



SEAFOOD AT ITS BEST

LESSON 3

SEAFOOD-BORNE ILLNESSES AND RISKS FROM EATING SEAFOOD



KEEP YOUR FAMILY SAFER FROM FOOD POISONING
Check your steps at FoodSafety.gov

LESSON 3

GOALS

To gain a better understanding of the potential health risks of eating seafood by covering the following topics:

- Microorganisms
- Raw seafood
- Marine toxins
- Allergens
- Mercury contamination
- Man-made pollutants
- “Color added”
- Seafood inspection
- COOL
- Summary

LESSON 3

OBJECTIVES

- Increase knowledge of the potential health risks of eating seafood
- Provide context on the potential health risks of eating seafood
- Inform participants about seafood safety inspection and country of origin labeling

FOODBORNE ILLNESSES

- Approximately 48 million people suffer foodborne illnesses per year, resulting in 128,000 hospitalizations and 3,000 deaths
- Improper holding temperature, inadequate cooking time, and poor sanitation & hygiene are the primary food preparation practices contributing to foodborne illness
- Norovirus causes most illnesses, Salmonella causes most hospitalizations and deaths of known pathogens resulting in illness

MICROORGANISMS



Bacteria Culture in a Petri Dish

- Norovirus – any seafood product
- Salmonella – any seafood product
- Listeriosis – ready-to-eat products, smoked fish, seafood salads, pre-cooked products
- Botulism – smoked, salted, canned, fermented, vacuum-packed products

RAW SEAFOOD

RISK OF ILLNESS

- Risk of illness excluding raw seafood is 1 per million servings
- Risk of illness including raw seafood is 1 per 250,000 servings
- Purchase from reputable dealers



RAW MOLLUSCAN SHELLFISH

- Commonly refers to oysters, clams, and mussels
- Shellfish harvest waters are regulated under the National Shellfish Sanitation Program
- Any protein food eaten raw carries greater risk of illness than cooked food



NATIONAL SHELLFISH SANITATION PROGRAM (NSSP)

- Federal, state, industry cooperative program to ensure safe molluscan shellfish
- Sanitary control; classification of growing areas; harvesting restrictions; tags with the proper certificate number on each package; records that show origin and disposition of shellfish
- FDA conducts an annual review of each state shellfish control program to ensure conformity with the NSSP

VIBRIO VULNIFICUS

IN RAW MOLLUSCAN SHELLFISH

- Bacteria that can sicken or kill at-risk people who eat raw oysters or clams
- *V. vulnificus* does not change appearance, taste, or odor of shellfish
- Naturally found in coastal waters
- Cooking to 145° F kills the bacteria

WHO SHOULD NEVER EAT RAW SHELLFISH?

People who suffer from:

- Liver disease
- Alcoholism
- Cancer
- AIDS or HIV infection
- Inflammatory bowel disease
- Steroid dependency
- Chronic kidney disease
- Diabetes
- Gastric disorders
- Weakened immune system
- Abnormal iron metabolism (hemochromatosis)

RAW FINFISH

- Risk of parasitic infection is rare
- Adequate freezing eliminates infection by parasites
- Use commercially frozen fish to prepare raw fish dishes such as sashimi, sushi, ceviche, and gravlax
- Alternatively, freeze fish to internal temperature of -4° F for at least 7 days
- Home freezers may not be cold enough



MARINE TOXINS



- Naturally occurring chemicals contaminate certain seafoods
- Contaminated seafood frequently smells, looks, and tastes normal
- Ciguatera fish poisoning is usually the result of eating contaminated sport-caught marine fish

SCOMBROID TOXIN

- Scombroid toxin – most common in tuna, mahi-mahi, marlin, and bluefish
- Bacterial spoilage allows histamine to form, which may cause allergic reaction
- Toxin not destroyed by cooking
- From 1998-2002, 35% of foodborne outbreaks due to fish caused by scombroid toxin



"White Marlin in North Carolina" by Dominic Sherony

CIGUATERA TOXIN

- Ciguatera toxin – tropical reef fish such as barracuda, amberjack, snapper, and grouper



"Side View Barracuda" by Amanderson2

- Caused by marine algae that fish eat
- Toxin not destroyed by cooking
- From 1998-2002, 25% of foodborne outbreaks due to fish caused by ciguatera

MARINE TOXINS

DIAGNOSIS AND TREATMENTS

- Diagnosis based on symptoms and recent history of eating specific kind of seafood
- Few treatments; antihistamines and epinephrine sometimes used for scombroid poisoning
- Rare long-term consequences; amnesic shellfish poisoning can lead to long-term problems with short-term memory
- Every year ~ 30 cases reported in U.S.

AVOIDING MARINE TOXINS

- Keep mahi-mahi, tunas, bluefish, mackerel, amberjack, and sardines refrigerated to prevent the development of histamine
- Do not eat barracuda, especially from the Caribbean
- Check for local advisories before collecting shellfish or catching reef fish
- Do not eat seafood sold specifically as bait
- Always buy from a reputable dealer

ALLERGENS

- Fish and crustaceans can cause allergic reactions in some people
- Any food containing any of the major food allergens must be properly labeled
- If you are allergic to a food, avoid that food and read food labels
- An allergy to one type of seafood does not mean the individual is allergic to all seafood

MERCURY

- Occurs naturally and is also released into the atmosphere from industrial pollution
- Bacteria in water transform mercury into methylmercury, which fish absorb as they feed
- Methylmercury levels are higher in larger, longer-lived predatory fish, such as Shark, Swordfish, King Mackerel and Tilefish from the Gulf of Mexico

HEALTH RISKS FROM MERCURY

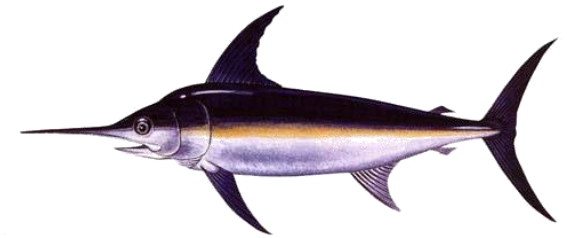
- Effects depend on dose, age of person, duration of exposure, route of exposure, and health of person exposed
- At high levels can harm brain, heart, kidneys, lungs, and immune system
- Nervous system damage (crosses blood-brain barrier and placenta)
 - ♦ Learning impairment, developmental delays

2004 FDA AND EPA JOINT MERCURY ADVISORY

- FDA/EPA advisory for women who may become pregnant, are pregnant, nursing mothers, and parents of young children
- Seafood is an important part of a healthy diet:
 - ♦ High-quality protein
 - ♦ Omega-3 fatty acids, low in saturated fat
 - ♦ Contributes to a healthy heart
 - ♦ Proper growth & development of children



MERCURY ADVISORY FOR HIGH-RISK GROUP



- Do not eat Shark, Swordfish, King Mackerel, or Tilefish from the Gulf of Mexico
- Eat up to 12 ounces/week of a variety of seafood low in mercury
 - ◆ Shrimp, canned light tuna, salmon, pollock and catfish
 - ◆ Eat up to 6 ounces/week albacore (white) tuna
- Check advisories for local waters for sport-caught fish



RECOMMENDATION

- Majority of population does not eat enough seafood, especially fatty fish, to obtain health benefits
- 2010 Dietary Guidelines encourages all to eat more seafood
- Eat a variety of seafood
- If you are in the high-risk population follow the FDA/EPA advisory for mercury



"Champagne Seafood Delight" by Rob Taylor

MAN-MADE POLLUTANTS

- Dioxins and Polychlorinated Biphenyls (PCBs) are ubiquitous, very persistent chemicals
- Generally present in low concentrations in foods, especially fat-containing foods such as milk, butter, meat, and fish

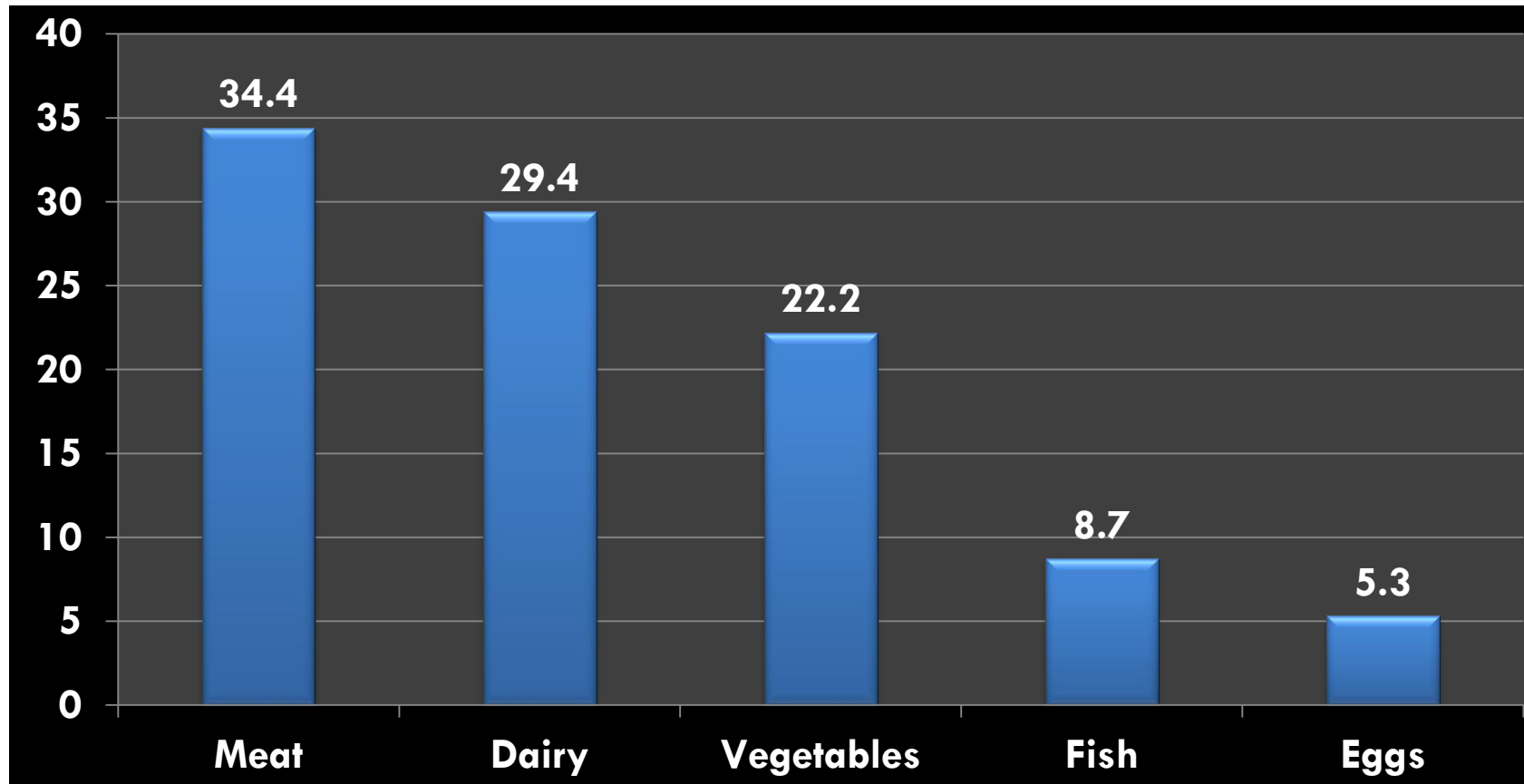


POTENTIAL HEALTH EFFECTS FROM DIOXIN AND PCB EXPOSURE

- Some studies suggest that dioxins and PCBs are carcinogenic and may have immune system or neurological effects
- Reported health effects involve workers in chemical plants or those exposed due to accidental contamination of the environment or eating contaminated edible oils

PERCENT INTAKE OF DIOXINS AND PCBs IN ADULTS

BY FOOD TYPE



WILD AND FARMED SEAFOOD

- No consistent differences between wild and farmed seafood
- Contaminants in wild seafood can only be reduced by long-term reductions of pollutants



- Farmed seafood offers possibility of managing contaminants to minimize risk while maintaining benefits

GUIDELINES

Individuals concerned about man-made pollutants, especially those who eat large amounts of sport fish and shellfish caught from potentially contaminated waters

- eat a variety of seafood
- avoid eating excessive amounts of any single type of seafood
- check local advisories for local waters
- avoid eating internal organs of fish, tomalley of lobsters, mustard of crabs
- if eating sport caught fish that may contain elevated levels of contaminants trim away fat and use cooking methods that allow fats and juices to drain away



COLOR ME **RED**

CAROTENOID PIGMENTS



- “Color added” labeling required by FDA
- Color is not added – carotenoid pigments are added to fish feeds for species such as salmon and trout
- Carotenoid pigments give color to a wide variety of insects, birds, and fish

CAROTENOID PIGMENTS

ESSENTIAL NUTRIENTS FOR SALMONIDS

- Wild fish obtain carotenoid pigments from eating krill or insects
- Farmed fish from feeds that contain the pigments
- Carotenoid pigments are essential nutrients for salmon and trout



"Salmon Chileno" by Fishercott



"Adams River Sockeye" by Peter Gordon

SOURCES OF PIGMENTS ADDED TO FISH FEED

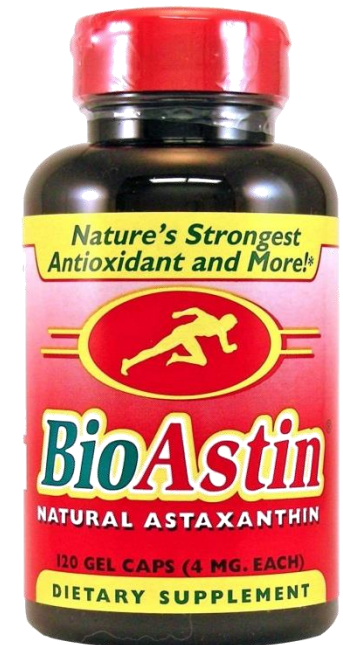
- Pigments can be extracted from algae, yeast, plants, or crustaceans
- Or pigments can be produced by chemical synthesis
- Most feeds contain astaxanthin, some canthaxanthin, or both



"Pile of Crawfish" by Isaac Wedin

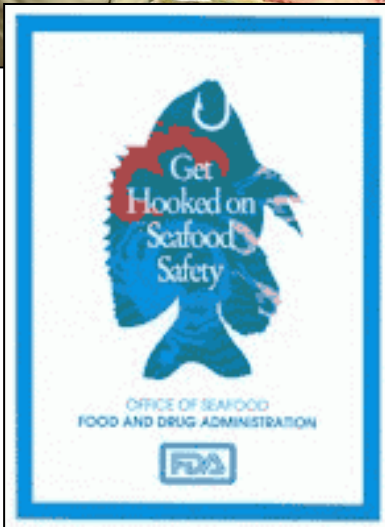
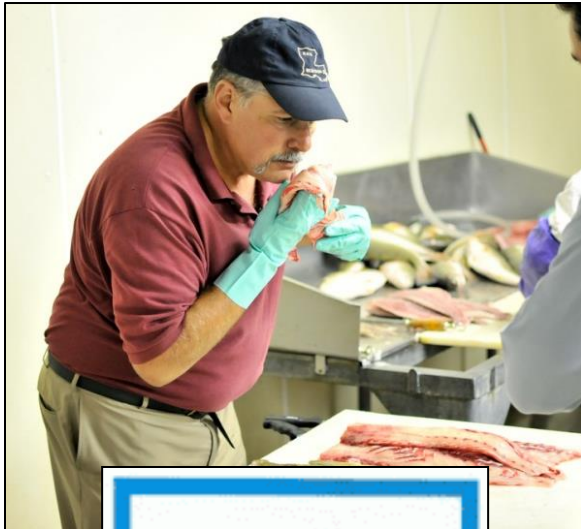
NATURAL VS. SYNTHETIC ASTAXANTHIN

- No difference in function, molecular weight, or chemical formula
- Analogous to taking a vitamin C tablet or eating an orange for vitamin C
- Astaxanthin sold for human health benefits as a natural antioxidant in health stores and on the Internet



SEAFOOD INSPECTION

"DHH Geny Lopinto Sensory Testing Fish Filets" by Louisiana GOHSEP



- **H** – hazard
- **A** – analysis and
- **C** – critical
- **C** – control
- **P** – point

HACCP

- Seafood is the first commodity to implement HACCP on an industry-wide basis
- Focuses on identifying and preventing hazards that could cause foodborne illnesses



ENSURING SAFETY

- HACCP also requires basic sanitation standards
- Molluscan shellfish are also under the National Shellfish Sanitation Program
- Seafood importers must verify suppliers are providing seafood processed under HACCP

NATIONAL SEAFOOD INSPECTION PROGRAM



- Department of Commerce's NOAA incorporates FDA's HACCP regulations into their program
- Certifies processors that meet federal standards and rates products with grades based on quality

COUNTRY OF ORIGIN LABELING (COOL)

- Applies to retail sales for wild and farm-raised fish and shellfish
- Became effective April 5, 2005
- Country of origin
- Wild or farm raised
- Label or notice must:
 - ♦ Be legible
 - ♦ Not obscure or interfere with other required information



SUMMARY

- Certain hazards associated with specific species (scombroid poisoning) and higher-risk behavior (at-risk people eating raw shellfish) persist
- Microorganisms associated with handling and temperature abuse are controllable but persistent risks
- Overall, acute seafood safety hazards are not increasing, likely due HACCP and other seafood safety programs

SUMMARY

BENEFITS > RISKS

- Methylmercury is a concern for women of reproductive age and young children
- Risk associated with dioxins and PCBs are from consumption of sport-caught seafood from contaminated waters
- To maximize net benefits and limit potential risks eat a variety of seafood twice/week





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