ASTA ANNUAL MEETING
APRIL 17-20, 2005

Adulteration

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SPICE ADULTERATION

History and Overview

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Date: April 20, 2005

ASTA 2005 ANNUAL MEETING

Phoenix, Arizona

Certified Laboratories, Inc.

Full Service Laboratory – Est. 1926

SPICE ADULTERATION

AN OVERVIEW

- HISTORY AND REGULATORY OVERVIEW
- MICROBIAL ADULTERATION
- “FILTH” ADULTERATION
- ECONOMIC ADULTERATION
- ENVIROMENTAL ADULTERATION

- **HISTORY AND REGULATORY OVERVIEW**
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Food Adulteration

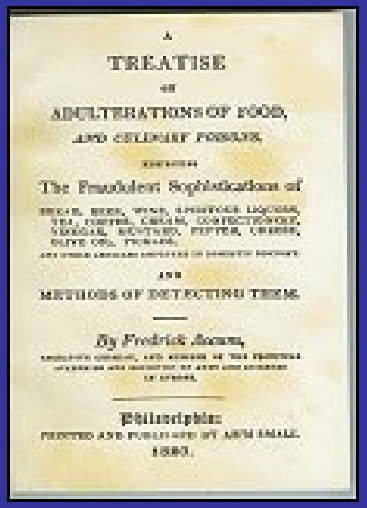
Act of intentionally debasing the quality of food offered for sale either by the admixture or substitution of inferior substances or by the removal of some valuable ingredient.

Some of the earliest efforts in food regulation include:

- Theophrastus (370-285 B.C.), who reported on the use of artificial flavors in the food supply.
- Cato (234-149 B.C.), who recommended a method “to determine whether wine has been watered”;
- Pliny the Elder (23-79 A.D.), who described adulteration of bread with chalk, vegetable meals, and cattle fodder; and
- Galen (131-201 A.D.), who warned against adulteration of products such as pepper.

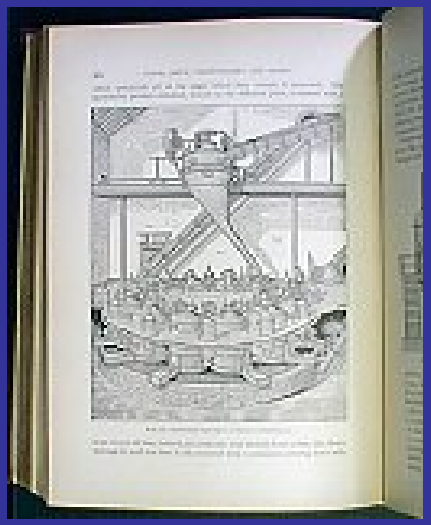
Food Adulteration

- About the middle of the 19th century chemical and microscopal knowledge has reached the stage that food substances could be analyzed, and the subject of food adulteration began to be studied from the standpoint of the rights and welfare of the consumer.
- In 1860 the first food law framed in the interest of the purchaser was passed.


A
TREATISE
ON
ADULTERATIONS OF FOOD,
AND CULINARY POISONS,
EXHIBITING
The Fraudulent Sophistications of
BREAD, BEER, WINE, SPIRITUOUS LIQUORS,
TEA, COFFEE, CREAM, CONFECTIONERY,
VINEGAR, MUSTARD, PEPPER, CHEESE,
OLIVE OIL, PICKLES,
AND OTHER ARTICLES EMPLOYED IN DOMESTIC ECONOMY,
AND
METHODS OF DETECTING THEM.
By Frederick Accum,
Philadelphia:
PRINTED AND PUBLISHED BY ABM SMALL.
1820.

A Treatise on Adulterations of Food and Culinary Poisons 1820

Exhibiting the Fraudulent Sophistications of Bread, Beer, Wine, Spirituous Liquors, Tea, Coffee, Cream, Confectionery, Vinegar, Mustard, ***Pepper,*** Cheese, Olive Oil, Pickles, and other Articles Employed in Domestic Economy, and Methods of Detecting Them.



Harvey W. Wiley

Foods and Their Adulteration
1907

Origin, Manufacture, and composition of food products; description of common adulterations, food standards, and national food laws and regulations.

Food Adulteration

- In the United States the federal Food and Drug Act of 1906 was the result of a long and stormy campaign led by Dr. Harvey Washington Wiley. This law defined food adulteration and the misbranding of products; it provided regulations covering the interstate movement of food and penalties for violations
- The 1938 act broadened the definitions of adulteration, misbranding, and lack of informative labeling

Food Adulteration

- A food is adulterated if one or more of the following conditions exist:
  - It bears or contains any poisonous or deleterious substance which may render it injurious to health (i.e. salmonella/aflatoxin)
  - It is a raw agricultural commodity and it bears or contains a pesticide chemical which is unsafe
  - It is, or it bears or contains, any food additive which is unsafe (i.e. sudan)
  - It consists in whole or in part of a diseased, contaminated, filthy, putrid or decomposed substance, or it is otherwise unfit for food (i.e. filth elements)
  - It has been produced, prepared, packed or held under insanitary conditions whereby it may have become contaminated with filth, or whereby it may have been rendered diseased, unwholesome or injurious to health (see filth)

Food Adulteration

continued….

- A food if adulterated is one or more of the following conditions exist:
  - Any required constituent has been omitted or abstracted in whole or in part (i.e. spent meal)
  - Any substance has been substituted in whole or in part for a substance normally found in the food (Sumac)
  - Damage or inferiority has been concealed in any manner
  - Any substance has been added to the food or mixed or packed with the food so as to increase its bulk or weight or reduce its quality or strength or make it appear better or of greater value than it is.
  - It is or bears or contains any color additive which is unsafe

A food product that is adulterated, counterfeit or fraudulent may not have been subjected to the rigorous quality control and hygiene procedures therefore there will be a greater potential of risk from;

- Toxins
- Allergens
- Food poisoning microorganisms
- Other hazards to the consumer

WHO IS JOHN PARK?

United States v. *Park*, 421 U.S. 658 (1975)

John Park, president for Acme Food, was found criminally liable as a “responsible corporate officer” for violations of the Food and Drug Act even though he personally has not participated in any wrongdoing.

CORPORATE OFFICIAL'S LIABILITY FOR VIOLATIONS OF FEDERAL FOOD, DRUG, AND COSMETIC ACT - CHARGE TO JURY

- In order to find the defendant guilty, you do not have to find that he personally committed acts causing food to become adulterated.

- You may find that the defendant caused the adulteration of food if you find that, by reason of his job, the defendant had the responsibility and authority to prevent adulteration from occurring, or to promptly correct any adulteration, and that he failed to do so.

CORPORATE OFFICIAL'S LIABILITY FOR VIOLATIONS OF FEDERAL FOOD, DRUG, AND COSMETIC ACT - CHARGE TO JURY

continued….

- Moreover, it is no defense that the defendant did not intend adulteration to occur, or that he lacked knowledge of the specific circumstances that caused adulteration.

- The law does not require the defendant to have actively engaged in wrongdoing in order to be held responsible for the adulteration of food being held for sale in his processing plant.

- All that the law requires if that the defendant held such a position of responsibility within the enterprise that he had sufficient authority to prevent or correct the dangerous conditions and thereby prevent the adulteration of the food.

CORPORATE OFFICIAL'S LIABILITY FOR VIOLATIONS OF FEDERAL FOOD, DRUG, AND COSMETIC ACT - CHARGE TO JURY

continued….

- Responsible agents of businesses whose services and products affect the public health have a legal duty to exercise the foresight and vigilance necessary to ensure that their products are not adulterated and are therefore safe for public consumption.

- The Federal Food, Drug, and Cosmetic Act imposes this duty because responsible agents have at least the opportunity to learn of, correct, or prevent insanitary conditions, whereas even the most cautious consumer is unable to protect himself.

RESPONSIBLE RELATIONSHIP

- The doctrine requires a court inquiry into whether a corporate officer exercised extraordinary care and diligence, by virtue of his or her position and authority, toward preventing the resulting violation.

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IMPORT ALERT #99-19

DETENTION WITHOUT PHYSICAL EXAMINATION OF FOOD PRODUCTS DUE TO THE PRESENCE OF SALMONELLA", ATTACHMENT REVISED - 4/15/04

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ASTA HISTORY

From Preface of Cleanliness Guidelines

Importers would guarantee that spice shipments which they found, by sampling and macroscopic analysis by an ASTA Approved Laboratory, to be adulterated, would be properly cleaned or reconditioned before being put into consumer channels or would be returned to the exporting country.

In applying these Specifications to the everyday conduct of business, it is important to recognize that they are an integral part of the American Spice Trade Association's contracts.

All products listed in these Specifications, both foreign and domestic, must comply before they can be introduced into commerce or further processed.

FDA Filth Charge

- Spice adulterated within meaning of 21 U.S.C. 342(a)(3), in that it consists wholly or in part of a filthy substance by reason of presence therein of insects, and/or insect webbing, and/or insect excreta, and/or insect damaged spice, and/or mammalian excreta rodent hairs and in that it consists in part of a decomposed substance by reason of presence therein of moldy, decomposed spice.

Sawtoothed grain beetle

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POTENTIAL ADULTERANTS

PRODUCT	ADULTERANT	SUGGESTED METHOD TO BE USED TO DETECT
Ground Spice	Spent Spices (defatted)	New ASTA Methods 26.1, 27.0
Capsicums	Tomato Skin	Licopene
Capsicums	Bixin	Under Development
Capsicums	Dextrose or other Mono or Di-saccharides	HPLC carbohydrate profile
Ground Spice	Starch	ASTA Starch Method, Microscopic
Ground Spice	Grains	Microscopic
Ground Spice	Hulls	Microscopic
Ground Spice	Added Oleoresins	
Oregano	Foreign Leaves (i.e. sumac, cistus)	ASTA Method 26.0
Oregano	Non-Compliant Herbs (i.e. Savory, Thyme, Marjoram)	Microscopic
Saffron	Floral Waste	Microscopic
Saffron	Added Artificial Color	TLC
Ground Black and White Pepper	Buckwheat Millet Seed	Microscopic
Cinnamon	Coffee Husks	Microscopic
Nutmeg	Coffee Husks	Microscopic

SUDAN

- Food manufacturers continue to face the costly process of food recalls as the UK's Food Standards Agency brings more food products contaminated by the illegal carcinogenic food dye Sudan to light.

- Requires that imports of chilli and chilli products - including curry powder – can only cross the EU border with proof they are free of the illegal chemical dyes - Sudan I, Sudan II, Sudan III or Scarlet Red (Sudan IV).

SUDAN 1: THE BUNGLES THAT PUT POISON ON OUR PLATES

The toxic dye which sparked the lastest food scare has probably been in our diet for a decade or more.

Jonathan Ungoed-Thomas and Jonathan Leake report

As food safety officials from around Europe filed into the glass and concrete Albert Borschette conference block in

ports (17%) was contaminated with Sudan 1.

❑ Failed to ensure that tens of thousands of contaminated food products were destroyed

Joanna Blythman, author of Shopped, an investigation into British supermarkets, said: "The supermarkets say that

Manual:

Microscopic Identification
Of
Spices

American Spice Trade Association, Inc.
2025 M Street, NW
Washington, DC 20036

2003

ACKNOWLEDGEMENT

Work done on the manual for Microscopic Identification of Spices is courtesy of McCormick & Company, Inc. and Warren G. Ocus, Microscopist.

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ENVIROMENTAL ADULTERANTS

- Mycotoxins/Aflatoxins
- Heavy Metals

MOST COMMON MYCOTOXINS

- Aflatoxin
- Ergot alkaloids
- Fumonisin
- Ochratoxin
- Patulin
- Penicillic Acid
- Trichotecenes

AFLATOXIN

- Aflatoxins were the first mycotoxins to be identified by research workers and currently are the best known.

- They are produced by certain species of *Aspergillus* and appear on a variety of raw products, such as spice, cereals, dehydrated fruit, figs and dried fruit.

- Among the twenty or so varieties of aflatoxins recorded, only four are found in foodstuffs (aflatoxins B1, B2, G1 and G2).

Mycotoxin	Responsible Molds	Occurrence in Food	Possible Toxicity
Aflatoxin B1, B2, G1, G2	*Aspergillus flavus*, *Aspergillus parasiticus*	Peanuts, Corn, Dried Fruit, Spices	May cause cancer and liver damage

ASPERGILLUS

AFLATOXIN SURVEY INDIA 20

Type of Sample	Total No. of Samples	Aflatoxin Range PPB	No. & % of samples with <10.0 PPB	No. & % of samples with aflatoxin in the range PPB			No. & % pf samples with >100.0 PPB
				10-30	30-50	50-100	
Red Chilies	99	3.7-257	25 25%	35 35%	20 20%	11 11%	8 8%
Turmeric	97	3.7-221	25 26%	31 32%	19 18%	13 12%	9 8%
Dry Ginger	89	5.8-137	1 1%	42 47%	32 36%	13 15%	1 1%
Coriander	106	15.9-71	15 14%	50 47%	26 25%	15 14%	0 0%
Black Pepper	104	12.-430	16 14%	17 16%	19 18%	34 33%	18 17%

AFLATOXIN LEVELS (ppb) IN CHILLI PRODUCTS

Product Type	Samples Tested	Mean	Standard Deviation	Minimum	Maximum	Samples Passed (%)	Samples Marginal (%)
Chilli Powder	26	25	16	7	71	0	8
Paprika Powder	21	24	20	7	89	0	5
Chilli – crushed	12	13	8	2	28	17	17
Chilli – whole	11	13	13	0	49	18	9
Chilli – minced	5	9	9	1	24	40	20
Chilli – sauce	15	14	10	2	39	13	27
All	90	19	15	0	89	9	12

CONCLUSION:

Chilli products in Australia suffer from widespread aflatoxin contamination.

COMMISSION REGULATION (EC) No 472/2002

of 12 March 2002

amending Regulation (EC) No 466/2001 setting maximum levels for certain contaminants in foodstuffs

(Text with EEA relevance)

Product	Maximum level (µg/kg)			Sampling method	Performance criteria for methods of analysis
	B_1	$B_1 + B_2 + G_1 + G_2$	M_1		
'2.1.4. Following species of spices: — *Capsiaum* spp. (dried fruits thereof, whole or ground, including chillies, chilli powder, cayenne and paprika) — *Piper* spp. (fruits thereof, including white and black pepper) — *Myristica fragrans* (nutmeg) — *Zingiber officinale* (ginger) — *Curcuma longa* (turmeric)	5	10	—	Directive 98/53/EC	Directive 98/53/EC'

HEAVY METALS

HEAVY METALS

- The term **heavy metal** refers to any metallic chemical element that has a relatively high density and is toxic or poisonous at low concentrations. Examples of heavy metals include mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr) and lead (Pb).

- Heavy metals are dangerous because they tend to **bioaccumulate**.

HEAVY METAL SPECS IN EUROPE IN PPM

Commodity	Reference	Date	Pb	Hg	As	Sn	Cu	Zn
Garlic	ISO 5560	1996	N/A	N/A	N/A	N/A	N/A	N/A
Ginger	BS 7087 Part 8	1996	10	N/A	5	200	20	50
Marjoram	BS 7087 Part 9	1996	10	N/A	5	200	20	50
Nutmeg & Mace	BS 7087 Part 14	1992	10	N/A	5	N/A	20	50
Onion	ISO 5559	1994	N/A	N/A	N/A	N/A	N/A	N/A
Pepper, Black	ISO 959	1991	N/A	N/A	N/A	N/A	N/A	N/A
Pepper, Green	ISO 10621	1996	N/A	N/A	N/A	N/A	N/A	N/A
Rosemary	ISO 11164	1995	N/A	N/A	N/A	N/A	N/A	N/A
Sage	ISO 11165	1995	N/A	N/A	N/A	N/A	N/A	N/A
Thyme	ISO 6754	1995	N/A	N/A	N/A	N/A	N/A	N/A
Turmeric	BS 7087 Part 13	1992	10	N/A	5	N/A	20	50

TESTING FOR RAPID DETECTION OF ADULTERATION OF FOOD

REPORT TO CONGRESS
SUBMITTED TO
THE COMMITTEE ON ENERGY AND COMMERCE OF THE HOUSE OF REPRESENTATIVES
AND
THE COMMITTEE ON HEALTH, EDUCATION, LABOR, AND PENSIONS OF THE SENATE

OCTOBER 2003

DEPARTMENT OF HEALTH AND HUMAN SERVICES
U. S. FOOD AND DRUG ADMINISTRATION

- The ability to intercept adulterated food before it enters domestic commerce is a high priority.
- FDA currently has over 90 different active research projects involving the development of tests and sampling methodologies intended to increase the detection of adulteration of food.

- **Upgrade of Field Pesticide Analytical Capability with Gas Chromatograph Mass Selective Detection System** – Project is to develop better analytical methods for pesticide detection.
- **Rapid Screening Test for Food Quality** – Purpose is to develop simple, field-compatible methods to test for food quality

The End

Any Questions?

Certified Laboratories, Inc.

Full Service Laboratory – Est. 1926