

FDA Action Plan and Perspective on Acrylamide in Food

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FDA

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**CIC-OEHHA Meeting on Acrylamide
Work Plan**



Why is acrylamide in food a concern?

- **Acrylamide is a neurotoxicant and potential carcinogen**
- **Found in a wide range of foods, including dietary staples and formed through traditional cooking**
- **Formed during food processing and at home**
- **Related to flavor-producing Maillard reactions**
- **Formed from nutrients in food (asparagine and sugars, like glucose)**



FDA Response to Acrylamide: Overview

- **FDA agrees with WHO-FAO consultancy**
 - **acrylamide in food is a ‘major concern’**
- **FDA considers acrylamide in food a high priority**
- **FDA has developed a comprehensive action plan with the input of its Food Advisory Committee and the public**



FDA Response to Acrylamide: Overview

- **FDA has invested extensive resources to develop the science to support appropriate policy**
 - **LC/MS/MS method with LOD 10 ppb**
 - **Tested a wide variety of foods**
 - **Prepared exposure assessment**
 - **National Center for Toxicological Research (NCTR) initiated extensive toxicological testing**
 - **National Center for Food Safety and Technology (NCFST) studying formation and ways to reduce levels**



Action Plan: Overall Goals

- **Through scientific investigation and risk management decision making, prevent and/or reduce potential risk of acrylamide in foods to the greatest extent feasible.**
- **Provide all the essential elements for risk analysis, i.e., risk assessment, risk communication, and risk management.**



Action Plan: Major Goal Areas

- **Analytical methods**
- **Mechanisms of formation and reduction approaches**
- **Dietary exposure assessment (levels in foods)**
- **Toxicology/epidemiology -- risk assessment**
- **Leadership to develop science/technology**
- **Inform & educate public and processors**



Acrylamide formation strategies

- **Strategies suggested to control acrylamide levels in food**
 - **Reduce/remove precursors (asparagine, sugars) from food**
 - **Disrupt acrylamide-producing reaction**
 - **Remove formed acrylamide from food**

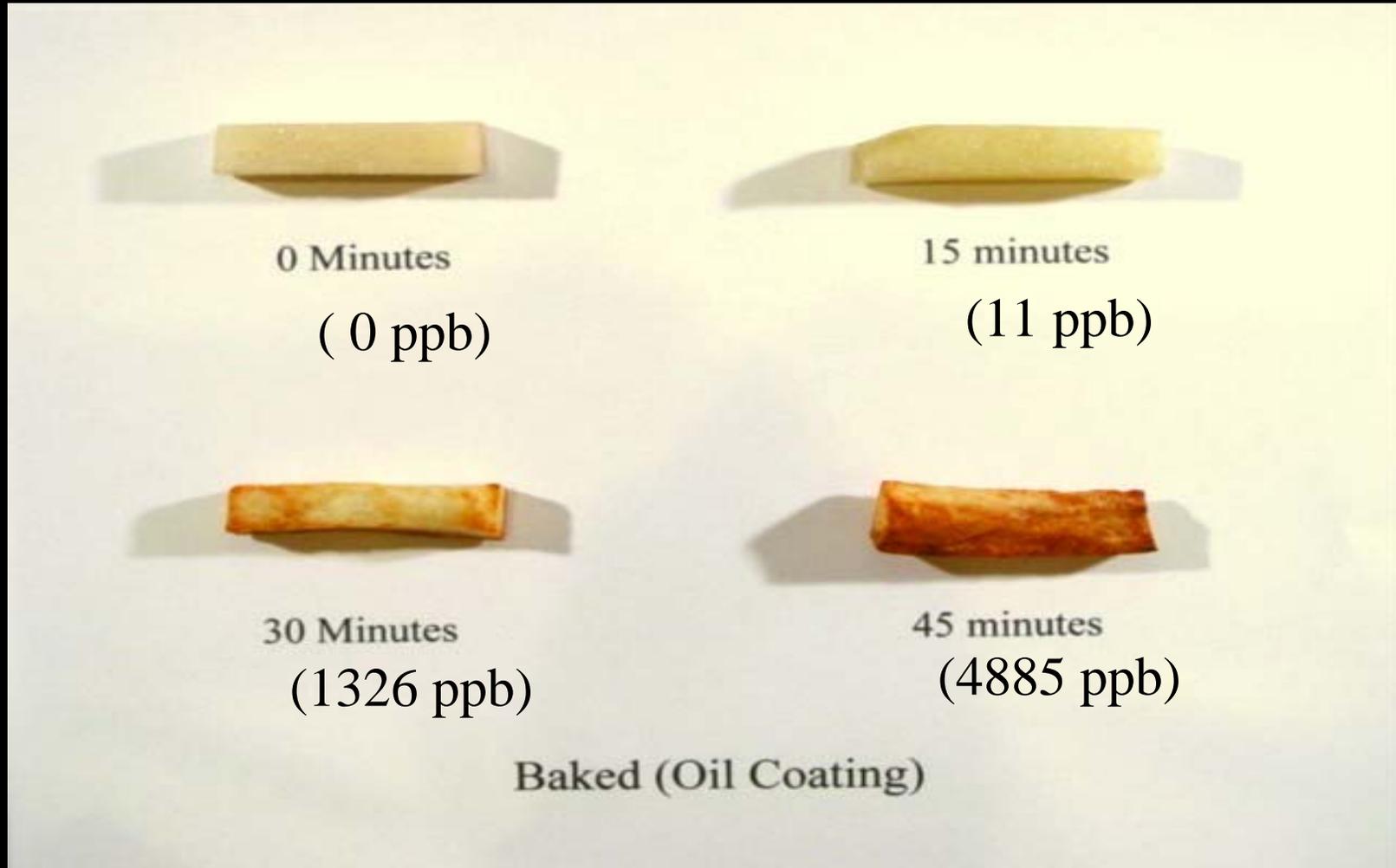


Factors affecting acrylamide formation

- **Food composition**
 - Amino acids, sugars
 - pH
 - Moisture
- **Processing conditions**
 - Temperature
 - Time
 - **BUT temperature of the food is critical**



Consumer cooking and time

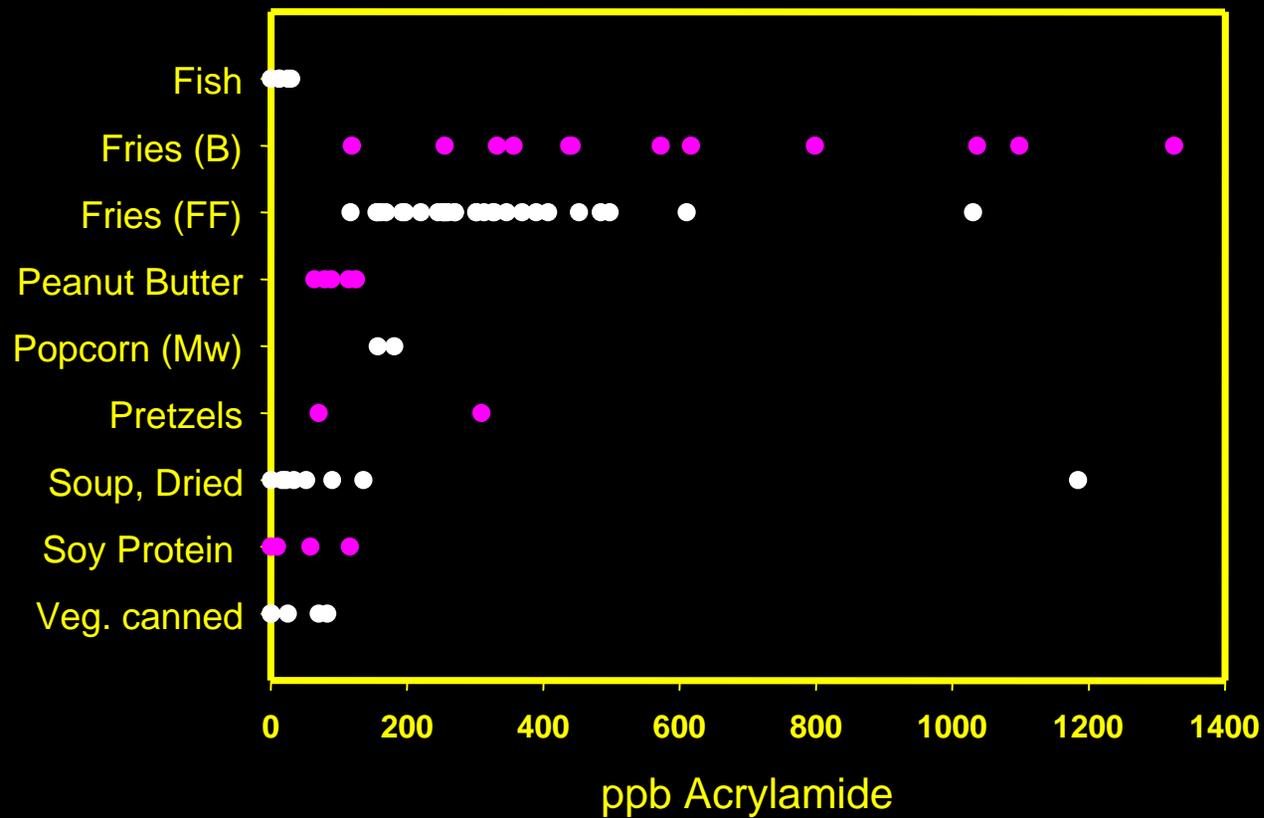


Food survey progress

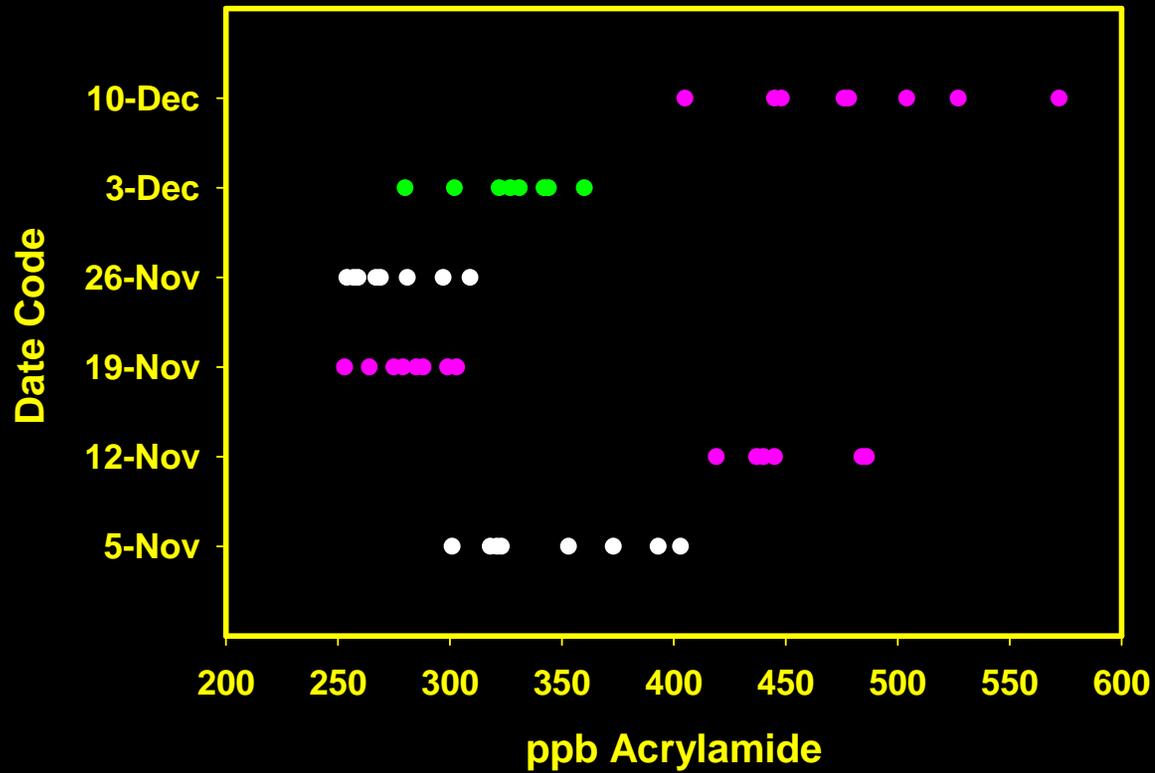
- **Some foods have little or no acrylamide, such as infant formula, baby cereal, fish and chicken, and condensed and liquid milk.**
- **Other foods have acrylamide, but in variable amounts.**



Examples of variability within selected food groups



Lot to lot variability in potato chips



Acrylamide food levels - summary

- **Acrylamide was detected in a variety of foods and at a variety of levels.**
- **In some foods, no acrylamide was detected.**
- **FDA has found variability between food categories and within food categories, as well as between different brands.**
- **The variability in levels of acrylamide in similar foods suggests that there are ways to make products that will minimize acrylamide formation.**



FDA Exposure Assessment of U.S. Consumers to Acrylamide

- **Eight of the tested food types consistently comprise 83 % of the exposure: restaurant and oven-baked French fries, brewed coffee, breakfast cereal, potato chips, cookies, toast, and soft bread.**
- **Each of the eight food types contributes 5 percent or more to total acrylamide exposure.**



Exposure Assessment of U.S. Consumers to Acrylamide

- **No one food accounts for the majority of the mean population acrylamide intake.**
- **Some foods with lower acrylamide values contribute appreciably to the overall mean population acrylamide intake because they are commonly consumed.**



Toxicology Action Highlights

Toxicology Issues

- **Bioavailability**
 - **Food versus water**
- **High-dose vs very low-dose exposures**
- **Animal vs. Human**



Toxicology Action Highlights

- **FDA-NCTR Studies (Est. Start Date)**
 - Describe *in vitro* and *in vivo* DNA adducts from glycidamide (GA) (Summer 2002)
 - Measure Hb adducts of acrylamide (AA) and GA in rodent exposures (Fall 2002)
 - Toxicokinetic studies of AA & GA (Summer 2003)
 - Role of CYP 2E1 in AA metabolism and formation of GA-DNA adducts (October 2003)
 - Determine mutagenicity of AA and GA *in vivo* (Fall 2003 +)



Toxicology Action Highlights

- **FDA Studies (Est. Start Date)**
 - Neonatal mouse carcinogenicity bioassay of AA and GA carcinogenicity (Fall 2003)
 - Chronic carcinogenicity bioassays of AA and GA (Fall 2003)
 - Developmental neurotoxicity studies (Fall 2003)
- **Some other studies**
 - AA workers (coal processing) epidemiology study
 - Population-based data on AA exposure using NHANES (CDC, Jan. 03)
 - Development of PBPK model for AA/GA (ILSI sponsored industry, academia and government partnership)



Consumer message

- **FDA's current dietary message for acrylamide is to: "Eat a balanced diet, choosing a variety of foods that are low in trans fat and saturated fat, and rich in high-fiber grains, fruits, and vegetables."**
- **The FDA believes there are not enough scientific data to justify changing the message at this time.**



Consumer message

- **Advice must be carefully constructed so as not to expose consumers to greater risk, e.g.,**
 - **Potential for undercooking given advice not to overcook**
 - **Potential for omitting important staples of the diet, such as bread and cereals resulting in potentially greater risk from less fiber and beneficial nutrients**
- **Advice must provide consumers with effective scientifically based risk communication to prevent disease and promote health**

