I. Intro:
   A. Recent food safety issues and history of food safety back to Old Testament (dietary laws)
   B. Overheads--Outline of presentation

II. Types of Food Safety Problems
   A. Basic issue--What do we need to do, individually and collectively, to assure that our food is safe?
   B. Types of potential health/safety problems--each regulated through a different set of laws and administrative rules.

   1. Safety of workers in producing food
      a. e.g., current grape boycott is to draw attention to alleged dangers to farm workers in use of pesticides
      b. More a labor relations/worker safety issue than a food safety issue in the sense we will discuss today. Similar questions could be raised for other workers in the food industry--e.g., safety of those working in meat processing plants.

   2. Potential chronic health problems arising from the nutrient composition of various foods (nutritional safety):
      a. Heart disease and cancer risk from high-fat diets
      b. Danger of dental caries from high-sucrose diets
      c. Colon cancer risk from low-fiber diets
d. Nutritional deficiencies from diets lacking sufficient variety (not much of a problem in high-income countries like the US)

e. Dangers from over-consumption of alcohol and tobacco.

f. How are these dealt with in the US?
   (1) Largely through consumer education, labeling, and restrictions on advertising (alcohol and tobacco), along with some warning labels.
   (2) Attempts at outright prohibition failed for alcohol, and never tried for tobacco.

g. These issues usually covered not in discussions of food safety but of consumer education and nutrition labeling. But one of the issues we will discuss is whether we can follow the same approach for other types of food hazards:
   (1) Warn consumers of risks and let them decide rather than proscribe what can go into food.
   (2) Or do we need stronger approaches here. Warning labels on french fries? Or setting tolerance limits for fat in French fries similar to tolerance limits we set for pesticides in fresh produce?

3. "Contaminants" in food that can adversely affect health, although some of these may be naturally occurring. This is the domain usually covered in
discussions of food safety:

a. Chemical contaminants

   (1) Pesticides

      (a) Ways they enter the food system

         i) Used on farms for

            a) Economic or cosmetic reasons (relate to nature of consumer demand for blemish-free food)

            b) To prevent microbial contamination--e.g., to kill rats so they don’t poop in the corn.

         ii) Off the farm, in processing and storage

   (2) Animal Drugs

      (a) Used to:

         i) Treat disease

         ii) Increase feed efficiency through suppressing sub-clinical disease--e.g., through adding antibiotics to feed.

   (3) Environmental contaminants

      (a) Get into food inadvertently--e.g., PCBs in Great Lakes fish; mercury contamination in seafood
(b) Was a bigger problem in the US in the 1970s, but has declined with improved environmental regulations.

(4) Food additives

(a) Added to foods at processing time

(b) Used to:

i) Maintain product consistency (e.g., emulsifier)

ii) Maintain or improve nutritional quality (e.g., vitamin supplementation)

iii) Maintain palatability

iv) Provide leavening or control acidity/alkalinity

v) enhance flavor or impart desired color

vi) Also included here are new food substances such as Olestra

b. Microbial/biological contaminants

(1) Bacteria

(2) Fungi

(3) Viruses

(4) Prions (don’t carry DNA)--e.g., mad cow disease
(5) Toxins

(6) Parasites—e.g., tapeworms

(7) Becoming more important due to:

(a) Resistant strains of bacterial pathogens

(b) Discovering new varieties of pathogens

(c) With increased international trade, more pathogens are being spread to more people.

c. Naturally occurring substances

(1) Some regulation through limits set by FDA—e.g., aflatoxin in grains and peanuts.

(2) Fact is that many flavors and substances that add spice to our diets are insecticides—e.g., mustard.

d. Other perceived risks—e.g., irradiation of foods.

III. Relative Risks (at least acute risk directly traceable to contamination)—Issues or perception vs. reality.

A. Microbial/biological contamination—9,000 to 12,000 deaths in US per year, although often mis-diagnosed as "flu".

1. Over 1 million affected annually in US

2. Approx. $5 billion in economic losses due to resulting illness

3. Incidence of food poisoning:

   a. 1 in 5 million meals of fish
b. 1 in 200,000 meals of beef  
c. 1 in 20,000 meals of poultry  
d. 1 in 250 meals of shellfish  

B. **Pesticides**--Evidence of acute damage much less, and most indications of chronic problems not as severe as costs of microbial contamination. But greater uncertainty here.  

C. **Animal Drugs**--e.g., BST  

D. **Environmental**--Decreasing for individual contaminants, but question of the interaction across contaminants  

IV. Should the public sector be involved in assuring food safety?  

A. Can we count on the market to provide adequate food safety? Is there a market failure, and if so, what is its nature?  
   1. Why not rely on the market to weed out providers of unsafe food?  
   2. Isn’t there a profit incentive to provide safe food, particularly in an era of increased litigation?  
      a. Clearly the threat of food safety lawsuits is one force driving food system to tighter vertical control. Desire of food firms to be able to trace food from consumers’ plate to farm field to identify where problems occur.  
      b. Is this threat enough to assure food safety? Is there a public-good characteristic to food safety information? To answer this question,
one has to understand the nature of food safety risks in food.

3. **How to assess risk?**

   a. Fundamental problems of lack of scientific knowledge--First dealing with an area of high uncertainty (although data base in increasing).

   In the presence of uncertainty, how conservatively should standards be set? Would firms set them conservatively enough?

   b. Risk for a particular individual from a contaminant = Hazard x Exposure

   (1) Hazard = Dose-response (which will vary by type of individual and their health status [public good information]

   (a) Typically assessed through animal testing, with all the problems inherent in that.

   i) Aside on how low-dose responses are assessed in animal studies?

   ii) Problems in extrapolating to humans--e.g., of thalidomide

   iii) Example of rat experiments with saccharin

   (b) Short-run and long-run studies

   (2) Exposure a function of

   (a) Level of contamination of a particular food

   (b) Individuals choice of types and quantities of food a
person consumes.

c) Problem of assessing possible interactions among contaminants in the diet.

c. Will the market work? Issues in generating and making these data public?

(1) Dose-response data very costly to produce and have large scale economies. And once released, hard to exclude others from using. Public good characteristics in their production.

(2) What is incentive of private firms to truthfully reveal information on possible levels of contaminant content in their foods? A real information asymmetry problem, where manufacturer has lots more information than consumer and little incentive to reveal it.

(3) Threat of litigation not strong enough to assure disclosure, as it is very difficult to trace origin of certain types of contamination given:

(a) Mis-diagnosis (e.g., food poisoning thought of as flu)

(b) The contaminated food is eaten with many other foods and the problem may not show up immediately. Thus it is difficult to trace the injury
back to a particular food.

(c) Transaction costs--cost of litigation would be high relative to average level of harm suffered. Many people would not make the effort to sue.

(4) Even if information on dose-response and content were made public, could the average consumer process this information at reasonable cost? Justification for just setting safety standards and certifying that the food meets the standard.

d. But the above points regarding risk assessment imply that setting a standard is difficult--what is safe for some is not for others, and degree of uncertainty is large about long-term and interactive effects.

e. This means that political arguments sometimes take sway over scientific evidence. E.g.,

(1) Saccharin exemption

B. Current dilemma where many people do not trust the government to provide reliable information on food safety. Whom do you trust?

1. What other third parties might you trust? (E.g., current private-sector certification of “pesticide-free” and “organic” produce).

2. Who guarantees these? (Public certification of private certification?)
V. Who regulates food safety in the US and with what standards?

A. Historically, regulation has been split among 4 agencies, which are told to use different standards for different types of contaminants:

1. Food and Drug Administration
   b. Enforcing basic clean food acts, including laws covering sanitary standards, rules about additives, against adulteration, animal drug residues in food, etc.
   c. E.g., ruled in Jan. 1994 on P&G’s application to allow Olestra as a fat substitute in foods. (Overhead)
   d. Enforcing standards on pesticide standards established by EPA

2. Environmental Protection Agency
   a. In charge of setting standards for pesticide use and residues in food
   b. Also sets standards for worker safety in the application of pesticides.

3. U.S. Dept. of Agriculture, for meat, poultry and egg products

4. Dept. of Commerce--Fisheries inspection, although recently shifted more to USDA.

B. Standards used (current efforts to move to a single standard)

1. How safe is safe?
2. Problems of using inconsistent standards for different contaminants in different settings

3. Zero tolerance for some substances—Delaney Clause—
   a. Any additive or pesticide residue (in processed food) shown to cause cancer in people or animals is banned.
   b. Includes animal drug residues and pesticides in processed foods
   c. Problems with this standard when we can now detect minute quantities.
      (1) 1 ppm = 1 cherry in 20,000 1 lb. cans
      (2) Now can detect parts per trillion. On ppt = 1 grain of sand in an Olympic sized swimming pool
      (3) Do such minute quantities really pose a risk? Before, when legislation was drafted they were ignored because they couldn’t be detected.
      (4) E.g., in 1987 US Court of Appeals in Washington, DC, ruled that FDA had to ban 4 food colorings, including Orange no. 19, where scientific research showed that maximum lifetime risk of cancer death from this coloring is 1 in 19 billion! Court ruled that the risk was trivial, but that under the Delaney Clause, the additive had to be banned.
      Note that if the same pesticide residue shows up on fresh
produce, it isn’t necessarily banned. Its use is governed by EPA, which applies a risk-benefit standard.

4. De minimus standard. E.g., 1 in a million additional deaths for cancer.
   a. Current proposal to move everything to this standard.
   b. Used in past by EPA for registering certain pesticides. Court ruled that this was not valid for foods going into processing and applied Delaney clause.
   c. Prop 65 in California has 1 additional death in 100,000 over their life times as a de minimus risk.
   d. Note what this means in terms of additional number of deaths.

5. Benefit-risk standard of FIFRA (Federal Insecticide, Fungicide and Rodenticide Act), which regulates pesticides on fresh produce.

6. GRAS (Generally recognized as safe) standard for older, widely used additives.

7. Inconsistency across standards—e.g., between Delaney clause for pesticide residues on processed products and risk-benefit standard for same residues on fresh produce.

VI. Determining how to deal with food safety in a public policy sense--3 issues

A. *How to assess risk?*—Discussed above (dose x exposure = risk)

B. *How to assess tradeoffs?* How much safety should society buy if safety is expensive. *(Overhead on perceptions of risk).*
1. Should there be tradeoffs?
   a. Is it moral to make such tradeoffs? Is it immoral not to?
   b. Problems with an absolute ban--e.g., Delaney
      (1) Ability now to detect very minute quantities of contamination in food
      (2) Multiple objectives of the food system--Low cost food, convenience, healthy?
   c. Who bears the costs and who gains the benefits of the tradeoffs (e.g., farm workers face most exposure to pesticides, while consumers gain most of benefits).

2. Examples of types of tradeoffs:
   a. Some of food safety issues arise from changing consumer demands:
      (1) Shift from red meat to poultry and fish, which have greater risk of bacterial contamination. Trading off lower fat for more bacteria?
      (2) Shift to more pre-prepared and microwavable foods, which may harbor bacteria?
      (3) Desire for more variety in diet--e.g., increased consumption of raw seafood (sushi) in US.
      (4) Cost of food vs. safety. Is it moral to make these tradeoffs? Is it immoral not to? How would you assess benefits and
Examples of some of the dilemmas.

(a) Cheaper food vs pesticide residues? More expensive broccoli ==> fewer people eat it and benefit from its anti-oxidants, so get more cancer to avoid fewer cancers from pesticides.

(b) Move away from pesticides and preservatives and get more bacterial problems?

(c) Move away from pesticides and get more resistant strains with designed-in pesticides?

C. **Questions of implementation:**

1. Who should make the tradeoffs?

2. Who should enforce any standards that are set?

3. What’s the most effective way to reduce hazards?

   a. E.g., can have *Process standards* (conduct)--set standards for what people do. It is often hard to sent performance standards for microbial contamination, hence, the reliance on process standards in some areas, such as health board standards for how food is prepared in restaurants. Note that GATT is outlawing process standards as a NTB.

   b. Performance Standards--What process must look like at the end of
the process (tolerances).

c. Now moving from process standards to HACCP approach (Hazard Analysis and Critical Control Points). E.g., What role can consumer education play--for example with salmonella in chicken?

(1) See reading on HACCP
(2) Firms now have to file plans identifying critical control points (CCPs) and develop plans to assure food safety at those points.

VII. Where do you come out?

A. Go back to opening comments of students on food safety.