

**SAFE FOODS**

**BETTER SAFE THAN SICK**

# Food can be bad for you: food illness

- Every year: 76 million Americans-  
sick: contaminants/bacteria
- 325,000 → hospital
- 5000: die
- Unborn fetus- death → pregnant  
woman eats contaminated food

# Symptoms: Food Poisoning

- Upset stomach
- Diarrhea
- Fever
- Vomiting
- Abdominal cramps
- Even: paralysis & meningitis

# How to protect yourself, family, friends

- At supermarket



Uncooked, raw food:  
bacteria/contaminants in/on it

**Safety** starts as soon as **you**  
**pick up food**

# **2010 Dietary Guidelines for Food Safety**

- **CLEAN**
- **SEPARATE**
- **COOK**
- **CHILL**

# Shopping Cart

- Separate:
  - Raw
  - Cooked
  - Ready-to-eat food



**FIGURE 17.15** Meat carries labels offering safe handling guidelines. (Dennis Drenner)

Prevents: Cross- contamination

# Common Sense Points

- Check expiration dates
- Don't leave perishable foods- hot car
- Bring food home quickly
- Store food: cabinet, refrigerator, freezer
- Don't leave perishable foods: counter top/table

# In Fridge: keep it “cool & clean”

## Common Sense Points

- Keep refrigerator below 40 F: cold slows bacteria
- Keep freezer: 0 F
- Clean fridge shelves
- Wipe up food/liquid spills
- Stop food juices (meats/fruits/veggies) from **dripping** (cross-contamination)



# • **Preparing Foods**

## **Common Sense Points**

- Clean all surfaces
- Clean knives, forks, spoons
- **Wash hands** 20 secs- soap & H<sub>2</sub>O
- Dry hands- clean cloth/disposable towel
- Keep separate: raw, cooked, ready-to-eat foods

# •Preparing Foods

## Common Sense Points

- Just before cooking: peel away/discard outer veggie leaves
- Wash fruits/veggies → dry → clean paper towel (bacteria grow on fruits/veggies)

# •Thawing frozen foods

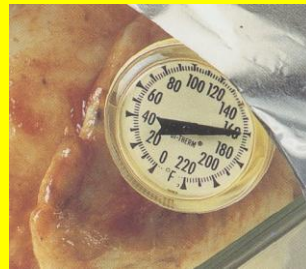
1. On plate → fridge
2. In cold H<sub>2</sub>O (airtight bag)
3. On plate → microwave

**Not** on counter top/table at room temperature

- **Be smart- cook smart**

- Cook foods → temps → kill bacteria

- Best way: **food thermometer:**  
inside temperatures



Food

Roasts/steaks

Poultry

Cook to

145 F

180 F

# •Be smart- cook smart

## Food

Ground meat

Leftovers

Sauces/soups/  
gravies

Egg dishes

## Cook to

160 F

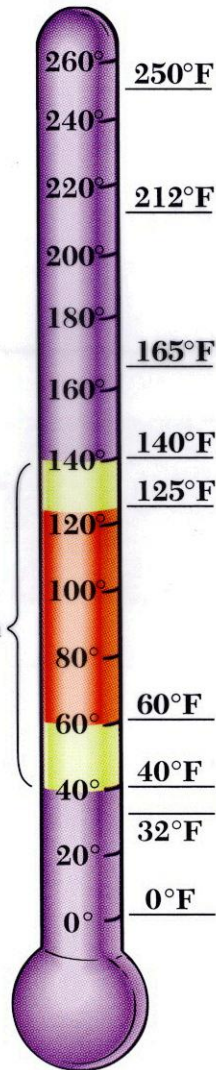
165 F

160 F

160 F



**Danger Zone** Temperatures in this zone allow rapid bacterial growth and production of bacterial toxins.



Canning temperature for low-acid foods in pressure cooker

Range of cooking temperatures to kill most bacteria.  
The amount of time needed decreases as the temperature increases.

165°F Minimum temperature for reheating foods.

Warming temperatures control growth but allow survival of some bacteria.

140°F

125°F

Some growth may occur: Many bacteria survive.

60°F

Some bacterial growth may occur in this zone.

40°F

Cold temperatures allow slow growth for a few cold-tolerant organisms but stops the growth of most.

32°F

0°F

Freezing temperatures prevent bacterial growth but some bacteria are able to survive.

- **Be smart- cook smart**

- Cook fish → OK: flakes with fork
- Don't eat pink ground beef
- Don't eat runny eggs
- Cook hot dogs/sausages thoroughly

# •Leftovers

- Bacteria grow: **uncovered** food on countertop/table
- Immediately: store food in fridge/freezer- wrap properly
- After 3-4 days? “When in doubt, throw it out”

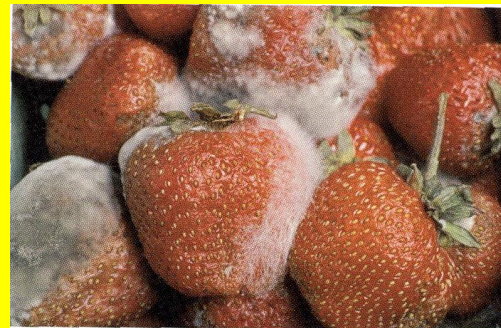
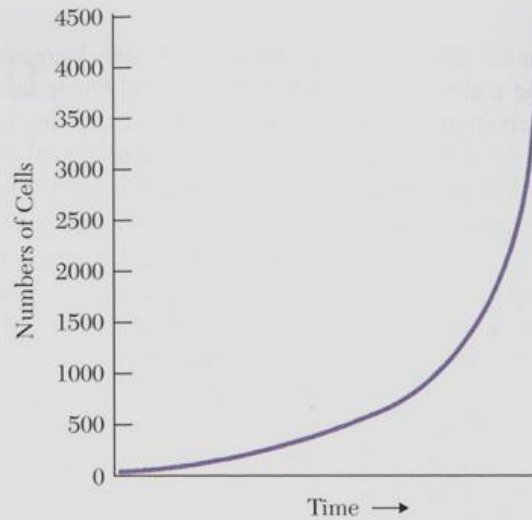


Figure 14.3 Molds rarely cause human illness, in part because they look so unappealing that we throw the food away.



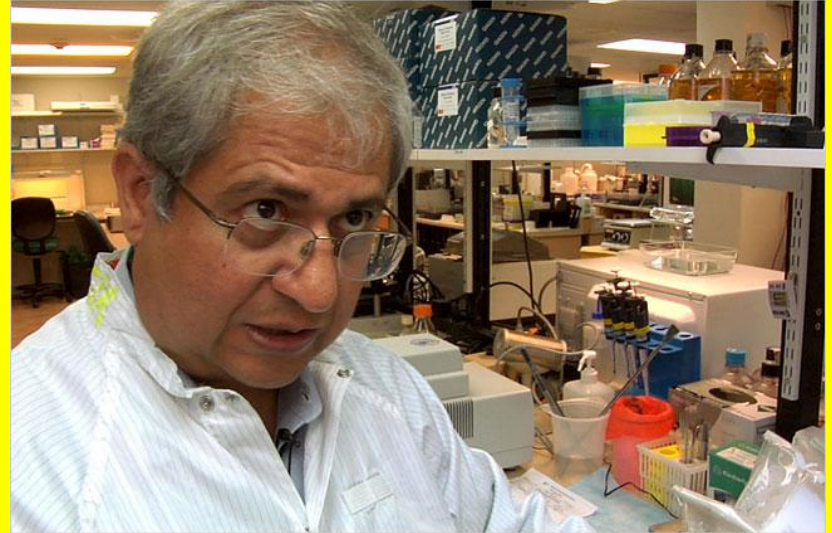
# Germs are everywhere!

**FIGURE 17.7** *The size of a population of bacterial cells doubles each time the cells divide, resulting in an exponential growth curve. If 10 bacterial cells contaminate an egg salad sandwich during preparation and it sits in a warm car for 4 hours, during which the cells divide every 20 minutes, there will be 40,960 bacterial cells in the sandwich by the time you return to eat it.*  
(©Snowflake Studios/StockFood America)



Dr. Samadpour, Microbiologist

“In a warm kitchen,  
E. Coli doubles  
Every **45** minutes”



Only few bacteria cells



**ILLNESS**

# Special Populations at risk

1. Pregnant women & fetuses
2. Growing children
3. Older adults
4. People- weak immune systems

# Pregnant Women & young children

Mercury damage nervous system

fetus child

The diagram consists of the text 'Mercury damage nervous system' in red. Below it, the word 'fetus' is on the left and 'child' is on the right, both in red. Two green arrows point from the text 'nervous system' to 'fetus' and 'child'.

Don't eat fish high in mercury:

Shark

Swordfish

King Mackerel

Tilefish

[www: cfsan.fda.gov/seafood1.html](http://www.cfsan.fda.gov/seafood1.html)

- What not to eat: common sense
- Raw, unpasteurized milk/milk products
- Raw/partially cooked eggs/egg dishes
- Raw/undercooked meat, chicken, fish, shellfish
- Unpasteurized juices, raw sprouts

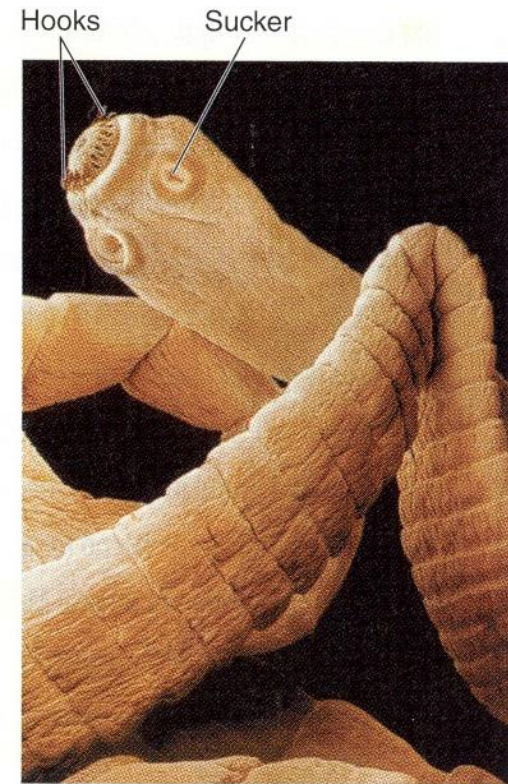


# Raw fish & parasites



**FIGURE 14.7**

The incidence of parasitic infections has increased with the popularity of raw fish, such as this sushi. (Glenn Beanland/Lonely



**Figure 14.2** Tapeworms have long, worm-like bodies and hooks and suckers, which help them to attach to human tissues.

# EAT YOUR SPINACH?





September 15, 2006 NY Times

## **FDA warns: not to eat bag spinach**

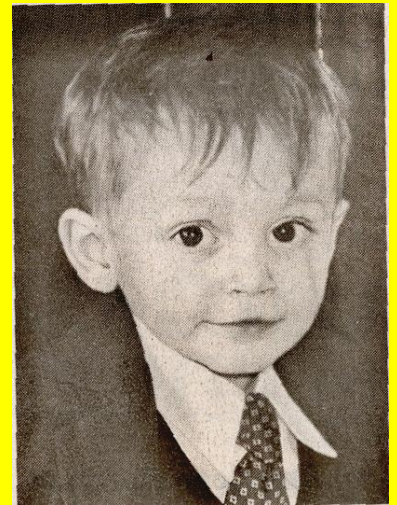
- 200 people sick
- 3 people die
- 20 states





**Idaho:** Kyle Allgood's mom-health  
conscious: Kyle (2 years old)

- Made **smoothie** from vegetable (spinach), fruit + juice to get children to eat veggies
- 3 days later: Kyle : flu-like symptoms, diarrhea, kidney failure, cardiac arrest. Died: 9/20/06



# Taco Bell closes 9 restaurants:

- Food poisoning: New Jersey, Long Island, Pennsylvania



Left  
Holding  
the  
Bag



Ed Betz/Associated Press  
A Taco Bell restaurant in Deer Park, in Suffolk County, was one of eight on Long Island to be closed at the request of officials.

# What caused food poisoning?

**E. Coli** : bacteria found in intestines of you, cows, other animals- normally harmless



In cow's intestine: E. Coli evolved  
into deadly strain: O157:H7

- Toxins: kill intestine blood vessels, abdominal cramps, kidney blood vessel damage, kidney failure
- Washing food won't kill E. Coli, cooking may kill it
- Deadly: swallow **10** bacteria: infected

# How did E. Coli get from cows to spinach?

- Dairy/beef cows → manure

irrigation/ground H<sub>2</sub>O

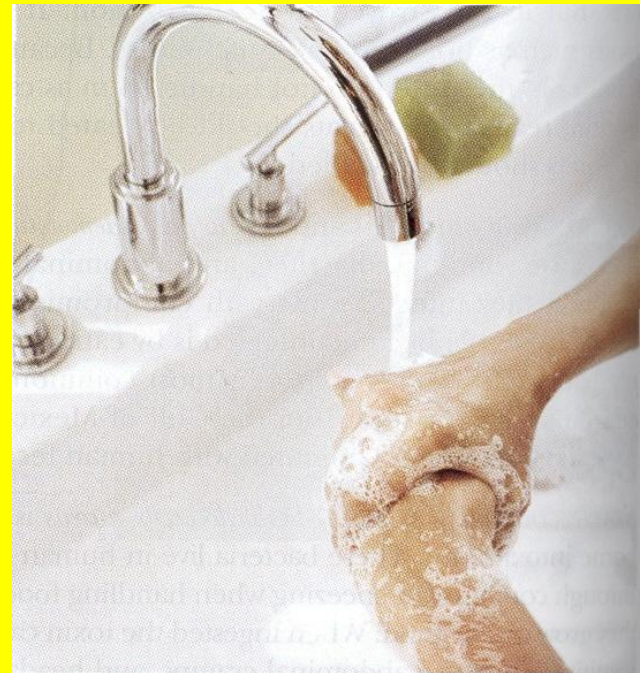
Polluted → crops in field

Even 1/2 mile away from cows

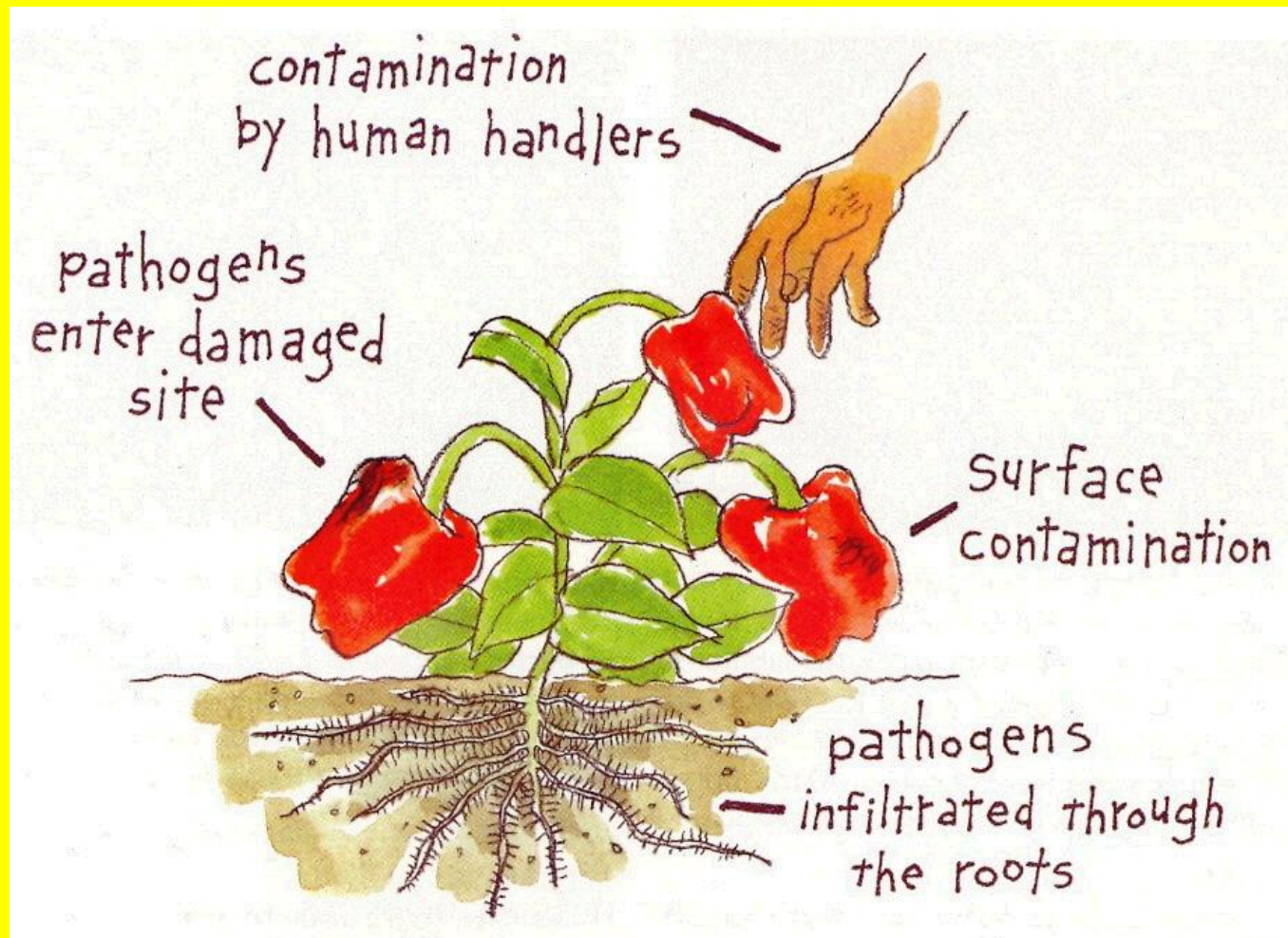


# Other possibilities

- **Feces** from wild animals → crops
- **Flooding**: ground water contamination
- **Unclean hands-workers**



# Summary: possible sources of fruit/vegetable contamination



# 1993: E. Coli outbreak

- Undercooked hamburgers: Jack in the Box restaurants
- 4 children died
- USDA (poultry/meat/egg production) expanded testing/inspection
- FDA: oversees produce & seafood





# BAD BEEF: Summer 2007

- Topps meat factory- New Jersey
- Supplier **Walmart**
- ↓ testing ↓ safety
- ↑ pressure- workers  
more patties
- Hamburgers: **E. coli**
- 40 people sick
- Topps- out of business
- 2d largest recall in history



NY Times Oct. 2009

“The burger that  
shattered her life”

“Eating ground beef is  
still a gamble”

**Stephanie Smith, 22**

Dance Instructor,  
Minnesota



- Fall 2007: Ate mom's grilled hamburger from **Sam's Club** (**Wal-Mart**)
- Stomach aches
- Cramping
- Bloody diarrhea
- Unconscious, Coma: 9 weeks
- Awoke: damaged nervous system
- **Paralyzed**: won't ever walk again



Hamburger she ate  
from food giant: Cargill  
“American Chef’s Selection  
Angus Beef Patties”  
Ingredients: beef trimmings  
(half fat/half meat),  
Slaughterhouse scraps,  
Bread crumbs, spices  
**Product label says: BEEF**





Source of “product”: Nebraska,  
Texas, Uruguay, South Dakota

Ground up: Wisconsin

- 25% cheaper for Cargill
- Cause: Virulent form **E. Coli**
- 9400 other people sick

# Cargill

Problem: Inconsistent **E. Coli**  
**testing: suppliers, grinders,**  
**meat sellers**

Cargill: recalled 800,000 pounds-  
patties

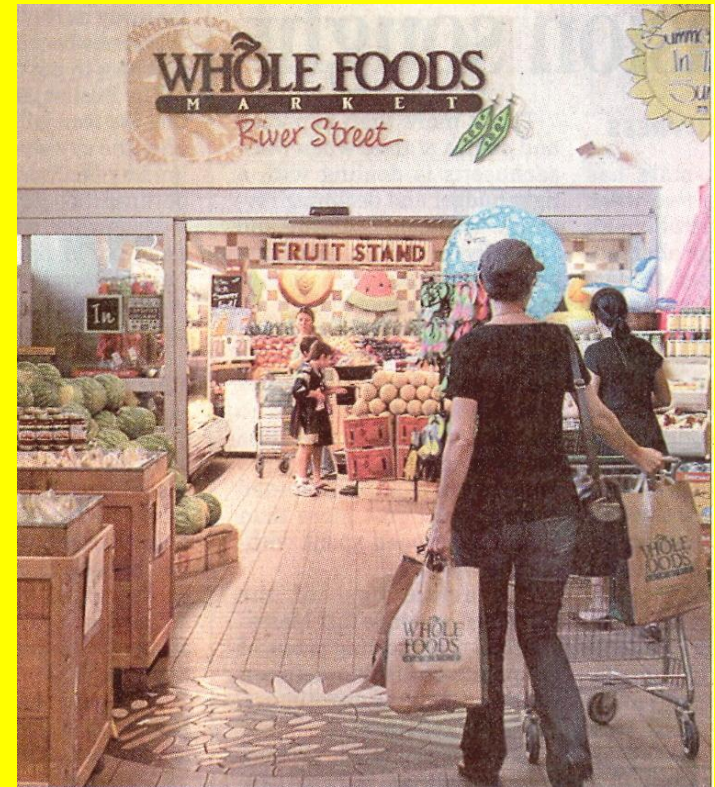
No USDA fines/sanctions, many  
lawsuits

Exception:  
**Costco-**  
Big  
Company-  
Tests for  
E. Coli  
**Before**  
Grinding



# BAD BEEF: July 2008

- Nebraska Beef Ltd
- Supplier:  
**Whole Foods**
- Beef products:  
30 people sick
- **E. Coli** contamination
- 1.2 million pound recall





## E. Coli infections: greatest risk- children & elderly

- Most often: undercooked ground beef or unpasteurized milk
- Also: lettuce, alfalfa sprouts, salami
- Also from: food handlers- don't wash hands after using toilet

# Even peanut butter can cause problems

- Feb. 2007: 300 people sick
- Traced to **Salmonella** in Peter Pan peanut butter
- Pulled from shelves
- Symptoms: diarrhea, fever, dehydration, abdomen pain, vomiting
- Salmonella: feces of birds/other animals
- Origin in Peter Pan ?



Peter Pan peanut butter and another brand were linked to a salmonella outbreak that sickened people in 39 states, including Massachusetts.

Local stores pull Peter Pan brand after recall

Frozen Food  
Companies  
shifting blame  
to consumer



Inadequate  
Microwaving



Zoe Warren:  
Age 1: ate pot pie  
Hospital for weekend  
High fever, racing pulse

# “Did your microwave nuke the bacteria”

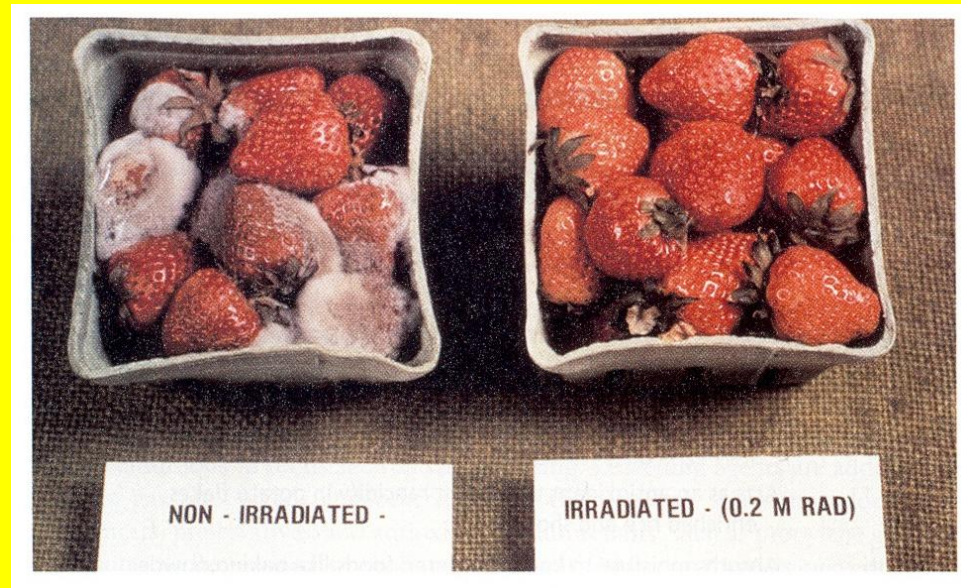
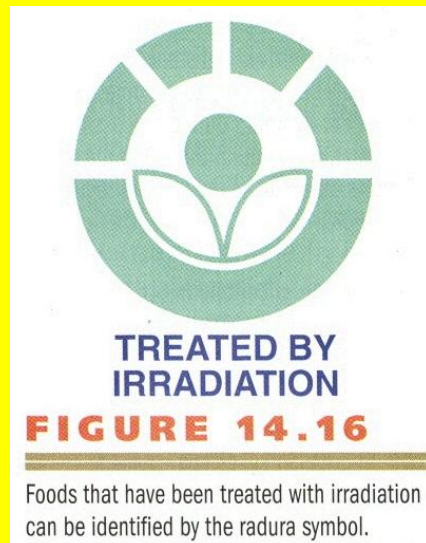
- 2007: 5000 people sick from Conagra Foods “**Banquet**” turkey pot pies
- Congra sells 100 million pot pies/year
- **Swanson & Hungry Man** can’t guarantee safety- frozen foods
- Problems: microwave wattage, time
- General Mills: **Use ovens instead**
- USDA: **Use food thermometers**



# What to do?



- More irradiation of food? Several foods now irradiated- no harmful effects



FDA 2008 regulation: OK to irradiate **spinach & iceberg lettuce** to kill **E. Coli**

Concern: Irradiation may destroy good **phytochemicals, vitamins** in plant food

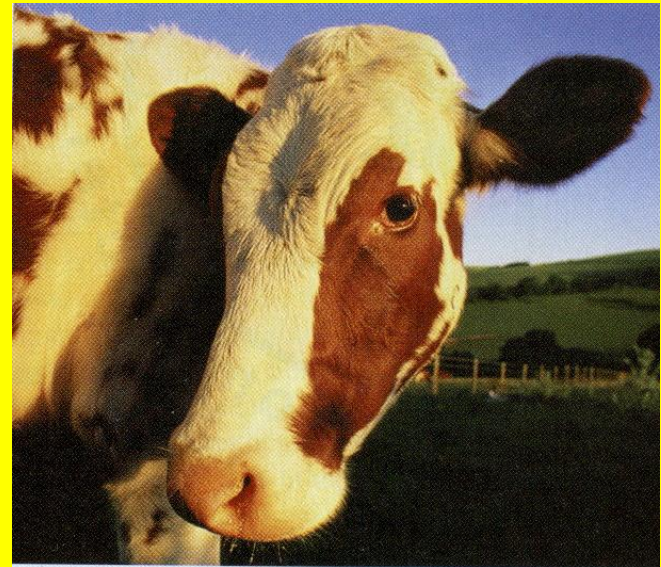
# What to do?

- Blame FDA? Regulates produce & seafood; USDA oversees meats
- Food safety program- not strong enough, budget cuts, not enough inspectors
- Suggestion: create one food safety agency?



# What to do?

- Vaccinate all infants against E. Coli? One idea or
- Canadian company: cow vaccine: reduces by 70% animals shedding E. Coli in manure



# What to do? Detection

- **SensorfreshQ-**  
Draper Labs-  
Cambridge;  
available **Sharper Image**
- Measures bacteria-meat  
(spoiled)

## A measure of freshness

High-tech scanner could keep Thanksgiving from being spoiled

By Hiawatha Bray  
GLOBE STAFF

Just in time for Thanksgiving, a Lexington company is marketing the perfect gift for the paranoid chef who has everything: a pocket-sized device that detects spoiled meat.

Food Quality Sensor International Inc. of Lexington (FQSI) makes the SensorfreshQ, a hand-held scanner that can detect high bacteria levels on meat and poultry. The \$90 device, which went on sale recently at specialty retailer **The Sharper Image**, uses sensor technology developed at Draper Laboratory in Cambridge to identify spoiled meat, even if it still looks and smells fresh.

Most of Massachusetts' top technology firms make products for business and government — massive data storage arrays from EMC Corp., guided missiles from Raytheon Co., or cell-phone chips from Analog Devices Inc. There are a few exceptions, like Bose Corp. and iRobot Corp. Now FQSI hopes join their ranks by selling millions of its SensorfreshQs.

"There are all kinds of ways that foods can spoil . . . and this device is a handy way to detect that spoilage," said FQSI president Marco Bonne, a food industry veteran who served as president of Prince Foods in the 1980s.

As bacteria feast on the protein in meat, they generate tiny amounts of chemicals called biogenic amines. These chemicals mix with the surrounding air, but people can't smell them. Megan

SCANNER, Page C5

The SensorfreshQ measures bacteria levels on meat and can determine whether it is fresh or spoiled.



SARAH BREZINSKY GILBERT/  
FOR THE BOSTON GLOBE

# Is cat & dog food safe for your pet?

- April 2007: recall 60 million packages- pet food
- 14,000 sick pets; 16 deaths

## What's really in there?



**Recall prompts shift to more natural and organic pet foods**

By Bruce Mohl  
GLOBE STAFF

The massive recall of tainted pet food in the United States is sparking a broader debate about the quality of the food Americans are feeding their pets.

Pet food stores say the recalls, which have been linked to contaminated wheat gluten from China, have prompted many consumers to shift to more expensive natural, organic, and holistic pet foods that contain recognizable meats, fruits, and vegetables.

Connie Kastelnik of West Roxbury said she initially was relieved to learn that the Hill's Pet Nutrition Inc. food she buys for her dog, Dillon, was not on the recall list. When Hill's recalled a dry cat food, however, she and her husband decided to start investigating more natural alternatives.

"When something like this happens, it destroys your trust in the industry," Kastelnik said. "You don't know if tomorrow there will be something else."

Rebecca Remillard, a veterinarian-nutritionist at the Angell Animal Medical Center in Jamaica Plain, said the shift to natural and organic products is understandable but not necessary nutritionally.

She said there is no difference nutritionally between a \$1.19 can of Wellness Turkey Formula cat food containing turkey, chicken, sweet potatoes, carrots, cranberries, and zucchini and a 45-cent can of Friskies Special Diet Turkey & Giblets Dinner containing just turkey, with meat and poultry "byproducts."

According to the labels on the two cans, both meet the nutritional levels established by AAFCO, the Association of American Feed Control Officers.

Remillard said the Wellness product, manufacturer

**PET FOOD, Page C5**

**WELLNESS**  
Made by Old Mother Hubbard,  
Chelmsford  
Size 5.5 ounces  
Price \$1.19  
Animal ingredients No  
Sample ingredients Turkey, chicken  
liver, sweet potatoes, cranberries,  
blueberries, zucchini, garlic, squash



**FRISKIES SPECIAL DIET**  
Made by Nestle Purina Petcare  
Co., St. Louis  
Size 5.5 ounces  
Price 45 cents  
Animal ingredients Yes, meat  
and poultry  
Sample ingredients Turkey,  
poultry giblets, brewers rice,  
titanium dioxide color

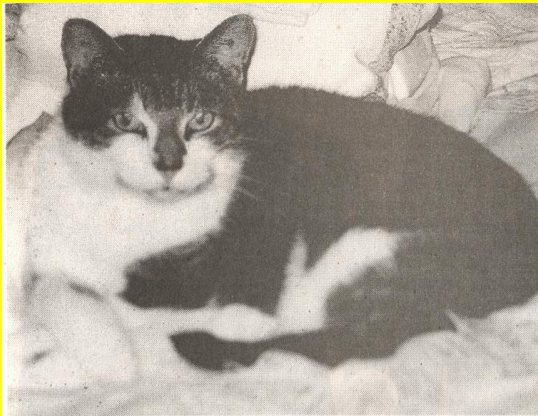


Karen Tam/Associated Press

Try It By F.D.A. rules, products not allowed in animal feed can go into pet food.



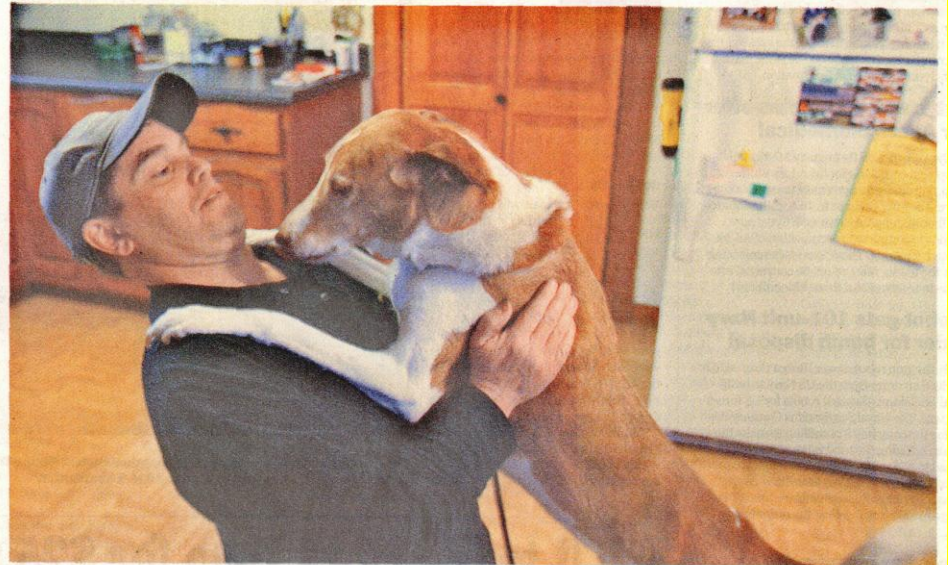
# Glen Daly's cat & dog: Freetown, MA



A photo of Glen Daly's cat, Chance. Daly attributes Chance's death to illness caused by contaminated food.

Chance died-  
kidney failure

Suspect gluten went to plants that make products for people, FDA says



Glen Daly plays with his dog, Teddy, at his Freetown, Mass., home. Daly's cat, Chance, suffered from kidney failure and was euthanized.

Was human food tainted too?

Teddy: OK

- Traced to fake ingredient:  
**melamine** → chemical company-  
China
- **Melamine**: scrap product made  
from coal (in plastics, fertilizers)
- Mixed with wheat gluten → US pet  
food



April 2007: USDA quarantined or killed 6000 hogs in US

- Melamine-laced pet foods/rice protein sent to hog farms by mistake
- Concern: food safety & globalization





China (2008): 4 infants dead, 50,000 sick from baby milk formula /milk powder containing melamine



Contaminated candy:  
U.S. & Europe



# Are plastic food/bottle containers safe?

2008 study: high levels of **bisphenol A (BPA)** in urine, 2X risk of diabetes or heart disease



Recommendations: don't microwave or clean plastic containers in dishwasher

# **Bisphenol A (BPA)**

- Chemical in Sippy cups, pacifiers, baby bottles
- Linked to **Developmental Problems-** children





# BPA

- Used in hard **plastic**, reusable bottles
- Also found in canned soups, infant formula
- **Children ingest small amounts**

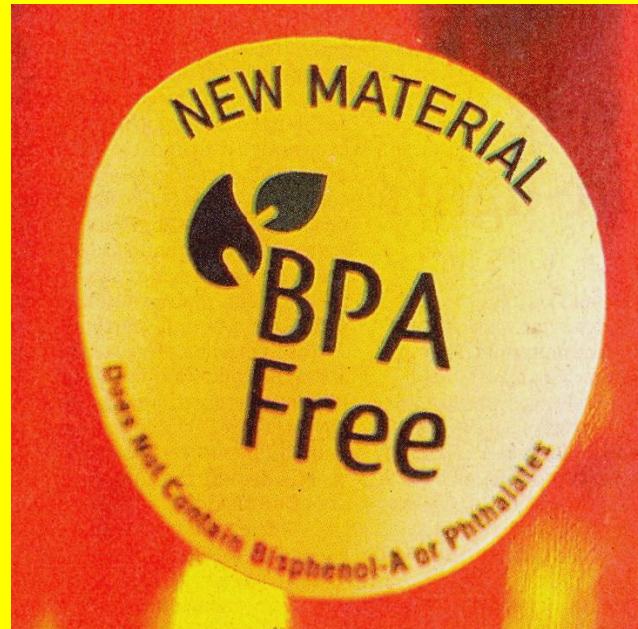


# BPA

- 2009 Harvard study: BPA **leaches** from **bottles** → **body**
- Warning: pregnant/breastfeeding moms: avoid BPA food/drink containers; or **storing** breast milk/baby formulas in them
- Lining canned foods- may contain BPA
- ↑ Risk mental problems- fetus/baby

## How to find BPA

- Code at bottom: **7 and "PC"**
- Better: eat fresh/frozen fruits/veggies
- Use glass/stainless steel bottles
- California:  
**BPA Free**  
Water  
bottles



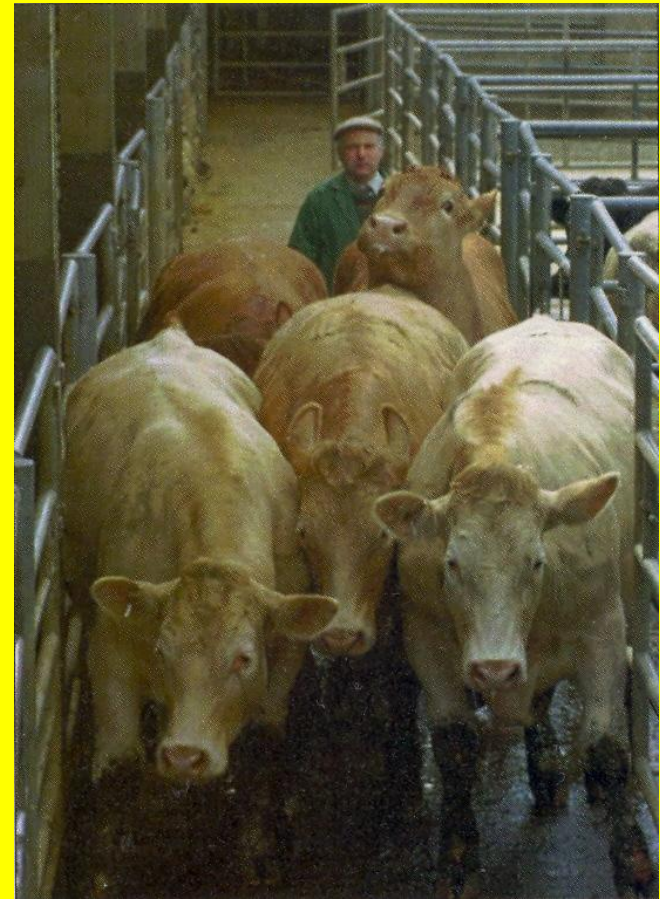


# How do you get Mad Cow Disease?

- Great Britain: 1<sup>st</sup> diagnosed 1986
- 180,000 cows infected
- 146 people infected
- USA: 1st case 2 days before Christmas 2003



US Cows  
Quarantined

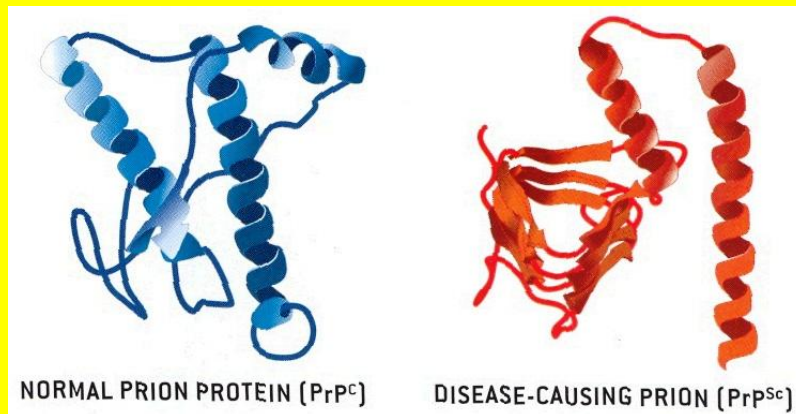
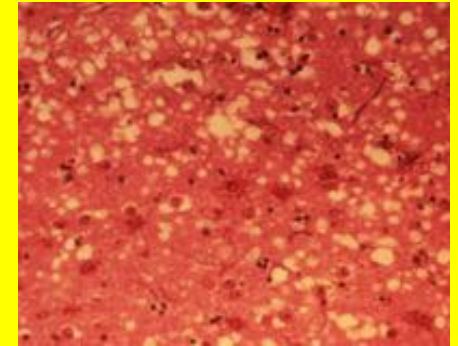


British Infected  
Cows Destroyed

# Mad Cow Disease

- Cows: weight loss, changes-temperament
- Weeks/months → death
- Human form: Creutzfeldt-Jakob Disease (CJD)
- Mood swings, numbness, 14 mos. dementia → coma → death: **incurable**

- Mad Cow Disease & CJD caused by infectious protein: **prion**
- Forms clumps in brain
- Brain looks like **sponge**
- Prions: not really “alive”
- Can't kill by cooking



# Cow → Human infection?

- Older cow **slaughter** methods:  
brain/spinal cord mixed → meat
- Infected meat → eat by humans  
Creutzfeldt-Jakob Disease ←





# What's being done to protect you?

1. Ban slaughter method that mixes nervous tissue with meat
2. USDA restrictions: import of cows/beef from Europe
3. More testing of cows slaughtered in US



BUT.... 2007 Hidden video- Humane Society

“Downer Cows”: too sick to walk at California meat packing company

Workers: electric prods, power hoses, forklifts to move cows



Result: **February 2008** largest US meat recall- **143** million pounds of beef

- But most company's beef already sold/eaten (stores/school lunches)
- **May 2008**: FDA proposes ban on use Downer Cows for food
- Previously allowed: veterinarian's OK

US beef → South Korea

- \$800 million/year
- 2003: 1 case Mad Cow in US
- South Korea: ban on US beef
- 2008: South Korean government lifts ban
- 100,000 people protest



# Beef protests: South Korea



# Globalization of our food supply

Concern: food safety- FDA underfunded, understaffed























# Food stopped at the border: Salmonella, pesticides, filth

## Food Refused at the Border

An analysis of food imports denied by the F.D.A. in the last year reveals the variety and extent of violations.

Countries with the most F.D.A. refusals <i>July '06 to June '07</i>	Number of refused food shipments <i>July '06 to June '07</i>	Most frequent food violation and counts <i>July '06 to June '07</i>	Total value of food imports <i>2006</i>
India	1,763 	Salmonella (mostly on spices, seeds, shrimp) 256 	\$1.2 billion
Mexico	1,480 	Filth (candy, chilis, juice, seafood, cheese) 385 	9.8
China	1,368 	Filth (produce, seafood, bean curd, noodles) 287 	3.8
Dominican Republic	828 	Pesticide (produce) 789 	0.3
Denmark	543 	Problems with nutrition label (candy) 85 	0.4
Vietnam	533 	Salmonella (seafood, black pepper) 118 	1.1
Japan	508 	Missing documentation (drinks, soups, beans) 143 	0.5
Italy	482 	Missing documentation (beans, jarred foods) 138 	2.9
Indonesia	460 	Filth (seafood, crackers, candy) 122 	1.5

Sources: Food and Drug Administration; U.S. International Trade Commission

The New York Times

# Physicians Committee for Responsible Medicine



“Salmonella are intestinal bacteria, and  
tomatoes have no intestines”

Dr. Neal Barnard

# Salmonella outbreak: July 2008

- 1300 Americans sick
- Tomatoes incorrectly blamed
- Actual cause: Mexican jalapeno and Serrano peppers
- Contaminated irrigation water: from chicken or cow feces?

# How did Typhoid Mary get her name?

- Mary Mallon
- Immigrant from Europe- cook (1868)
- **“Healthy carrier”** of **Salmonella**  
(bacteria)



Working as a cook, Mary Mallon, also known as Typhoid Mary, caused over 50 outbreaks of typhoid.

- “Healthy carrier” of Salmonella- no symptoms
- Salmonella → Typhoid Fever (104 F), headaches, diarrhea
- From food/H2O in contact: **feces** of infected person
- Mary: cook for different families: Long Island, Manhattan, Ithaca
- May have infected 1400 people; 3 deaths
- Hence name: “**Typhoid Mary**”

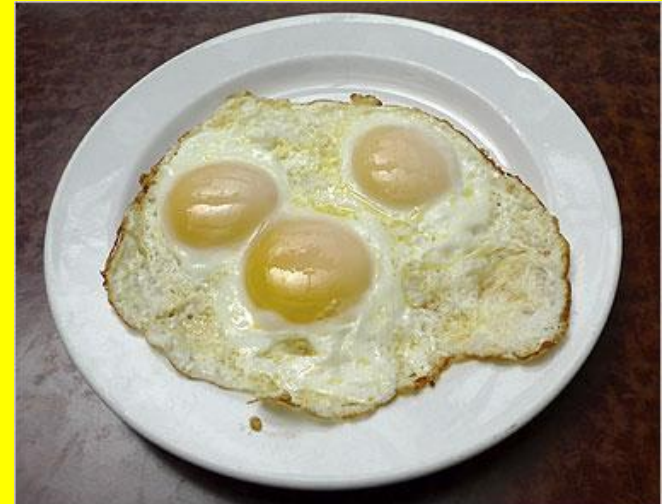


# August 2010: Toxic salmonella outbreaks from eggs

- Traced to Iowa farms owned by **Jack DeCoster**
- Previous history of violations (Maine, Maryland): minor fines, suspended sentences
- Called before Congress- Sept.



1600 Americans sick from bad eggs  
Largest egg recall in history:  
**1/2 billion eggs**



# Lax oversight by FDA/state officials

- No salmonella monitoring- Iowa
- Dysfunctional food safety system?
- USDA oversees chickens, **liquid eggs** used in food
- FDA oversees: **shell eggs**
- No one inspected Iowa farms
- **Civil/criminal suits in progress**



# FDA inspections Iowa farms



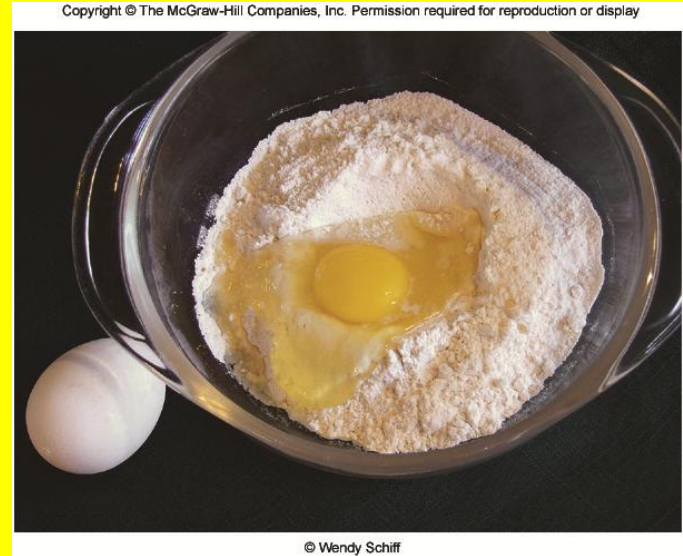
- Manure piles 4-8 feet high below chickens
- Hens walking through manure
- **Mice (salmonella carriers)**  
“running wild”
- Bone meal feed for hens:  
contaminated with **salmonella**





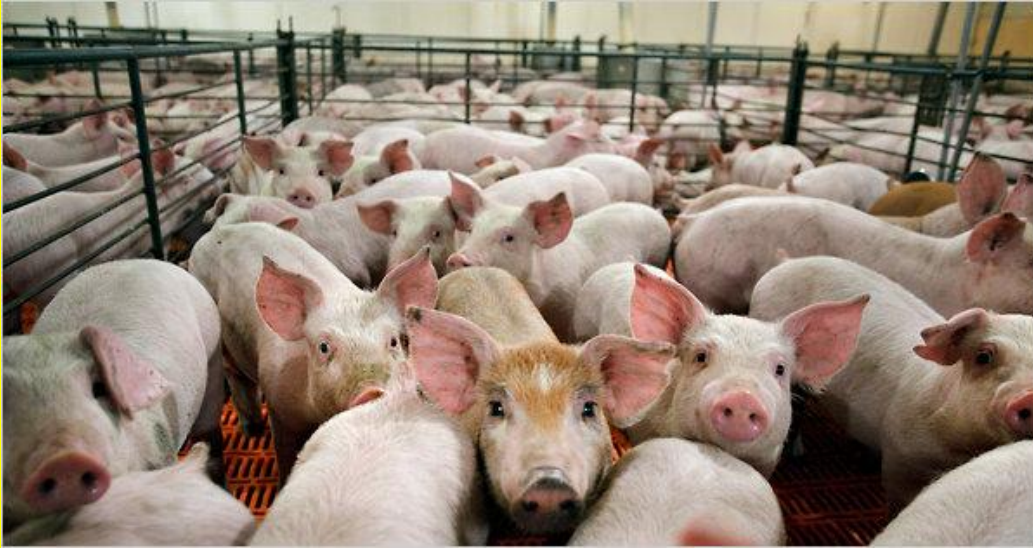
# What DeCoster farms did:

- Stopped selling  
**“shell eggs”**
- Send eggs to  
**“breaking plants”**
- **“Liquid eggs”** →



Pasteurized  
Food manufacturers ←  
→ you

# Antibiotics fed to healthy pigs

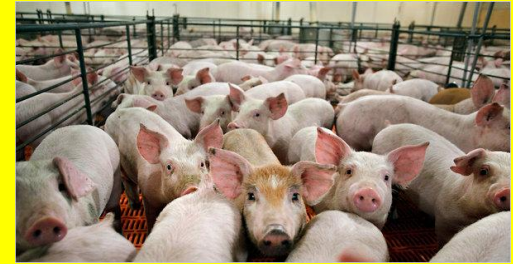


# Pigs grow faster, less food

- Problem:

**antibiotic-resistant**

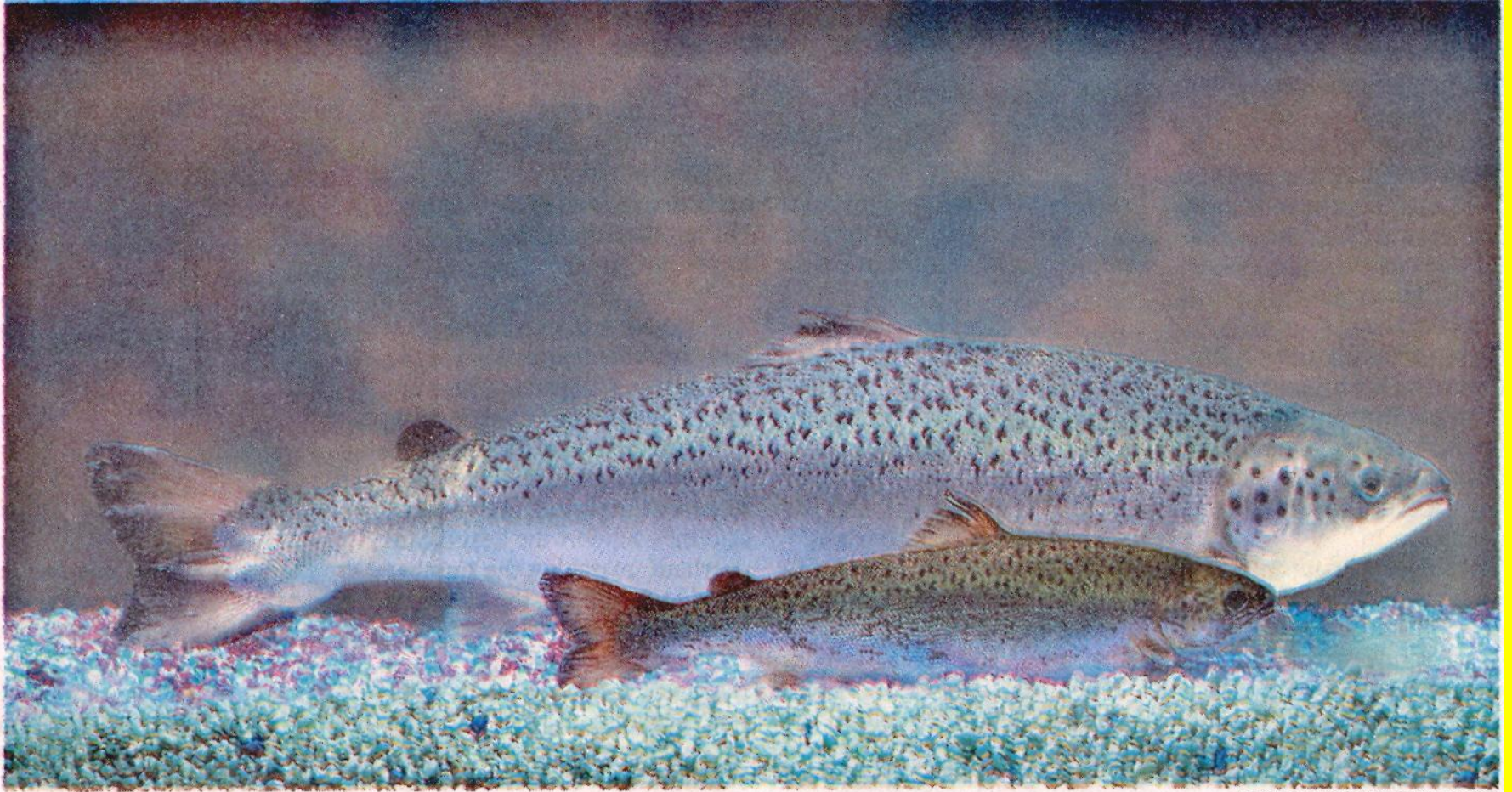
**bacteria** (salmonella, E. Coli)



- Enter environment: manure, worker clothing
- Humans: **antibiotic resistant infections** (intestine, bladder, blood)
- Legislation pending: stop overuse



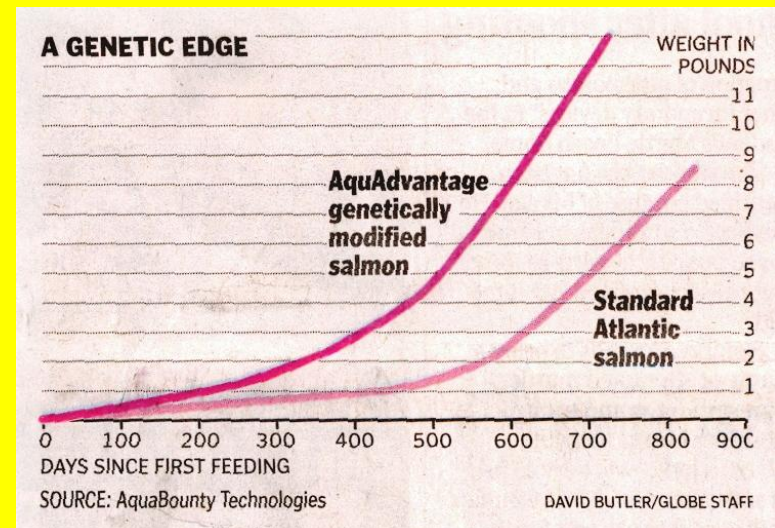
# FRANKENFISH?



AQUABOUNTY TECHNOLOGIES

**AquaBounty's genetically modified salmon reached market size twice as fast as a standard fish of the same age.**

- Waltham company developed **Genetically Modified (GM) salmon**
- Aquaculture (farmed fish)
  - Insert growth hormone gene from another fish → Atlantic salmon
  - Grow 2X as fast





# **FDA says fish are safe to eat**

- Waiting- public comments- hearings
- **Critics:** “Frankenfish”- could cause allergies, reduce wild salmon population (if get loose)
- **Supporters:** reduce future food shortages, help wild fish stocks
- No separate **labeling** if food “not substantially different- regular food”