public Law 101-445, Title III, 7 U.S.C. 5301 et seq.)

104 STAT. 1034

PUBLIC LAW 101-445-OCT. 22, 1990

Public Law 101-445 101st Congress

An Act

Oct. 22, 1990 [H.R. 1608] To strengthen national nutrition monitoring by requiring the Secretary of Agriculture and the Secretary of Health and Human Services to prepare and implement a ten-year plan to assess the dietary and nutritional status of the United States population, to support research on, and development of, nutrition monitoring, to foster national nutrition education, to establish dietary guidelines, and for other purposes.

National Nutrition Monitoring and Related Research Act of 1990. Intergovernmental relations. Business and industry. Health professions. Science and technology.

7 USC 5301 note.

7 USC 5301.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

#### SECTION 1. SHORT TITLE.

This Act may be cited as the "National Nutrition Monitoring and Related Research Act of 1990".

#### SEC. 2. PURPOSES.

The purposes of this Act are to-

 make more effective use of Federal and State expenditures for nutrition monitoring, and enhance the performance and benefits of current Federal nutrition monitoring and related research activities;

(2) establish and facilitate the timely implementation of a coordinated National Nutrition Monitoring and Related Research Program, and thereby provide a scientific basis for the maintenance and improvement of the nutritional status of the

https://www.gpo.gov/fdsys/pkg/STATUT E-104/pdf/STATUTE-104-Pg1034.pdf

# What is USDA Dietary Guideline?

- National Nutrition Monitoring and Related Research Act of 1990 **Requires**:
  - United States Department of Agriculture (USDA)
  - Department of Health and Human Services (DHHS)
- Review and Update Dietary Guidelines for Americans (**DGA**) every **five years**
- **Prior to NNMRR** Act of 1990, DGA existed in less volumous editions:
  - Earliest revision, Wilbur Olin Atwater, 1894 [Terms like vitamins were not even developed]
  - The revisions of 1980 and 1985, less extensive than post NNMRR Act
- Current DGA has two **main concepts** of:
  - Maintain calorie balance over time to achieve and sustain a healthy weight (quantity of diet)
    to avoid positive energy balance
  - Consuming nutrient-dense foods and beverages (quality of diet)
- Current DGA promotes two **eating patterns** of:
  - USDA Food Patterns
  - DASH (Dietary Approaches to Stop Hypertension) Eating Plan



#### Oral Comment Meeting

On August 11, 2020, USDA and HHS hosted a virtual meeting to hear comments from the public on the Scientific Report of the 2020 Dietary Guidelines Advisory Committee. USDA and HHS will consider the Committee's Scientific Report, along with public and agency comments, as the Departments develop the next edition of the Dietary Guidelines.

#### **Meeting Materials**

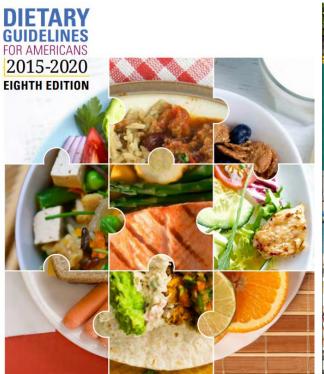
View the agenda and list of oral commenters. The archived webcast is available below. The meeting transcript will be posted to this page once available.

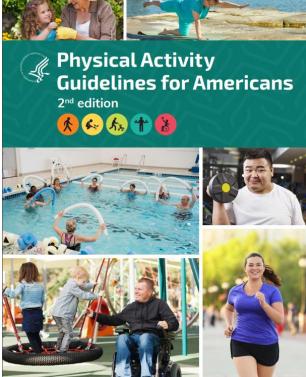


**View Archived Webcast** 

#### **Advisory Committee Meetings**

The 2020 Dietary Guidelines Advisory Committee's work is now complete. The Advisory Committee held 6 public meetings. Information from these meetings, including meeting materials and archived webcasts, can be found here.









### DGA main concepts

- (1) Maintain calorie balance over time to achieve and sustain a healthy weight (quantity of diet)
  - Decrease the calories consumption
  - Increase the calories expenditure through physical activity
- (2) Consuming nutrient-dense foods and beverages (quality of diet)
  - Reduction in consumption of:
    - Sodium,
    - Calories from solid fats, (Trans fatty acids, another great topic for the paper)
    - Added sugars,
    - Refined grains.
  - *Increase in consumption of:* 
    - Vegetables, fruits, and whole grains,
    - Fat-free or low-fat milk and milk products,
    - Seafood, lean meats and poultry, eggs,
    - Beans and peas, and nuts and seeds.



Four DGA Key Recommendations, Three recommendations for specific group populations

### Four DGA Key Recommendation

- (1) Balancing calories to manage weight
- (2) Foods and food component to **reduce**
- (3) Food and nutrients to increase
- (4) Building health eating patterns

### Three recommendations for specific group populations

- (1) Women capable of becoming pregnant
- (2) Women who are pregnant and breastfeeding
- (3) Individuals age 50 years and older



# (1) Balancing calories to manage weight Negative and positive energy balance

- Prevent and/or reduce overweight and obesity through improved eating and physical activity behaviors.
- Control total calorie intake to manage body weight. For people who are overweight or obese, this will mean consuming fewer calories from foods and beverages.
- Increase physical activity and reduce time spent in sedentary behaviors.
- Maintain appropriate calorie balance during each stage of life—childhood, adolescence, adulthood, pregnancy and breastfeeding, and older age.



### (2) Foods and food component to reduce

#### • Sodium Intake:

- General recommendation: < 2,300 milligrams (mg) /day (Salt Vs. Sodium)
- For 51+& those with hypertension, diabetes, or chronic kidney disease, and healthy African Americans: <1,500 mg /day (51% of population)

#### • Saturated Fats:

- <10% percent of calories from saturated fatty acids
- Replacing them with monounsaturated and polyunsaturated fatty acids.

### • Dietary cholesterol:

- <300 mg per day of dietary cholesterol per day
- *Trans* fatty acid consumption:
  - As low as possible (<1% energy intake)
  - Limiting foods that contain synthetic sources of trans fats, such as partially hydrogenated oils, and by limiting other solid fats.



### (2) Foods and food component to reduce

- Calorie reduction:
- Reduce the intake of calories from solid fats and added sugars. [Subsidized, HFCS?]
- Refined grains:
- Limit the consumption of foods that contain **refined grains**, especially refined grain foods that contain **solid fats**, **added sugars**, and **sodium**.
- Alcoholic beverages
- Consumed in moderation
  - Up to one drink per day for women
  - Two drinks per day for men



One study instead of evidencebased decision making



### (3) Food and nutrients to increase

- Increase **vegetable and fruit** intake.
- Eat a variety of vegetables, especially dark-green and red and orange vegetables and beans and peas.
- Consume at least half of all grains as whole grains. Increase whole-grain intake by replacing refined grains with whole grains.
- Increase intake of **fat-free or low-fat milk** and milk products, such as **milk**, **yogurt**, **cheese**, **or fortified soy beverages**.
- Choose a variety of **protein foods**, which include **seafood**, **lean meat** and **poultry**, **eggs**, beans and peas, soy products, and unsalted nuts and seeds.





### (3) Food and nutrients to increase (continued)

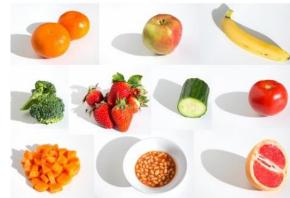
- Increase the **amount and variety of seafood** consumed by choosing seafood in place of some meat and poultry.
- Replace **protein foods that are higher in solid fats** with choices that are lower in solid fats and calories and/or are sources of oils.
- Use oils to replace solid fats where possible.
- Choose foods that provide more:

Potassium, dietary fiber, calcium, and vitamin D, (Nutrients of Concern in American Diets). These Sources: vegetables, fruits, whole grains, and milk and milk products.

Globally: Iron and Vitamin A deficiency (1/3 of world population), Muscle foods







### (4) Building healthy eating patterns

- Select an eating pattern that meets nutrient needs over time at an appropriate calorie level.
- Account for all foods and beverages consumed and measures how they fit within a total healthy eating pattern.
- Follow **food safety recommendations** when preparing and eating foods to reduce the risk of **foodborne illnesses**.



# (5) Three recommendations for specific group populations

- Women capable of becoming pregnant
- *Heme iron* (which is more readily absorbed by the body),
- Enhancers of iron absorption such as vitamin C-rich foods.
- 400 micrograms/per day of synthetic folic acid (from fortified foods and/or supplements) in addition to food forms of folate from a varied diet. [Childhood mortality?]
- Women who are pregnant or breastfeeding
- Consume 8 to 12 ounces of seafood per week from a variety of seafood types.
- Seafood to limit: high methyl mercury content, limit white (albacore) tuna to 6 oz per Seafood to avoid: four types of fish: tilefish, shark, swordfish, and king mackerel.
- Iron supplement, as recommended by an obstetrician or other health care provider.
- Individuals ages 50 years and older
- Consume foods fortified with vitamin B12, such as fortified cereals, or dietary supplements.





# Public Health Burden of Food and Diet-related Chronic Diseases

### Hypertension

- 74.5 million Americans—34 percent of U.S. adults—have hypertension (another 36% prehypertension).
- **36 percent** of American adults have prehypertension—blood pressure numbers that are higher than normal, but not yet in the hypertension range.
- Hypertension is a major risk factor for heart disease, stroke, congestive heart failure, and kidney disease.
- Dietary factors that increase blood pressure include excessive sodium and insufficient potassium intake, overweight and obesity, and excess alcohol consumption.





(<1% of American adults meet the joint sodium and potassium guideline)

# Public Health Burden of food and diet-related chronic diseases (continued)

#### Cardiovascular Diseases

- 81.1 million Americans—37 percent of the population—have cardiovascular disease.
- <u>Major risk factors</u> include high levels of **blood cholesterol** and other **lipids**, **type 2 diabetes**, **hypertension** (high blood pressure), **metabolic syndrome**, **overweight and obesity**, **physical inactivity**, **and tobacco use**.
- <u>16 percent</u> of the U.S. adult population <u>has high total blood</u> <u>cholesterol</u>.



# Public Health Burden of food and diet-related chronic diseases (continued)

#### Diabetes

- Nearly 24 million people—almost **11 percent** of the population—**ages 20 years and older** have diabetes.
- The vast majority of cases are type 2 diabetes, which is heavily influenced by diet and physical activity.
- About 78 million Americans—35 percent of the U.S. adult population ages 20 years or older—have pre-diabetes.
- Pre-diabetes (also called impaired glucose tolerance or impaired fasting glucose) means that blood glucose levels are higher than normal, but not high enough to be called diabetes.



# Public Health Burden of food and diet-related chronic diseases (continued)

#### Cancer

• Almost one in two men and women—approximately **41 percent** of the population—**will be diagnosed** with cancer during their lifetime.

#### **Osteoporosis**

- One out of every two women and one in four men <u>ages 50</u> years and older will have an osteoporosis-related fracture in their lifetime.
- About 85 to 90 percent of adult bone mass is acquired by the age of 18 in girls and the age of 20 in boys.
- Adequate **nutrition** and regular participation in **physical activity** are important factors in **achieving and maintaining optimal bone mass**.



#### Exercise 1

- -What is the main reason for enactment of *National Nutrition Monitoring and Related Research Act* and what year it was enacted?
- -What are the two main concepts and two eating pattern associated with Dietary Guidelines for Americans?
- -What are the four key recommendation of DGA and three recommendation for specific age groups?
- -According to DGA, what are the *Nutrients of Concern in American Diet* and what are their main dietary sources?
- -According to the DGA, what percent of American adults:

Currently suffer from hypertension?

Currently suffer from pre-hypertension?

Currently have symptoms of cardiovascular diseases?

Have high total blood cholesterol?

*Are suffering from diabetes?* 

Have symptoms of pre-diabetes?

Will be diagnosed with one type of cancer during life time?

Meet the DGA joint sodium and potassium guideline?

### Foods and food component to reduce

- Sodium Intake
- Saturated Fats
- Dietary cholesterol
  - Trans fatty acid consumption
- Calorie reduction
- Refined grains
- Alcoholic beverages



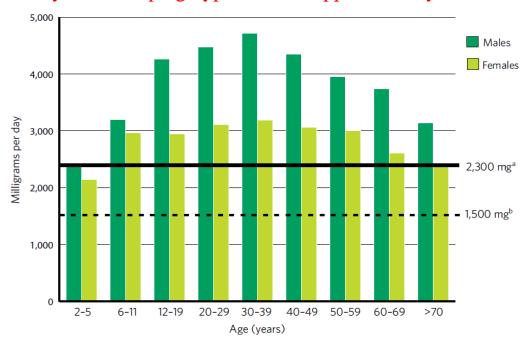




- Sodium is an essential nutrient, needed in relatively small quantities
- Substantial sweating increased the need for the nutrient
- Excess dietary sodium linked to elevated blood pressure.
- **Reduction in dietary sodium** also associated with **reduced BP** in adults and children
- Keeping blood pressure in the **normal range** reduces risk of:
  - Cardiovascular disease.
  - Congestive heart failure,
  - Kidney disease.
- Therefore, adults and children should limit their intake of sodium.



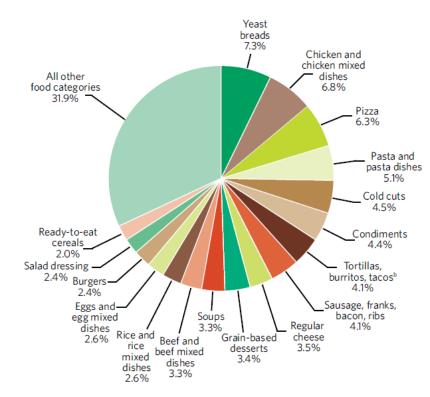
- Virtually all Americans consume more sodium than they need.
- The estimated average intake (Americans ages 2 years and older): approximately 3,400 mg per day.
- 34% adult hypertension; 36% prehypertension
- Life-time probability of developing hypertension: approximately 90%





# Foods and food component to reduce Sodium Intake National Health and Nutrition Examination Survey

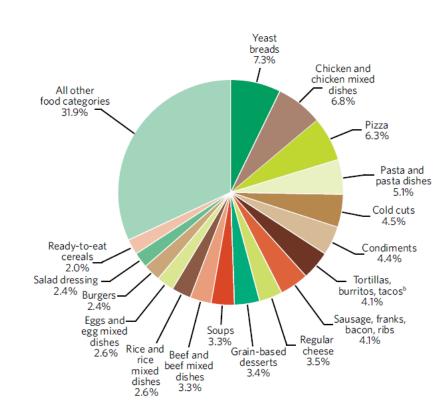
- Sodium is primarily consumed as salt:
  - Processed foods: around 75% of dietary diets
  - Food prepared in **restaurants**
  - Salt added at table and cooking only a very small portion
- **Reason for using salt** in processed foods:
  - Curing meat
  - Baking
  - Masking off-flavors
  - Retaining moisture
  - Enhancing flavor
  - Increasing shelf-life
  - Economical purposes (one of the cheapest ingredients: around 30 c/Ib)



Source NHANES data 2005-2006

NHANES: An ongoing epidemiological study since 1969 on Health and Nutrition

- Two types of food are of concern:
- (1) Very high sodium food:
  - Processed meats,
  - Prepared soups,
  - Sauces and snacks
  - RTE foods
- (2) Foods with **moderate amount** of sodium that are consumed in **large quantities**:
  - Yeast bread
  - RTE cereals
  - Cheese and processed dairy



- General Recommendation:
- (1) Read the **Nutrition Facts label** for information on the sodium content of foods and purchase foods that are **low in sodium**. [Front of package labeling]

#### Sodium content ≠ salt content

based on the molar mass: sodium content multiplied by 2.5= salt content.
e.g., sodium content of a diet is 40% of the total salt intake (1 gram of salt has 400 mg of sodium)

- (2) Consume more **fresh foods** and fewer processed foods that are high in sodium. beef (topside roast) and raw salmon: 48 and 110 mg/100 g, respectively canned corned beef and smoked salmon: 950 and 1880 mg/100 g, respectively
- (3) Eat more **home-prepared foods**, where you have more **control over sodium**, and use little or no salt or salt-containing seasonings when cooking or eating foods.
- (4) When eating at **restaurants**, ask that **salt not be added** to your food or order **lower sodium options**, if available.

- Sodium Reduction would be beneficial for:
  - All age groups to prevent hypertension or prehypertension
  - Those with hypertension to avoid further health complications
- Currently less than **15% of American** adults consume recommended amount of **salt**
- (<1% of American adults meet the joint sodium and potassium guideline)

#### **Recommendations:**

- Reducing consumption of High Calorie food
   (High calorie food typically contain high level of salt)
- DASH (Dietary Approaches to Stop Hypertension) diet (will be discussed next class)



### Foods and food component to reduce Dietary Fats

- Dietary fats are found in both **plant and animal foods**.
- Essential roles in diet:
  - Fats supply calories and essential fatty acids, and
  - Help in the absorption of the fat-soluble vitamins A, D, E, and K
- Acceptable ranges for total fat intake (**IOM**):
  - children ages 1 to 3 years: 30–40% of calories
  - children and adolescents ages 4 to 18 years: 25–35%
  - adults ages 19 years and older: 20–35%
- These ranges are associated with:
  - Reduced risk of chronic diseases, such as cardiovascular disease
  - Providing for adequate intake of essential nutrients



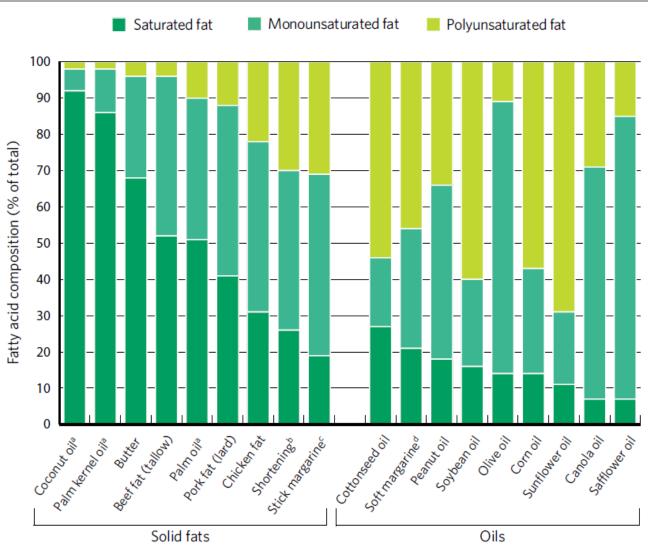
### Foods and food component to reduce Dietary Fats

#### **DGA** categorizes Fatty acids as:

- Saturated (mostly un-essential)
- Monounsaturated, or polyunsaturated (mostly essential)
- Trans fatty acids are unsaturated fatty acids, occurs during food processing
- Animal fats: higher proportion of saturated fatty acids
- major exception: seafood very high with polyunsaturated fatty acids
- **Plant foods**: higher proportion of monounsaturated and/or polyunsaturated fatty acids
- major exceptions: coconut oil, palm oil, pal kernel oil
- Those "solid" at room temperature: Recommended to limit/avoid
  - Animal sources
  - Or industrially produced by hydrogenation
  - High in saturated and/or trans fatty acids
- Those "liquid" at room temperature (vegetable oils): Recommended to increase



### Foods and food component to reduce Dietary Fats



### Foods and food component to reduce Dietary Fats- Saturated Fatty Acids

- Saturated fatty acids have important physiological and structural functions
- But considered as **unessential** (our bodies can synthesize)
- There for **no dietary requirement** for saturated fatty acids
- High intake of saturated fats:
  - Elevated blood total cholesterol
  - Elevation of low-density lipoprotein (LDL) cholesterol
  - Increased risk of cardiovascular diseases

#### Recommendation:

- Consuming less than 10 percent of calories from saturated fatty acids
- Replacing them with monounsaturated and/or polyunsaturated fatty acids
- Consuming less than 7 percent of calories: further reduce the risk of cardiovascular diseases





## Foods and food component to reduce Dietary Fats- Saturated Fatty Acids

#### **NHANES** data:

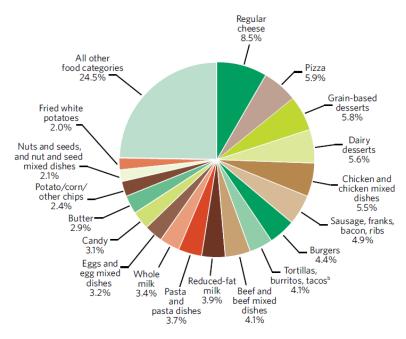
Around 11% calorie of Americans diet comes from saturated fatty acids

#### Major sources of saturated fatty acids in the American diet include:

- Regular (full-fat) cheese (9% of total saturated fat intake)
- *Pizza* (6%)
- *Grain-based desserts* (6%)
- Dairy-based desserts (6%)
- Chicken and chicken mixed dishes (6%)
- Sausage, franks, bacon, and ribs (5%)

#### **Recommendation:**

- Preparing foods at home
- Replacing solids fats (butter, lard, and coconut oil) with vegetable oils



## Foods and food component to reduce Dietary Fats- Trans Fatty Acids

- *Trans* fatty acids:
  - **Synthetic**: produced during manufacturing
  - Natural: very small amount in meat and dairy
- Synthetic Trans fatty acids:
- Strongly associated with negative health effects
- They are **not essential** in the diet.
- Increase LDL cholesterol
- Increased risk of cardiovascular disease.
- Since 2006, mandatory labeling
- Earlier DGA, less than 1% of calorie intake
- Current DGA, as low as possible in diet

#### Cis- and Trans-Fatty Acids

### Foods and food component to reduce Dietary Fats- Trans Fatty Acids

- Synthetic *trans* fatty acids:
  - Produced by a process referred to as hydrogenation
  - **Hydrogenation**: make products containing unsaturated fatty acids solid at room temperature therefore **more resistant to** becoming spoiled or rancid.
- Sources in past (before 2006): Hydrogenated oils used be very popular in fried products and deserts.
- Currently exists in in less quantities in some margarines, snack foods, and prepared desserts as a replacement for saturated fatty acids
- Could also be produced during **fried foods** preparation



### Foods and food component to reduce Dietary Fats- Trans Fatty Acids

#### • Natural trans fatty acids:

- *Trans* fatty acids also are produced by **grazing animals**, and **small quantities** are therefore found in **meat** and **milk** products.
- These are called "natural" or "ruminant" trans fatty acids.
- Some studies indicate natural *Trans* fatty acids (typically short change fatty acids) do not have negative health effects.
- Some also indicate *Trans* fatty acids such as **Conjugated Linolenic Acid** (**CLA**) could improve cardiovascular health by reducing LDL Cholesterol.
- Supplements of CLA available in market without approval of regulatory agencies.
- Evidence of health claims associated with natural *Trans* fatty acids are very limited and evolving.



## Foods and food component to reduce Dietary Fats- Cholesterol

#### Dietary Cholesterol:

- The body uses cholesterol for **physiological and structural functions**
- The nutrient could synthesized by body i.e. non-essential
- In blood it exists in Low and High Density level.
- *Cholesterol* is found only in animal foods.
- Plant foods consumption could alter the composition of LDH/HDL in blood
- For example coconut oil could increase the LDL

#### The major sources of cholesterol in the American diet include:

- Eggs and egg mixed dishes (25% of total cholesterol intake)
- Chicken and chicken mixed dishes (12%)
- *Beef and beef mixed dishes (6%)*
- All types of beef burgers (5%)



## Foods and food component to reduce Dietary Fats- Cholesterol

#### Current recommendation:

- Less than 300 mg per day
- Reduction below 200 mg cholesterol per day could further improve health
- Average men consumption: 350 mg per day
- Average women consumption: 240 mg per day

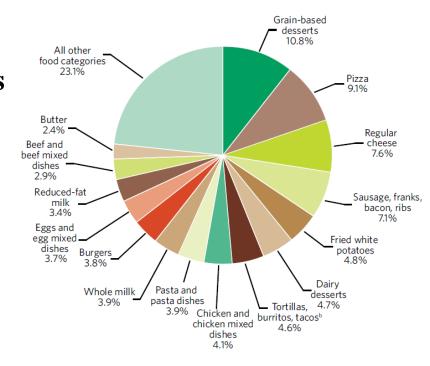
#### Reduction of Dietary cholesterol:

- Avoiding animal foods containing cholesterol (eggs and muscle foods)
- Avoiding dietary component that raise the blood cholesterol (Trans and saturated fatty acids)
- By definition, Cholesterol only exist in animal foods ("Chole" refers to food from animal origin):
- Plant product advertised as cholesterol free is misleading



## Foods and food component to reduce Dietary Fats- Solids Fats

- Recent DGA created a new category as "Solid Fats" in addition to saturated and trans fats
- Although saturated and *trans* fatty acids are components of many foods, **solid fats are foods themselves or ingredients**
- Solid fats contribute an average of **19 percent** of the total calories in American diets.
- Some major food sources of solid fats in the American diet:
  - Grain-based desserts (11% of all solid fat intake)
  - Pizza (9%)
  - Regular (full-fat) cheese (8%)
  - Sausage, franks, bacon, and ribs (7%)
  - Fried regular potatoes (5%)



## Foods and food component to reduce Dietary Fats- Solids Fats

- Among all "solid fats:"
  - processed meats (e.g., franks, sausage, and bacon) and increased risk of colorectal cancer and cardiovascular disease.
- Recommendation:
  - Moderation and balance
  - Limiting solids fats and processed meats
  - Replace them with alternatives that are low in solid fats (e.g., fat-free milk).
- Reducing solid fats also lead to reductions in: (co-benefits)
  - Saturated fatty acids
  - trans fatty acids
  - Calories



## Foods and food component to reduce Dietary Fats- Natural Sugar and Added Sugar

#### • DGA categorize sugars:

- Natural sugar: e.g. in fruits (fructose) and fluid milk and milk products (lactose)
- Added sugar: added to foods during processing, preparation, or at the table

#### Added sugar are typically provide:

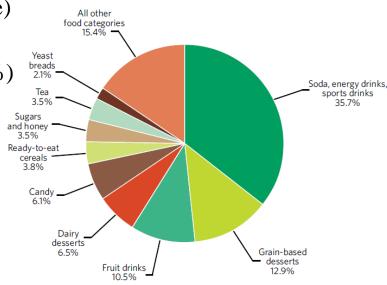
- To improve flavor
- *Preserve* the product (reducing water activity)
- *Improve viscosity, texture, and product body*
- Both natural and added sugar have similar nutritional properties (high fructose corn syrup and honey)
- Added sugars contribute an average of **16 percent** of the **total calories** in American diets.
- Leading cause of dental health issues and type 2 diabetes



## Foods and food component to reduce Dietary Fats- Natural Sugar and Added Sugar

- Main sources of "added sugar" to limit
  - Added sugars include high fructose corn syrup
  - Solid cane/beet sugar
  - Corn syrup and corn syrup solids
  - Malt syrup
  - Maple syrup
  - Pancake syrup
  - Fructose sweetener
  - Liquid fructose
  - Honey
  - Molasses

- Main Foods containing "added sugar" to limit
  - Soda, energy drinks, and sports drinks (36% of added sugar intake)
  - Grain-based desserts (13%)
  - Sugar-sweetened fruit drinks (10%)
  - Dairy-based desserts (6%)
  - Candy (6%)

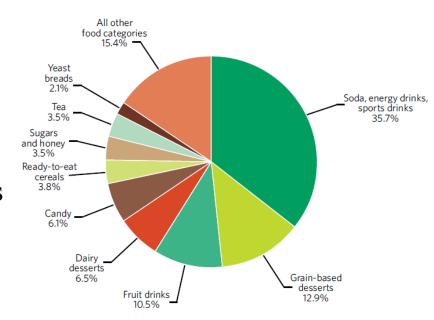


## Foods and food component to reduce The leading Problem

The leading cause of dietary concern in American adults:

Extra "Solid Fats" and "Added Sugar:"

- 35% of calorie typical American diet
- Major cause of weight management
- Cause of "hidden hunger" since solid fats and added sugars are low in micronutrients
- Only 5-15% in total calories intake recommended
- USDA Food Pattern diet suggested to reduce this nutrient (will be discussed next session with DASH Diet)



## Foods and food component to reduce Refined Grains

- Refining of whole grains:
  - The loss of vitamins, minerals, and dietary fiber.
  - Most refined grains are enriched: with iron, thiamin, riboflavin, niacin, and folic acid
  - This returns some, but not all
- If consumed in **moderation**, refined grains could provide **some nutritive value**
- Higher than recommended amount, leads to weigh management issues



## Foods and food component to reduce Refined Grains

- On average, Americans consume 6.3 ounce-equivalents of refined grains per day
- The recommended amount of refined grains is no more than **3 ounce-equivalents** per day
- Ounce-equivalents
  - 1 slice of bread
  - 1 cup of ready-to-eat cereal
  - ½ cup of cooked rice, cooked pasta, or cooked cereal Further recommendation:
- At least 50% of grains to be from whole grain sources
- Whole Grains (the bran, germ, and endosperm):

whole-wheat flour, bulgur (cracked wheat), oatmeal, whole cornmeal, and brown rice.



## Foods and food component to reduce Refined Grains

- Major sources of refined grains in the diets of Americans:
  - Yeast breads (26% of total refined grain intake);
  - *Pizza* (11%);
  - *Grain-based desserts* (10%)
  - *Tortillas, burritos, and tacos (8%)*
  - Refined grain products also are typically high in solid fats and added sugars:
    - cakes
    - cookies
    - donuts
    - Other desserts

Recommended be reduced...



### Foods and food component to reduce Alcohol

#### Based on NHANES data in the United States:

- Approximately **50 percent**: regular drinkers
- **14 percent**: infrequent drinkers.
- **9 percent of men** consume more than two drinks per day
- 4 percent of women consume more than one drink per day.

#### DGA drinking categories:

- (1) Moderate alcohol consumption
  - 1 drink per day for women
  - 2 drinks per day for men.
- (2) Heavy or high-risk drinking
  - >3 drinks on any day or >7 per week for women
  - >4 drinks on any day >14 per week for men
- (3) Binge drinking
  - Consumption within 2 hours of 4 or more drinks for women and 5 or more drinks for men





### Foods and food component to reduce Summary

- Moderate alcohol consumption is associated with:
  - Lower risk of cardiovascular disease.
  - All-cause mortality among middle-aged and older adults
  - Improved cognitive function for elderly



- Excessive (i.e., heavy, high-risk, or binge) is associated with:
  - No health benefits
  - Liver complications
  - Hypertension
  - Stroke
  - Type 2 diabetes
  - Cancer of the upper gastrointestinal tract and colon
  - Weight gain
  - Cognitive impairment



#### Exercise 2

- What are the food and food components that are recommended to be reduced in diet according to USDA DGA?
- What is the average dietary sodium intake of American adults? What are the two levels of recommendations for maintaining health?
- According to DGA, what age group consumes highest amount of sodium? What gender typically consume higher sodium across all age groups?
- What is NHANES?
- What are the four general recommendation for reducing dietary sodium intake?
- What is the difference between sodium content and salt content of a food? How much sodium exist (in mg) in a food containing 2 grams of salt?
- What animal-based food category typically contain high level of unsaturated (mono and polyunsaturated) fatty acids? What are the plant-based foods that are very high in saturated fatty acids?
- According to DGA, what are top three common food sources highest in:
- Saturated Fatty acids:
- Monounsaturated fatty acids:
- Polyunsaturated fatty acids:
- According to NHANES, what proportion of calories in American diet comes from saturated fats and what are the main contributors to dietary saturated fats? What is the recommended amount saturated fat in diet?
- What is the main source of synthetic trans fatty acids in diet and what is the current recommendation for consumption of synthetic trans fatty acids?
- What are the main sources of naturally-occurring trans fatty acids in diet?
- What is the current recommendation for daily dietary cholesterol? What is the men and women average intake of dietary cholesterol in the United States?
- What are the main sources and food categories associated with added sugar in diet of American Adults?

### Next Session...

#### • DGA Key Recommendation

- (1) Balancing calories to manage weight
- (2) Foods and food component to reduce
- (3) Food and nutrients to increase
- (4) Building health eating patterns

#### • Three recommendations for specific group populations

- (1) Women capable of becoming pregnant
- (2) women who are pregnant and breastfeeding
- (3) Individuals age 50 years and older

# Suggested topics... For those who are "shopping" for topics

Recent Advancements in control of *Listeria* monocytogenes in processed and ready-to-eat meat products

Advances in preventing O157 and non-O157 Shiga toxin producing *Escherichia coli* using natural antimicrobials and emerging technologies

Recent advances in non-thermal pasteurization of fluid milk

#### South Africa works to eradicate listeria from its processed meat facilities

By Dan Flynn on August 3, 2018

South Africa's National Listeria Incident Management Team issued another of its periodic reports recently for the world's largest listeriosis outbreak. It says there were no new cases of listeriosis during the week before publication on July 26.

Between Jan. 1, 2017, and July 17, 2018, South Africa recorded 1,060 laboratoryconfirmed cases of listeriosis resulting in 216 deaths. It added 87 confirmed cases to the outbreak totals after the March 4 recall of implicated ready-to-eat meat products.

Before 2017, South Africa experienced only 60 to 80 confirmed listeriosis cases each year or about one case per week. Listeriosis reports to the National Institute for Communicable Diseases (NICD) accelerated last year, causing Dr. Aaron Motsoaledi, Minister of Health. to declare the outbreak last December.

The Incident Management Team is conducting inspections of South Africa's 158 meat processing facilities. It collected environmental swabs for testing from 132 of the M6 meat processing facilities inspected to date. The IMT expected to complete inspections of all 158 meat processing facilities by the end of July, including 14 not currently in production. Where tests are favorable for the presence of Listeria monocytogenes, follow up is being done by districts with support from the National



iger Brands Enterprise Foods were most commonly reported to have been consumed where brand of polony was known.

### Example of Literature Review Table

Infection Model	Strength	Weaknesses	
Salmonella Culture (Non-Host)	Direct interaction with the pathogen without confounders	Does not represent the interaction of dietary components with the host	
Co-culture of Salmonella with host cell	Increased complexity of interaction compared to only pathogen culture, Represents effects of intervention on the pathogen as well as the host	Does not represent involvement of all the host cell types that simultaneously happen together in human	
Rodent Models	Represent a complex living system, very economical and convenient, ease in genetic manipulation to know mechanistic pathways	No diarrhea and vomiting, different intestinal immunity, different gastric environment, and anatomical structures	
Pig Models	Similar to humans in body composition, cardiovascular, renal, nutritional, immunological, metabolic and gastrointestinal aspects	Different than humans in Salmonella colonization pattern, gastric acidity, bile quantities, mucus thickness, immune system, not economical, not convenient	
Calf Models	Develop similar clinical and pathological features such as diarrhea and enteritis.	Stomach structure is different, not economical	
Clinical Trials	The ideal model	Difficult to study the preventive effects of interventions due to ethical considerations	

### Example of Literature Review Table

344 Fouladkhah et al.

**Table 1**Selected patents (1993–2013) of low-sodium/sodium-free food products

	Patent numbers		
Use of salt and salt alternatives with reduced particle sizes	US 20080008790A1; WO 2008005230A3; US 0038411A1; US 7,923,047B2; US 0008790A1; US 0244263A1; WO 126035A1		
Combination of salt, alternative salts, and flavor enhancers/maskers	US 5,213,838; US 5,871,803; US 6,541,050B1; US 6,787,169B1; US 6,783,788B2; US 0123670A1; US 7,402,328B2; US 0286275A1; US 0286276A1; US 0292592A1; US 0003358A1; US 0135110A1		
Use of naturally driven flavor-enhancing/masking ingredients	US 0047398A1; US 6,743,461B1; US 6,929,809B2; US 0220975A1; US 7,208,189B2; US 0160132A1; US 0117254A1; US 0104351A1; US 0027451A1; US 7,867,520B2; US 0097475A1; US 0052763A1		

### Example of Literature Review Table

Study	Health IT Component	Study Purpose	Time Frame	Sample Size	Outcome Measures	Relevant Findings
Study Black, A. D. J. Car, C Pagliari, C. Anandan, K. Cresswell, T. Bokun, B. McKinstry, R. Procter, A. Majed, A. Sheikh. 2011. The impact of eHealth on the quality and safety of health care: A systematic overview. Public Library of Science Med 8(t): e1000387.	Overview	To determine the impact of eHealth on the quality and safety of health care by conducting a systematic review of current systematic reviews	1997 to 2010	53 systematic reviews	Benefits and risks associated with various eHealth systems (i.e., legibility, accessibility, efficiency, patient disengagement, and increased costs)	There is insufficient empirical evidence in the literature to establish the impact of eHealth on the quality and safety of health care.  Evidence supporting eHealth is weak and inconsistent.  The presence of negative consequences cited in the literature indicates a need to further evaluate the risks associated with eHealth.
Harrington, L., D. Kennerly, and C. Johnson. 2011. Safety issues related to the electronic medical record (EMR): Synthesis of the literature from the last decade, 2000-2009. Journal of Health Care Management 56(1):31-43.	Overview	Identify problems associated with health IT that health care leaders need to be aware of when imple- menting health IT systems	2000 to 2009	24 studies	Rates of potential adverse drug events (ADEs)	Although health IT can be associated with greater patient safety (e.g. resolve legibility problems), it can lead to unintended consequences such as Increases in coordination load for clinicians resulting in new opportunities for error Overdependence on health IT, particularly when incorrect information is entered into the system, and making errors Alert fatigue When implementing health IT systems, health care leaders must be aware of potential problems and be prepared to ad-
Pearson, SA., A. Moxey, J. Robertson, I. Hains, M. William- son, J. Reeve, and D. Newby, 2009. Do computerised clinical decision support systems for prescribing change practice? A systematic review of the literature (1990-2007). Health Services Research 9:154.	Clinical decision support (CDS)	To determine CDS sys- tems' impact on specific aspects of prescribing	1990 to 2007	56 studies	Effectiveness of CDS systems in supporting prescribing during the following: - Initiation of treatment - Before drug selection - After drug selection	dress them  - CDS systems were more effective after drug selection in  - Flagging key safety issues (e.g., drug-drug interaction (DDI) alerts and warnings against prescribing potentially inappropriate medications for the elderly)  - Medication messages, such as suggesting alternative drug treatments
Shamliyan, T. A., S. Duval, J. Du, and R. L. Kane. 2008. Just what the doctor ordered. Review of the evidence of the impact of computerized physician order entry system on medication errors. Health Services Research 43(1 Pt 1):32-53.	CDS	To determine if elec- tronic ordering with CDS lowers medication errors (MEs) as com- pared to handwritten orders	1990 to 2005	12 studies	Rate of MEs	- Computerized physician order entry (CPOE) can be associated with a reduction in MEs, particularly when used with a CDS  - CPOE use is associated with - 66 percent reduction in total prescribing errors in adults (odds ratio (DR) 0.34; 95 percent confidence interval [CI] 0.22 to 0.52)  - A positive tendency in children, but not statistically significant (DR 31; 95 percent CI 0.09 to 1.02)
Tan, K., P. R. F. Dear, and S. J. Newell. 2005. Clinical decision support systems for neonatal care. Cochrane Database of Systematic Reviews (2):CD004211.	CDS	To assess how newborn mobility and mortality is affected by the use of CDS in CPOE, computerized physiological monitoring, diagnostic, and prognostic systems	1966 to 2007	3 studies - 2 randomized control trials - 1 randomized crossover trial	- Mortality within first 28 days of life of life - Mortality within the first year of life - Effects on physician or nursing staff performance - Staff satisfaction or compliance - Costs - Costs	There are too few randomized trials and data to determine the benefits or harms of CDS systems in neonatal care
Wolfstadt, J. I., J. H. Gurwitz, T. S. Field, M. Lee, S. Kalkar, Wei Wu, and P. A. Rochon. 2008 The effect of computerized physician order entry with clinical decision support on the rates of adverse drug events: A systematic review. Journal of General Internal Medicine 23(4):451-458.	CDS	To determine how CPOE systems with CDS components impact the rate of ADEs	1994 to 2007	10 studies	Rate of ADEs	More research is needed to determine the impact of CPOE systems with CDS components     5 of 10 studies focusing on CDS systems' impact on ADE rates found a significant reduction in the number of ADEs
Ammenwerth, E., P. Schnell-In- derst, C. Machan, and U. Siebert. 2008. The effect of electronic prescribing on medication er-	CDS e- prescribing	To determine the effects of CPOE on the relative risk reduction of MEs and ADEs	1992 to 2004	27 controlled field and pretest-post- test studies	Relative risk of - MEs and - ADEs	Studies show that the implementation of CPOE, especially those with CDS, can reduce the relative risk of MEs and ADEs - However, these studies

### Additional Resources



#### United States Department of Agriculture Food Safety and Inspection Service

Ask Karen provides information for consumers about preventing foodborne illness, safe food handling and storage, and safe preparation of meat, poultry, and egg products.

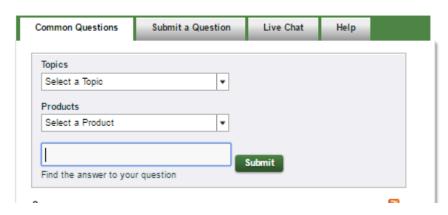
For answers to questions about inspection-related policies, programs, systems and procedures, access askFSIS IN.



Want to know how long you can safely keep meat in the refrigerator? Or how long to boil an egg? How about whether it's better to use wooden or plastic cutting boards?

Just ask Karen, your guide to expert knowledge on handling and storing food safely and preventing food poisoning.

Use this page to search our knowledge base of common food safety questions (available 24/7). On your mobile phone access <u>m.askkaren.gov</u> | En Español





Foodborne Pathogenic Microorganisms and Natural Toxins Handbook

#### **Bad Bug Book**

#### Handbook of Foodborne Pathogenic Microorganisms and Natural Toxins



#### Introduction

Food safety is a complex issue that has an impact on all segments of society, from the general public to government, industry, and academia. The second edition of the Bad Bug Book, published by the Center for Food Safety and Applied Nutrition, of the Food and Drug Administration (FDA), U.S. Department of Health and Human Services, provides current information about the major known agents that cause foodborne illness. The information provided in this handbook is abbreviated and general in nature, and is intended for practical use. It is not intended to be a comprehensive scientific or clinical reference.

Under the laws administered by FDA, a food is adulterated if it contains (1) a poisonous or otherwise harmful substance that is not an inherent natural constituent of the food itself, in an amount that poses a reasonable possibility of injury to health, or (2) a substance that is an inherent natural constituent of the food itself, is not the result of environmental, agricultural, industrial, or other contamination; and is present in an amount that ordinarily renders the food

### Thank you

