Seminar on

Contaminants in Food and Beverages

October 06, 2007

Venue

Thorale Bajirao Peshwe Sabhagruha
'Jnanadweepa', Thane College Campus,
Chendani, Bunder Road, Thane (W) 400 601.

Edited by

V. S. Burkule

Organized by

Department of Chemistry
Vidya Prasarak Mandal's
B.N. Bandodkar College of Science
(NAAC Accredited B^{++})
'Jnanadweepa', Chendani, Bunder Road,
Thane (W) - 400601, Maharashtra

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From Chairman's Desk

I have great pleasure in presenting the proceedings of the seminar "**Contaminants in Food and Beverages"** to you. The subject of the seminar was announced an year back and the response was overwhelming. We also conducted two workshops since the announcement last year on the same subject.

The importance of this subject needs no introduction. Food is vital for our survival and its contamination free consumption is a prerequisite for sound health. Inspite of being so important to our lives, unfortunately there are no guarantees that the food we eat is safe and free of all contaminations. The source of contamination can be from seed to dish. It can be unintentional or it can be an outcome of human greed. Independent of its causes or reasoning we should make all efforts to see that our food and beverages are safe to consume. It is very simple to say so but it is a very complex process. Education plays a very important and vital role in this process. One of the improtant component of education is information.

Ever since human beings learnt farming techniques, the agriculture has come a long way now. Production, storage and distribution have seen radical shift in its practices. At every stage we have introduced a possibility of contamination. In an effort to grow more we started using pesticides and insecticides. The earliest whistle blower of misuse of chemical fertilisers was Rachel Carson. She was attacked by chemical industry and was dubbed as an hysterical woman. We all owe our debt to her for having warned us about such contaminations and dangers it posed, not only to human but also to animal kingdom. It seems we have not learned enough lessons yet. We have a crop of regulations paralysed by corrupt bureaucracy. We can change this scenario if we have will and determination to do so. I am sure this seminar will strengthen our commitment to help deliver contamination free food and beverages in the interest of our own good.

Thanking you

Dr. Vijay V. Bedekar
Chairman,
Vidya Prasarak Mandal, Thane

From Principal's Desk

It gives me a great pleasure to give one more volume of the proceeding in your hands as our yearly rituals.

One year back October 06, 2007 was booked for the National Conference on "Contaminants in Food and Beverages" Prior to the conference we conducted two workshops on the theme of conference on January 16, 2007 and July 27, 2007. The eminent speaker like Dr. R. K. Shastri had come to deliver his keynote address. Popular teachers and scientists had came to deliver their lectures in these workshops but in addition to this I am happy and proud to say that nine students of our college from S.Y.B.Sc. and T.Y.B.Sc. Classes presented their presentations on the topic of the theme like contaminants in milk, eggs, water, oil, meat etc.

Such presentations in National Conferences give them not only confidence, courage but in addition to all this in depth knowledge of the subject. Participation in conference helps to inculcate scientific awareness among the students along with the habits of reading scientific journal, news that changes overall personality of the student.

I am happy for all the efforts taken by Chemistry Department, teaching as well as non-teaching staff, to make this conference a great success.

I appreciate the help rendered by all Departments, Office, and students of the college and especially by Department of Information Technology to make conference successful. It's worth mentioning the invaluable support rendered by our parents body Vidya Prasarak Mandal for the workshops, conferences and every such activity through out the year.

Let us meet on the same platform next year to discuss about 'wonderful world of insects'.

Dr. (Mrs.) M.K. Pejaver
Convener
Principal, B.N. Bandodkar College of Science, Thane

Secretary's Note

August 05 , 2003 a report published by India's Center for Science and Environment [CSE] a Non Government Organization [NGO] made newspaper headlines across the Country.

• The report indicated that 12 major brands of soft drinks sold in the country's capital New Delhi contained high levels of four pesticides which were well known to cause illnesses ranging from cancer to brain damage.

In August 2006, Center for Science and Environment published another report Soft drinks – Hard Truths II.

How food becomes contaminated ?

Contaminants are substances that are not intentionally added to food but those substances get mixed up in food at various stages like production, packaging , transport and storage.

Many of the naturally occurring contaminants in food are of microbiological origin and consist of harmful bacteria, bacterial toxins and fungal toxins. (for example Aflatoxin a contaminant of peanuts and grains is an example of a fungal toxin or mycrotoxin).

The second category of contaminants. includes organic chemicals, metals and their complexes and radio-nuclides. Chemicals contaminate foods through different routes depending on the chemical and its physical properties, its use, and the source or mechanism. The routes include the atmosphere, soil and surface or ground water. Environmental contaminants introduced into food as a result of human activities such as agriculture, mining and industry

Since contamination has a negative impact on the quality of food and human body can tolerate these contaminants to a certain level, but when the intake goes beyond the limit the hazardous effects are seen.

The Department of Chemistry of B. N. Bandodkar College of Science, selected the theme for the Seminar :- Contaminants in Food and Beverages to create awareness in this subject.

To create awareness in this subject in the students, two preparatory workshops were held on 16 Jan 2007 and 27 July 2007. It should be noted, 09 students responded for presentation in these workshops.

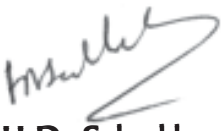
I am thankful to all, who extended their hands of help to me in this effort.

V.S. Burkule
Organizing Secretary

Message

I, welcome an idea of "Seminar on Contaminants in Food and Beverage" organised by B.N. Bandodkar College of Science, Thane

Now a days adulteration of food articles such as milk, edible oils, etc, is major problem which needs to be curbed by joint efforts of Govt. Agencies, N.G.O., Social Workers, educational institutions like your college, active consumers association and public. This problem can not be solved merely by prosecuting offenders involved in adulteration but need to educate consumer & awareness of consumer about adulteration is also important. In this context I appreciate an effort of arranging seminars & workshop by your college and its organizing committee and advisory committee.



H.D. Salunkhe

Joint Commissioner (Konkan Division)
Food and Drug Administration, M.S., Thane

V.P.M"s

B.N. Bandodkar College of Science, Thane

Department of Chemistry

Seminar on Contaminants in Food and Beverages

October 06, 2007

Time:- 9.00 to 5.30 p.m

Venue:- Thorale Bajirao Peshwe Sabhagruha, Thane College Campus, Thane

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Programme

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09 .00 a.m. -9.30 a.m.	**Registration**	
9.30 a.m.	**Saraswati Vandana**	**Mrs. Sindhu Tayade**
9.35 a.m. - 9.40 a.m	**Inauguration and**	**Dr. A.D. Sawant**
9.45 a.m. - 10.30 a.m	**Key note Address**	Pro–Vice-Chancellor University of Mumbai, Mumbai 400 032
10.30 a.m. - 10.50 a.m.	**Tea Break**	

First Session

10.50 a.m.– 11.40 a.m.	**Contaminants in Food and Bevereges**	**Dr. Ranjan Shastri** Advisor - Technology Agrochemical; Analytical and Environmental Science
11. 40 a.m. – 12.30 p.m.	**Heavy Metals and Radioactive Contamination in food**	**Dr. R.S. Lokhande** Professor & Research Guide, Department of Chemistry, University of Mumbai
12.30 p.m.– 1.15 p.m.	**Roll of FDA in prevention of Food Adulteration**	**Mr. H.D. Salunkhe** Joint Commissioner, Kokan Division Food & Drug Administrationm (Maharashtra)
1.15 p.m.– 2.15 p.m.	**Lunch Break**	

Second Session

Session Chair Person : Dr. R.S. Lokhande

2.15 p.m. – 3.00 p.m.	**Organic Contaminants in Thane creek Water and their concentrations**	**Dr. R.P. Chavan** Reader, Dept of Chemistry Dnyasadhana College, Thane
3.00 p.m. – 3.30 p.m.	**Environmental Cleanup Extractive Separation and Estimation of Toxic Metals**	**Dr. Yogesh V. Ghalsasi** Dept. of Chemistry K.J.Somaiya College of Science and Commerce , Vidyavihar, Mumbai 400 077
3**.30 p.m. – 4.00 p.m.**	**A Brief Review of Mycotoxins as Contaminants in Foods with Special Reference to Aflatoxins**	**Dr. Moses J. Kolet** Department of Botany B.N. Bandodkar College of Science, Thane
4.00 – 4.15	**Tea Break**	

Third Session

4.15 p.m.– 5.00 p.m.	**Presentation by College Teacher and Students**	
4.15 p.m. – 4.35 p.m.	**Contamination of Food and Water due to Biomedical Waste : How to manage?**	**Dr. S.D. Joshi** Department of Biology B.N. Bandodkar College of Science, Thane
4.35 p.m.– 4.45 p.m.	**Contaminants in Meat**	**Mr. Rughnuth Sakha** T.Y.B.Sc (Chemistry)
4.45 p.m.– 4.55 p.m.	**Contaminants in oil (Edible Oil)**	**Miss Pooja Dandekar** T.Y.B.Sc (Chemistry)
4.55 p.m.– 5.05 p.m.	**Heavy Metal Contamination in Vegetables**	**Mr. Saud Deshmukh** T.Y.B.Sc (Chemistry)
5.05 p.m. – 5.15 p.m.	**Contiminants in Beverages**	**Miss Sonal Salvi** T.Y.B.Sc (Zoology) & General Secretary B.N.Bandodkar College of Science, Thane
5.00 p.m.— 5.15 p.m.	**Valedictory Function**	
5.15 p.m.– 5.20 p.m.	**Vote of Thanks**	**V.S. Burkule** Organizing Secretary
5.20 p.m.– 5.25 p.m.	**Pasayadan**	**Mrs. Sindhu Tayade**

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123 Years Of Trust | Calendar | The Tribune ONLINE EDITION | Weather | Archive

Thursday, April 3, 2003, Chandigarh, India

Palak Metal Paneer

The level of contaminants in food in India is seldom below the prescribed limit.

The grow-quick varieties of vegetables, grains and meat products have added a new dimension to the problem.

Life-threatening chemicals are used to make grains grow faster and in abundance.

The over-sized brinjals, apples and broilers too are the result of excessive use of chemicals. Not even the extreme provision of life imprisonment for producing and marketing food items dangerous to human health is likely to make much difference.

India is a land where most people learn to live dangerously because to a majority of the population safe and healthy options have never been made available.

About a month ago the level of contaminants in bottled water of even leading brands had caused a minor stir in Delhi. There was a bit of official he-haw and that was the end of the controversy. A random check of any brand of bottled water today would show the same level of toxins that had sent alarm bells ringing when the news was first broken. The same is true of the poisoned vegetables and fruits that flood the markets across the country.

The growers do not get punished. The sellers are not penalised. And few consumers ever establish a link between their fast deteriorating health and the quality of food they consume. The bulk of the population in Delhi may not even be aware of the alarming report that what is being sold in most places is not Popeye's palak that makes the pipe-smoking sailor challenge even Rambo.

Yes, a detailed research, funded by the UK Department of International Development and conducted in Delhi by Shrishti, an NGO, reveals that the ubiquitous palak and bhindi, that are part of most Indian meals, are highly contaminated.

The credibility of the report should not be questioned because of the number of agencies that collaborated in the project.

Shrishti involved the Imperial College of London, Banaras Hindu University, Delhi University, the Indian Agricultural Research Institute and Development Tracks for studying the quality of vegetables grown in and around Delhi.

And what did the study reveal? That 72 per cent of the samples of palak contained lead concentration exceeding the limit mentioned in the Prevention of Food Adulteration Act. Nearly 25 per cent of the samples had more than double the dangerous limit. The samples also had a high concentration of zinc.

The study was not a rush-job. The team took three years collecting samples from diverse sources and putting them under the microscope. Until the general level of resistance reaches the scale where responsible civic authorities create effective mechanisms for preventing unwholesome foodstuff from reaching the markets all that the consumer can do is wash the fruits and vegetables at least three times to make them "half-safe" for human consumption. Which water should they use?

The contaminated bottled water or the droplets that pop out once in a while from the usually dry taps in Delhi?

Pesticides in Carbonated Drinks in India

Ref:- Global CEO • October 2003 (pdf e- book Read one for free) Pages 47 to 56

On August 05, 2003 a **report** published by India's **Center for Science and Environment [CSE] a** Non Government Organization **[NGO]** made newspaper headlines across the Country.

The CSE Report :- Main Features

- Tested 03 bottles each of 12 different brands of soft drinks for the 32 different pesticides used in India.
- Used the Gas Chromatography and Mass Spectrometry which established the identity of a chemical beyond doubt.
- The report indicated that 12 major brands of soft drinks sold in the country's

Capital New Delhi contained high levels of four pesticides which were well knon to cause illnesses ranging from **cancer to brain damage.**

CSC Report

Level of Pesticides above EU norms

Mirinda Lemon	**70 times**	**Limca**	**30 times**
Coca -Cola	**45 times**	**Blue Pepsi**	**29 times**
Fanta	**43 times**	**Mountain Dew**	**28 times**
Mirinda Orange	**39 times**	**Thump Up**	**22 times**
Pepsi	**37 times**	**Diet Pepsi**	**14 times**
7 Up	**33 times**	**Sprit**	**11 times**

Source :- www.myenjoyzone.com

• **A common man may consider that some big companies are adding pesticides to their soft drinks or are adulterating it in some other way to further their interests.**

After the Report

- The Indian Parliament immediately announced a ban on soft drinks on its premises.
- Various State Governments decided to send samples of the soft drinks to laboratories For testing.
- Active groups began staging protest.
- Coca –Cola and Pepsi Cola were two worried companies as they had much at stake, in the Indian market which was valued at Rs. 7000 cr.

Health ministry: what is cooking?

- February 2004: Central Committee on Food Standards (CCFS) meets. Endorses JPC report. Says it will set final standards.
- June 2004: Pesticide Residue Sub-Committee of CCFS meets. Decides to do year-long monitoring.
- November 2004: CCFS meets. Decides to set up National Expert Committee to study matter.
- 2005: National Expert Committee meets. Decides to test samples of sugar. This will be pilot study.
- 2006: Still testing. Officials say that as this is pilot study, no timeframe on when final standards will be set. But why test raw sugar, when companies use refined sugar? No answer.

Centre for Science and Environment

Bottom-line: 2006 no standard

- Department of Consumer Affairs tells BIS not to "rush". Says health ministry not on board. Companies are objecting.
- Ministry of Health says more research is needed. Says pilot study will be completed soon.

"Good science" is the convenient tool to obstruct action.

Companies win. We lose. Acceptable?

Centre for Science and Environment

Why should we care?

- Pesticides are toxic. In all drinks we have found levels above the finalised but not notified standard. They are "**unsafe**".
- Cannot be acceptable. Soft drinks are "choice" of millions. Particularly children. Cannot say that this is ok. Will be fixed later. Will set up committee. **Cannot play with our health**.

Centre for Science and Environment

Web Information on

Contaminants in Food and Beverages

Date : 24 September 2007

I] Web Pages : 768000

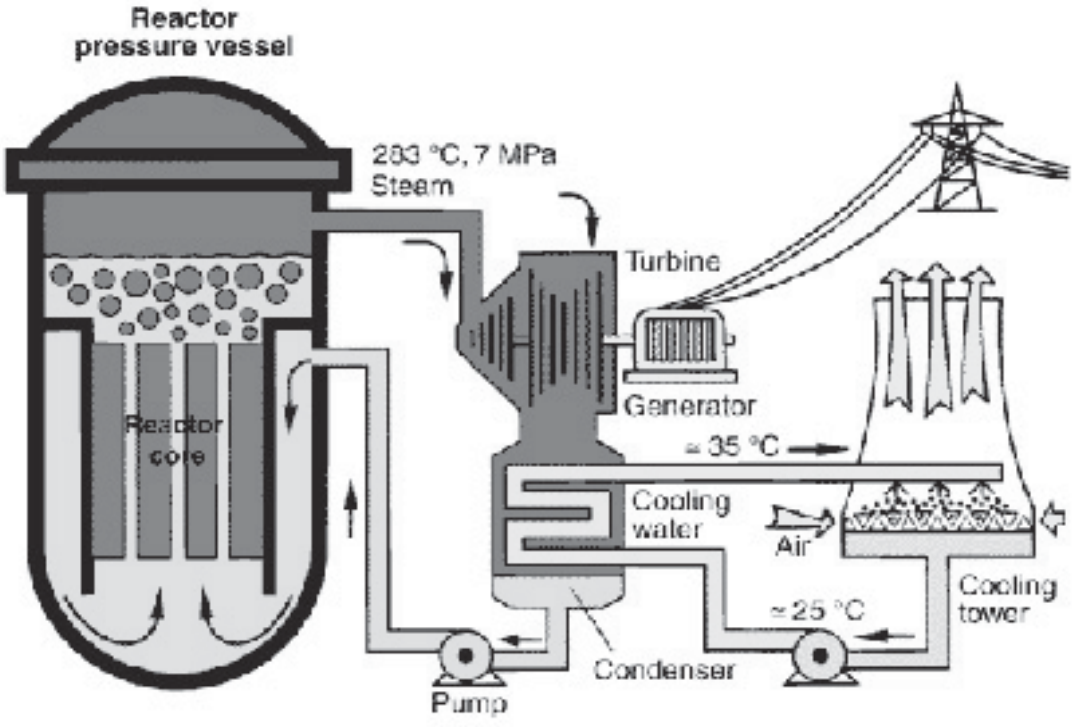
II] Pages from India : Only 449

This suggests the need to create awareness in this subject

Environmental Contamination of Food

- The routes include the atmosphere, soil and surface or ground water.
  - ❑ Contamination due to industrial or agricultural manufacture
- The manufacture of organic chemicals produces gases, sludges, and liquid effluents'.
- Metals can be released into the environment in several ways. The mining and refining processes produce dust and gases which enter the atmosphere. Metallic salts formed during recovery and refining processes can escape as waste products into surface and ground water.
- The usual waste disposal methods (sewage systems, incineration, landfill) are unable to prevent organic residues , Metals from entering the environment in spite of several laws
- ❑ Contamination due to radioactivity
- The release of radioisotopes by unsafe storage of nuclear wastes and nuclear accidents ,present a serious environmental threat.
- Nuclear weapons tests distribute their fission products globally
- These contaminants can last for many years due to long half-lives and are subject to biological magnification.

Nuclear Power Reactor



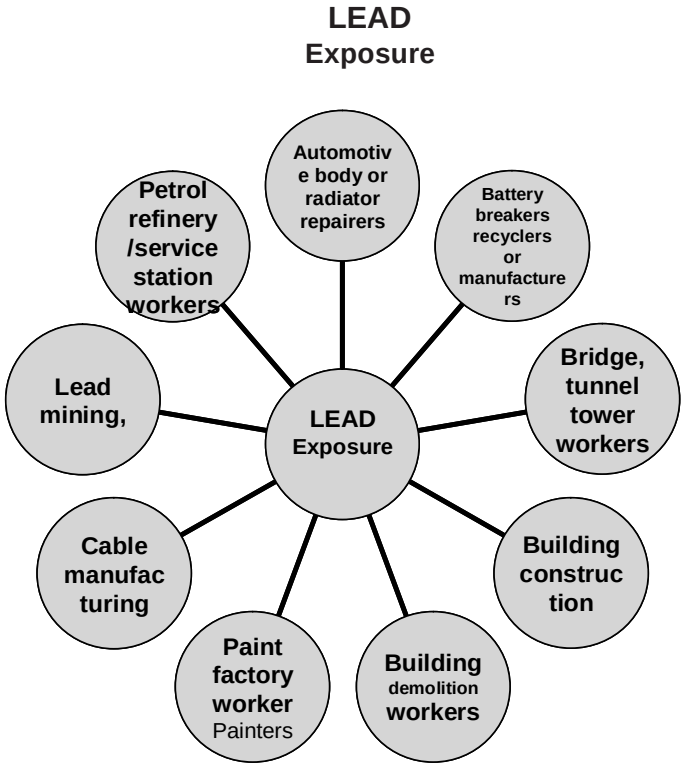
LEAD POISONING

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth.

It has no special taste or smell .

Lead is a metal which is cheap and useful. Hence it is found in ZXmany products and in many places in the environment.

Sources of Lead Exposure:-



Significant exposures result from inadequately controlled industrial emissions from such operations as lead smelters and battery recycling plants, which contaminate environments and people in the surrounding areas.

Petrol

Continuing use of lead in petrol exposes the entire community to lead through car emissions in the air. Lead also can enter the body when leaded petrol comes into contact with the skin.

Water

Lead in drinking water —— The major source is the corrosion of leaded plumbing materials in the water supply and household plumbing.

Contamination can arise from lead connectors, lead and PVC piping, lead-soldered joins in copper and brass faucets and other fittings containing lead.

Water from lead-soldered water tanks or run-off systems from roofing with lead-based paint also pose a risk,.

The highest level of environmental contamination is found to be associated with uncontrolled recycling operations and the most highly exposed adults are those who work with lead

Lead and your health

zOnce lead is absorbed into the bloodstream, some of it is filtered out and excreted, but the rest gets distributed to the liver, brain, kidneys and bones.

No level of lead in blood is safe or normal.

The disturbing fact is that exposure to **extremely small amounts** can have long-term and measurable effects in children while at the same time **causing no distinctive symptoms.**

Symptoms at a Glance

Below 2.17 µm/L (45 µg/dl) in children and 2.90 µm/L (60 µg/dl) in adults, lead exposure is usually asymptomatic.

Moderate	*Severe*	*Medical emergency*
children (> 45 µg/dl (2.17-2.65 µm/L) adults >60 µg /dl	children 55-70 µg /dl (2.64-3.4 µm/L)	children >70µg /dL+ (3.4+ µm/L) adults > 80 µg/dL+
muscle pains	joint pain	partial paralysis
prickly, itchy feeling	general fatigue	paralysis
mild fatigue	poor concentration	brain edema
Aggressiveness	tremor	stupor or coma
Irritability	headache	fits and vomiting
lethargy	abdominal pain	gum lead line
abdominal discomfort	constipation	colic
	weight loss	death

Testing for lead

It is often difficult to see that symptoms of ill health are due to lead.

If you think there is a risk to you or your family, have a blood test - it is the best way to check for lead poisoning. The test shows how much lead is in the blood.

What one can do

The best solution to reducing lead hazards is to avoid being exposed in the first place.

Eating well

Lead is absorbed more easily if your diet lacks essential minerals such as iron, calcium and zinc. To reduce the amount of lead the body absorbs if it is inhaled or swallowed, make sure your family - especially young children and pregnant women - has a diet low in fat and rich in:

• calcium (milk, cheese, yogurt, nuts - especially almonds)

• iron (eggs, lean red meat and poultry, liver, fish, cereal, beans, peas, lentils, dark green leafy vegetables)

• zinc (wheat bran, yeast products, red meat and liver, oysters and crab).

Too much fat also aids lead absorption (but there is no evidence that a low fat diet minimizes absorption). Frequent nutritious meals are important for children. Food in the stomach decreases the absorption of lead from non-food sources.

Reducing the use of leaded petrol

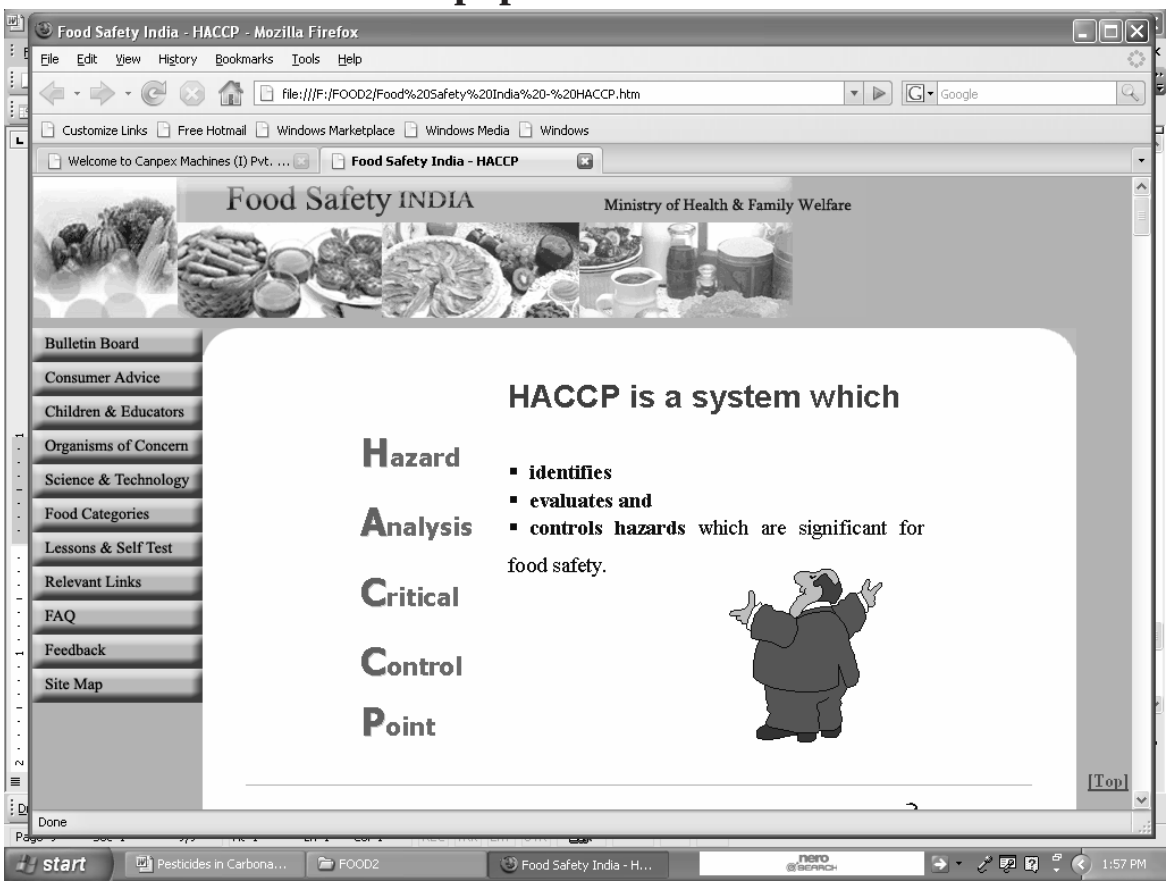
Reducing the use of leaded petrol and reducing amounts of lead in the petrol will result in a decline in lead in the air we breathe.

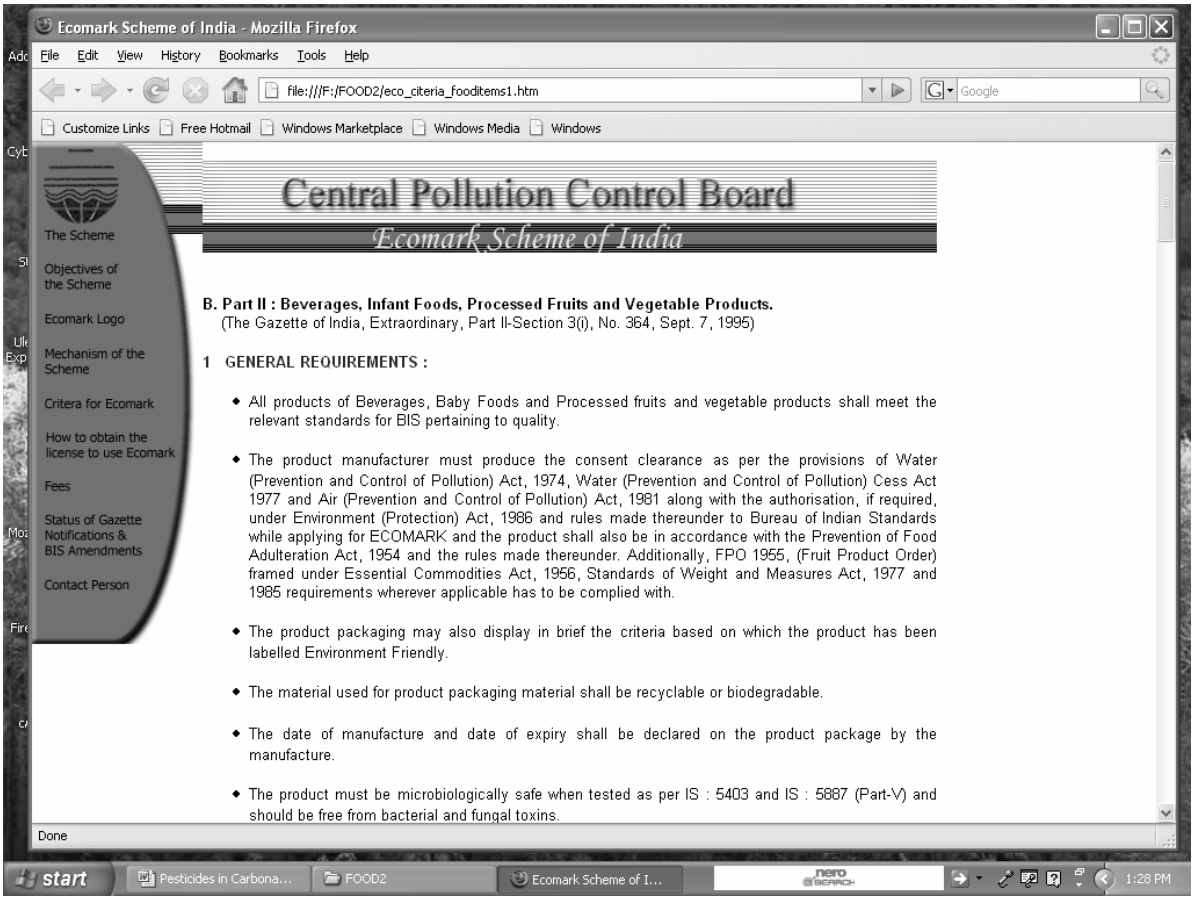
Reference site:-

Want more information about LEAD and LEAD POISONING ?

Visit **- leadpoison.net**

Impoprtant Websites





Using Nanotechnology to Detect Contaminants inFood and Water

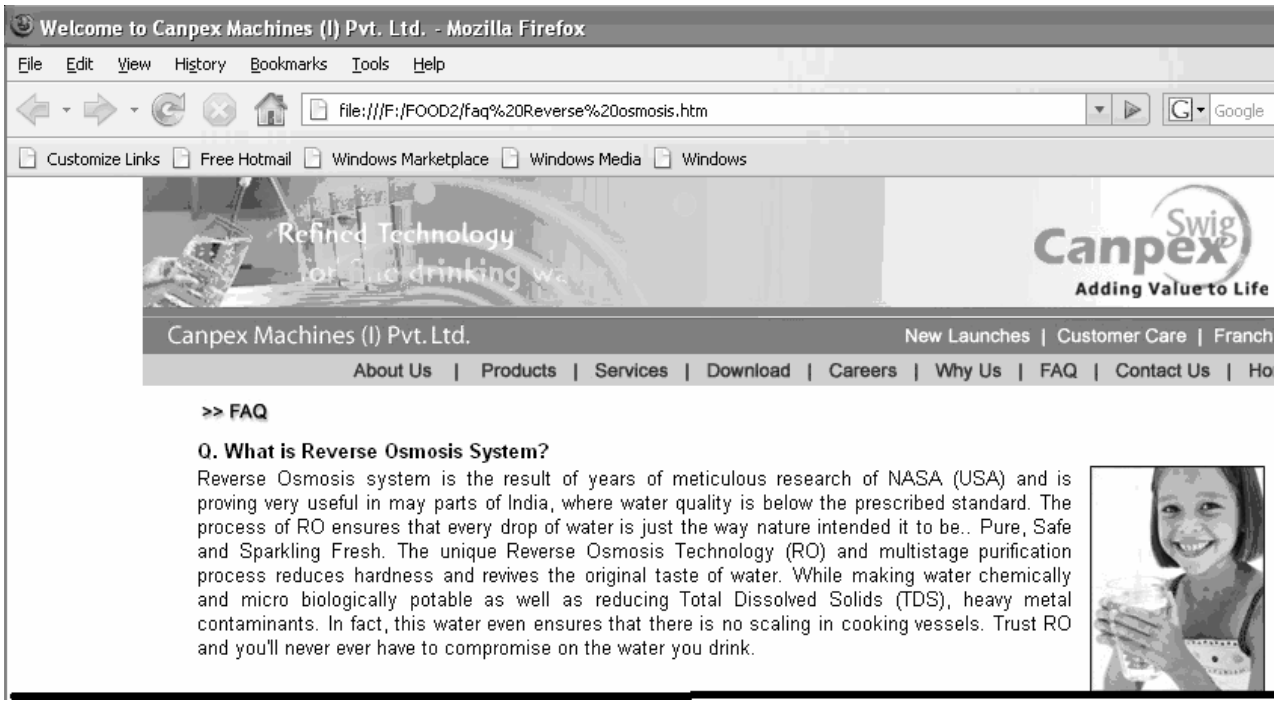
Source: AZoNano.com

Author: n/a 7/23/2007

Researchers from the Technical University of Denmark have developed two new portable sensor devices that can detect a variety of contaminants, ranging from molecules to whole bacteria, in food and water. One device consists of two microscale cantilevers that are coated with antibodies specific to the contaminant of interest. When liquid is passed through the cantilevers, the microbe or contaminant molecule under investigation binds to the surface of the cantilevers, causing them to bend and changing their electrical resistance, which can then be measured as a means of detection. Researcher Anja Biosen explained that that the device could be expanded to simultaneously detect many different types of contaminants by adding several cantilevers that are each coated with different detector molecules. The same cantilever technology is also applied to "lid devices" that produce a visible color indication of contaminant detection. The article says that such lid devices take the form of a portable one centimeter plastic box. Boisen said: "We use processes where the cantilevers are fabricated by etching a thin silicon wafer three-dimensionally. The procedure is suitable for mass production and it might be possible to make sensors so cheaply that they can be disposable. . . The lid device could be included in food packaging since it requires no external energy and is cheap to make. When a food is infected, the control unit in the plastic wrapping becomes coloured.

Thus a simple colour indicator can show the quality of the food."

Research at NASA (USA)



X-ray systems detect range of contaminants

Source: AZoNano.com

Author: n/a 8/16/2007

- A new range of x-ray systems can inspect package products for a wide variety of contaminants, its manufacturer claims.

S + S Separation and Sorting Technology said its Raycon x-ray series can detect a wide variety of foreign particles including metal contaminants, glass, ceramics, stones, rubber, bones and polyvinyl chloride (PVC).

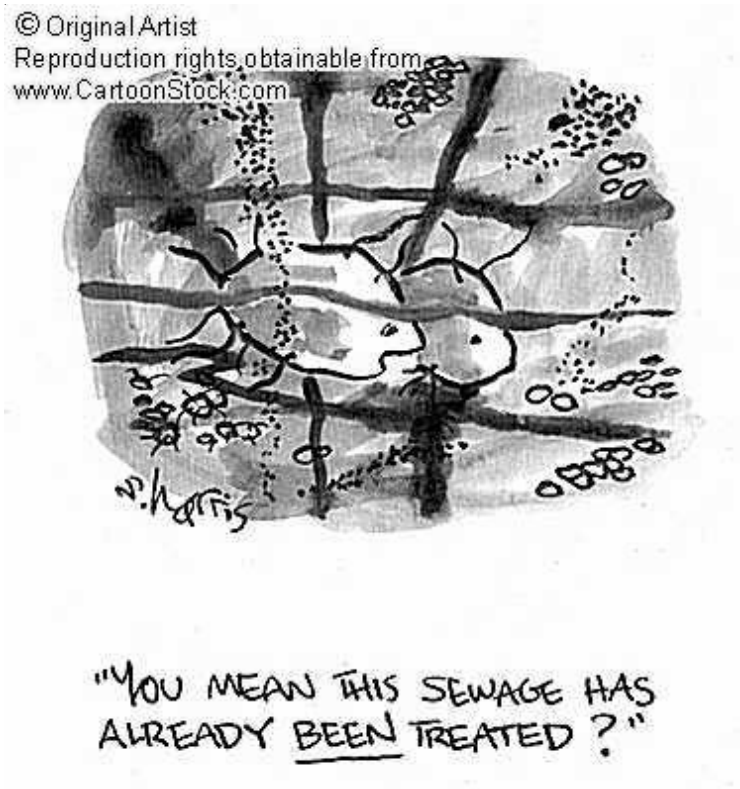
Manufacturers are upgrading their inspection systems to improve food safety and to reduce the risk of contaminants in food that can lead to costly recalls and damage consumer confidence in brands.

Moveover, tougher hygiene regulations based on hazard analysis and critical control point (HACCP) are forcing food processors to identify the parts production lines where risks of contamination are high and implement control measures to mitigate those risks.

The system is used for the final inspection of packaged products. Aluminium-coated packing materials or metallised films are no problem at all. The system also permits the simultaneous inspection of different products and packaging even in parallel production lines.

Out of line or misplaced products are inspected by the x-ray, but do not cause error messages. Up to 600 units per minute be checked by the system that can be connected to a pc.

The stainless steel construction ensures systems can withstand the harsh chemical and high-temperature washdowns.



BOOK INFORMATION

A large number of Books are available in the market.

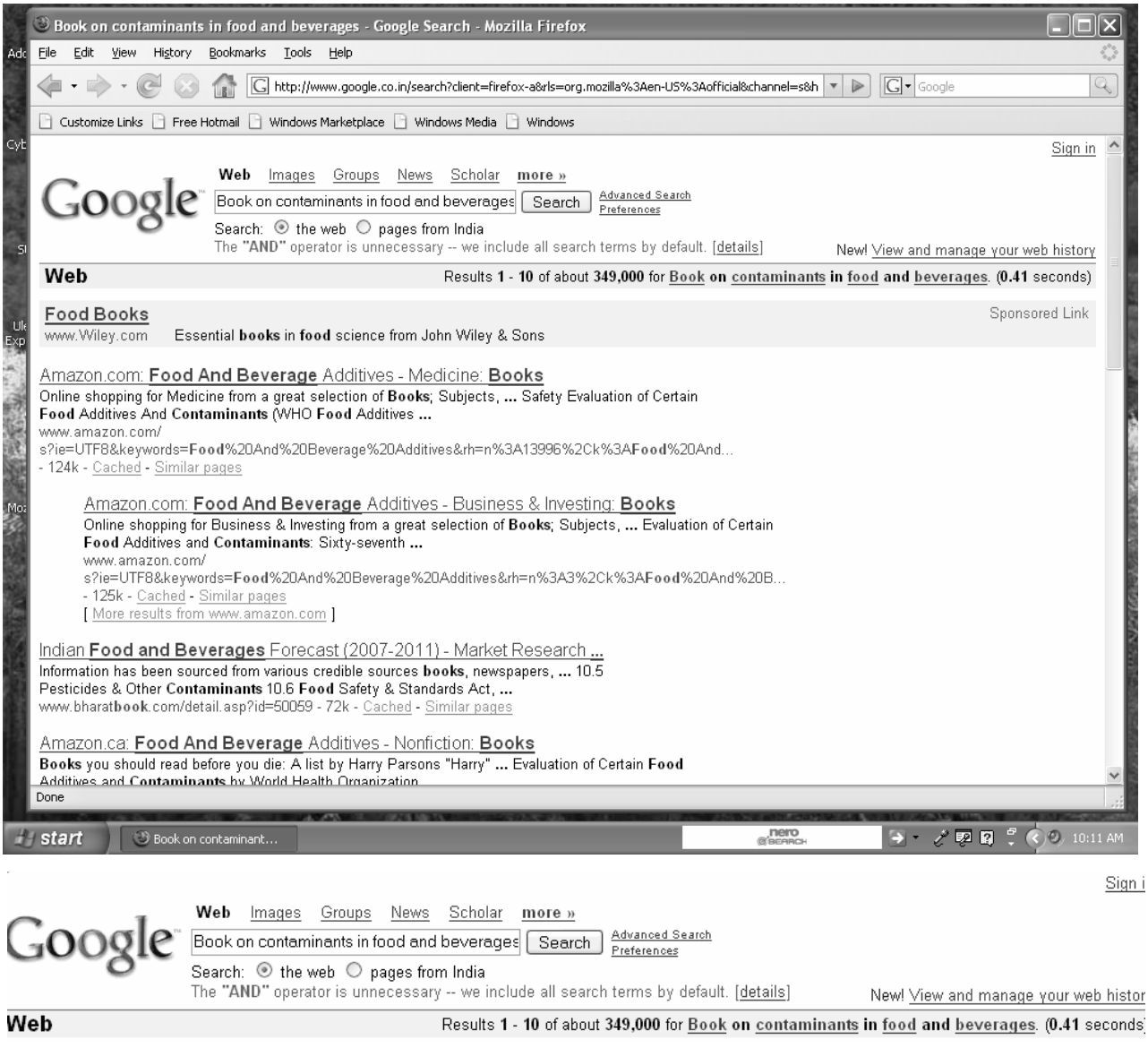
Now a days one can order a book through Internet

On the Google Search Engine on 15 September 2007

Results :- Duration :- 0.41 seconds

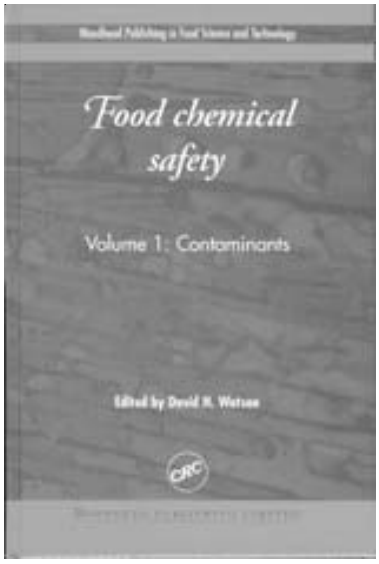
Subject :- Contaminants in Food and Beverages

Books / Reports:- 349,000



It is really amazing

Book 1



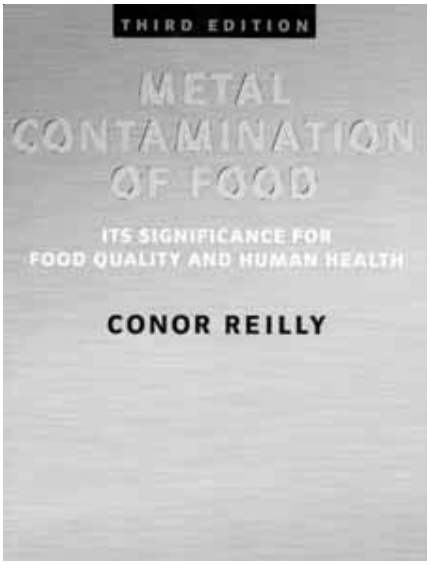
Food chemical safety: Contaminants (Volume 1)

336 pages ISBN 1855734621 £145.00

Edited by D Watson, Food Standards Agency, UK

This volume provides comprehensive information about contaminants in the food industry. The book opens with an explanation of risk analysis and analytical methods used for detecting contaminants in food products. This is followed by full details of relevant EU and USA regulations. The second part of the book provides information about specific contaminants.

Book 2



Author has many years experience teaching and researching in the area

Metal Contamination of Food is an essential reference book for food industry personnel, including those working in food processing, formation and ingredients, packaging, quality control and food safety.

Contents

I The Metals We Consume:

Introduction

The metals in food

Metal analysis of food How metals get into food

Metals in food and the law

II The Individual Metals:

The persistent contaminants: lead, mercury, cadmium

The packaging metals: aluminium and tin

Transition metals: chromium, manganese, iron, cobalt, nickel, copper, molybdenum

The other transition metals and zinc

The metalloids: arsenic, antimony, selenium, tellurium and boron

The new metal contaminants Barium, beryllium, thallium and the other metals - summing up

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Book 3

Food contaminants: Sources and surveillance

Edited by C Creaser, University of East England and R Purchase, British Industrial Biological Research Association, UK

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January 1991

204 pages 234 x 156mm hardback

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This book contains contributions based on the proceedings of two symposia on food contamination held in London in April 1989 and May 1990, both of which were organized jointly by the Environment, Food Chemistry and Toxicology Groups of the Royal Society of Chemistry.

The aim of these meetings was to assess the extraneous chemical contamination of food from two sources: firstly, food-chain contaminants - the presence of plant toxicants of fungal metabolites in food, or the contamination of food from environmental sources (airborne, aquatic and terrestrial); and secondly, food-production contaminants - contaminants of man-made origin brought about by a desire to facilitate food production and distribution.

The contributors concentrate on the contamination of food by chemicals arising from environmental and food-production sources.

Chapter 1 is concerned with food-chain contaminants present in food as natural components of the diet. This is followed by discussion of the chlorinated dioxins and furans, and polycyclic aromatic hydrocarbons. Following an introduction to the control and surveillance of food-production contaminants, four areas of activity are described: migration from food contact materials with particular reference to plastics, the analysis and regulatory control of veterinary products, the analysis of pesticides in drinking water and finally the problem of food taints.

Book 4

Preventing Foreign Material Contamination of Foods

By **Doug Peariso**

DOUGLAS PEARISO is the former senior quality assurance manager of the Foods Business Unit of Gerber Products Company, Freemont, MI

Written for quality assurance, HACCP, and related professionals charged with maintaining the integrity of their food product, *Preventing Foreign Material Contamination of Foods* offers conceptual, pragmatic, and *implementable* strategies to detect and eliminate physical contamination during food processing.

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3. Physical Separation Techniques for Controlling FM Contaminants
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6. Machine Vision and Its Application to Prevent FM Contamination of Foods
7. X-ray Examination of Foods for Foreign Materials
8. Proper Initial Validation, Ongoing Verification, and Change Control for Separation and Detection Equipment
9. Proper Use of Acceptance Sampling and Statistical Process Control to Augment FM Control Programs

Book 5

Indian Food and Beverages Forecast

(2007-2011)

Publication Date	June 2007
Publisher	RNCOS
Product Type	Report
Pages	85
ISBN Number	not applicable
Product Code	RCS00198

Price

£595.00
approximately: $1,200 |€ 878

Summary

The “Indian Food and Beverages Forecast (2007-2011)” report gives an in-depth analysis of the present and future prospects of the Indian food and beverages industry.

It looks into the industry in detail with foci on organized food retailing, consumer food purchasing behaviour, food processing industry and packed/convenience food industry.

This report helps clients to analyze the factors and examine the opportunities critical to the success of food and beverages industry in India.

List of some Books on Food

Food Toxicology, Food Irradiation and Food Contamination

Culinary and Hospitality Industry Publications Services

TITLE/AUTHOR	PRICE
Acrylamide and other Hazardous Compounds in Heat-Treated Foods (Skog)	238.95
Aflatoxin and Food Safety (Abbas)	189.95
Aldo-Keto Reductases and Toxicant Metabolism (Penning/Petrash)	159
Basics of Toxicology: Preserving the Legacy (Kent)	89
Carcinogenic and Anticarcinogenic Food Components (Baer-Dubowska)	138.95
Casarett & Doull's Toxicology: The Basic Science of Poisons, 6th edition (Klaasen)	119.95
Chemical Food Safety: A Scientist's Perspective(Riviere)	74.95
Clostridium Botulinum: Ecology and Control in Foods (Hauschild)	208.95
Dioxins and Health 2nd edition (Schecter and Gasiewicz)	179
Electronic Irradiation of Foods (Miller)	128
Environmental Contaminants in Food (Moffat)	178.95
Food and Nutritional Toxicology (Omaye)	118.95
Food Antioxidants: Technological, Toxicological, and Health Perspectives (Madhavi/Deshpande/Salunkhe)	228.95
Foodborne Carcinogens: Heterocyclic Amines (Nagao)	314
Food Chemical Safety, Volume 1: Contaminants (Watson)	268.95
Food Chemical Safety, Volume 2: Additives (Watson)	268.95
Food Irradiation: Principles and Applications (Molins)	159
Food Irradiation Research and Technology (Sommers)	184.95
Food Technology: Irradiation Video	115
Food Toxicology (Helferich and Winter)	148.95
Free Radicals and Oxidation Phenomena in Biological Systems (Roberfroid)	168.95
Handbook of Food Toxicology (Deshpande)	248.95
Handbook of Toxicology 2nd edition (Derelanko)	198.95
Indirect food Additives and Polymers: Migration and Toxicology (Sheftel)	178.95
Introduction to Biochemical Toxicology (Hodgson and Smart)	134
Irradiation for Food Safety and Quality (Loaharanu)	148.95
Irradiation of Food and Packaging (Komolprasert and Morehouse)	159
ISO 9000 Quality System: Applications in Food and Technology (Newslow)	78.95
Metal Contamination of Food: Its Significance for Food Quality and Human Health, 3rd edition (Reilly)	189.95

Contaminants in Food and Beverages	
Natural Toxicants in Feeds, Forages, and Poisonous Plants (Cheeke)	57
Nutritional Toxicology 2nd edition (Kotsonis and Mackey)	148.95
Nutrition and Chemical Toxicity (Ioannides)	254
Persistent, Bioaccumulative, and Toxic Chemicals I: Fate and Exposure (Lipnick et al)	184
Pesticide Chemistry and Bioscience: The Food-Environment Challenge (Brooks/Roberts)	144
Pesticide Residues in Foods: Methods, Techniques and Regulations (Fong et al)	124
Pesticide Residues in Food and Drinking Water: Human Exposure and Risks (Hamilton and Crossley)	216
Pesticides, Veterinary and Other Residues in Food (Watson)	308.95
Plant Food Allergens (Mills and Shewry)	188.95
Poisonous Plants and Related Toxins (Acamovic et al)	139
Progress in Food Contaminant Analysis (Gilbert)	229
Radionuclide Concentrations in Food and the Environment (Pöschl)	168.95
Reviews in Food and Nutrition Toxicity Volume 1 (Preedy and Watson)	138.95
Reviews in Food and Nutrition Toxicity Volume 2 (Preedy and Watson)	138.95
Seafood and Freshwater Toxins: Pharmacology, Physiology, and Detection (Botana)	238.05
Sittig's Handbook of Toxic and Hazardous Chemicals and Carcinogens	
• 2 Volume Set 4th edition (Pohanish)	494
Textbook of Modern Toxicology, 3rd edition (Hodgson)	98.95
Toxins in Food (Dobrowski)	178.95
Ullmann's Industrial Toxicology 2-Volume Set	499

Prices subject to change - Prices are in U.S. Dollars

The concern today is not contamination of **Carbonated Drinks** with pesticides,

There is no reason to neglect the traces of pesticides however small the amount may be found in our food or beverages. Over the years these chemicals accumulate in our bodies and harm our health and the wellbeing of our future generations. They are called **cumulative poisons** i.e. they poison slowly and insidiously. They also poison synergistically where the combined effect exceeds the sum total of individual effect. Pesticides like DDT, Lindane, Malathion, Chlorpyrifos etc. are known to cause cancers, damage nervous system, reproductive system, cause birth defects, disrupt immune system and reduce bone density, to name a few.

In 1986, ICMR (Indian Council of Medical Research) found that 51% of the food items it tested were contaminated with pesticide residues and 20% of these had pesticides above the maximum residue limit (MRL). For e.g.: Cereals: CERC reported that most of the wheat flour brands in India are contaminated with pesticides like Lindane (which should be absent), DDT, aldrin (banned in 1996) and dieldrin (restricted to use).

Food safety on the whole

We need to talk about food safety on the whole, and take into account the numerous other chemical contaminants including those due to heavy metals such as lead, mercury, cadmium, fluorine, nitrate, nitrites, phosphate etc. The release of radioisotopes by unsafe storage of nuclear wastes and nuclear accidents ,present a serious environmental threat. These contaminants can last for many years due to long half-lives and are subject to biological magnification.

The positive side of such controversies is that they help to create awareness and interest in issues as important as these which have been neglected over the years .

This is the main purpose of this seminar..

B.N. Bandodkar Collage of Science

Seminar Information on the Net

Date :- 24 September 2007

V.P.M"s

B.N. Bandodkar College of Science, Thane

Department of Chemistry

Seminar on Contaminants in Food and Beverages

1st Preparatory Workshop :- January 16, 2007 (Time 10.00a.m. to 01.00 pm)

Venue:- Thorale Bajirao Peshwe Sabhagruha ,Thane college Campus.

Inaugural Lecture **Scope and Importance of the subject**	Mr. S.G. Medhekar (H.O.D. and Co-convener)

Presentation by College Lecturer

Food additives	Mr.D.R. Ambavadekar

Presentation by College Students

Toxic effects of Food additives	Miss Kamakshi Nayak T.Y.B.Sc (Zoology)
Contaminants in Meat, Milk and Eggs	Miss Purva Acharekar T.Y.B.Sc (Zoology)
Contaminants in Water	Miss Tejashree Dange T.Y.B.Sc (Chemistry)
Contaminants in Beverages	Miss Sonal Salvi S.Y.B.Sc.
Harmful Bacteria in Food	Miss Amurata A. Shaligram T.Y.B.Sc. (Chemistry)
Hazardous effects of **Lead and Benzene present in Food**	Miss Swati S. Kadlag T.Y.B.Sc. (Chemistry)

Contaminants In Food and Beverages

Mr.S.G.Medhekar
Head
Department of the Chemistry
B.N.Bandodkar College Of Science,Thane-1.

Various Stages at which contaminants get mixed up in Food and Beverages

- At Production level
- At Storage Level
- At packaging level
- At Transport level

At Production level

A. Plant originated food materials
- i. Seeds,
- ii. Food grains,
- iii. Vegetables,
- iv. Fruits etc

For agricultural products , we need
- a] water
- b] Soil
- c] Fertilizers
- d] Pesticides
- e] Insecticides

B. Animal originated food materials
- i.Meat,
- ii. Fish,
- iii.Milk

C .Processed Foods
- i. Edible oils.
- ii.Squashes,Syrups,Soft Drinks,Juices etc.

At Storage Level

i. Preservatives
ii. Disinfectants
iii. Additives

At packaging level

Packaging Material

i.Polymers: pvc, polythene, plastic, thermo coal, rubber,
ii. Card board:
iii. Paper waste.
iv. Tin and Metallic containers
v. Aluminium foils etc.

Degree of contamination depends on
- **i. Solubility,**
- **ii. Time,**
- **iii.Temperature,**
- **iv. Humidity**

At Transport level

ii] Containers
Bags and Boxes
iii] Handling of Food Material

At Transport level

ii] Containers
Bags and Boxes
iii] Handling of Food
Material

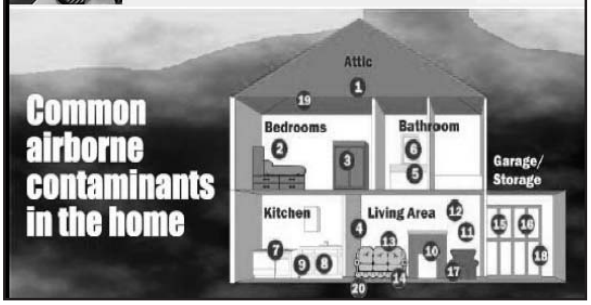
Street Food and drinks ?
&
Adulterated Food ?

Common Hazards

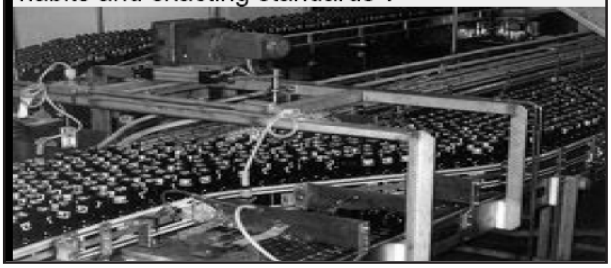
and

Common Precautionary Measures

Our food & our future?



Food processing plants demand the highest standards of cleanliness and sanitation, mirror finish with no faults for contaminants to collect into. This environment requires a unique combination of construction skills, clean work habits and exacting standards .



PREPARATORY WORKSHOP ON CONTAMINANTS IN FOOD AND BEVERAGES

1ST WORKSHOP

DATE: 16TH JAN.2007

FOOD ADDITIVES

Presentation by D.R.AMBAVADEKAR

FOODS

- NATURAL
- ORGANIC
- NOVEL
- FUNCTIONAL
- PROCESSED
- FABRICATED
- CONVENIENCE
- FRESH
- SEMBLANCE(ATTRACTIVE)
- TRADITIONAL
- NUTRITIOUS
- DELICIOUS
- PURE & REFIENED
- VEG.
- NONVEG
- FAST
- JUNK
- SNACK

WHY CHEMICAL FOOD ADDITIVES ?

- THEY ARE PURER
- MORE CONCENTRATED
- MORE CONSISTENT IN QUALITY
- ECONOMICAL
- SAFE TO HANDLE [CONVENIENT]

DEFINATION

BY NATIONAL RESEARCH COUNCIL/ NATIONAL ACADEMY OF SCIENCES

- A substance or a mixture substances of substances other than the basic food stuff which is present in the food as a result of any aspect of production, processing or packaging

Types of food additives

- UNINTENTIONAL /INDIRECT /INCIDENTAL
- FERTILISERS
- PESTICIDES
- INSECTICIDES
- HERBICIDES
- FUNGICIDES
- HORMONES
- HEAVY METALS
- RESIDUES OF DRUGS
- REMAINS (Plastic, Glass, paper)

- INTETIONAL /DIRECT
- PRESERVATIVES
- ANTIOXIDANTS
- SEQUESTRANTS
- ACIDULANTS
- SURFACE ACTIVE AGENTS
- STABILIZERS
- BLEACHING AND MATURING AGENTS
- NATURAL SUPPLEMENTS
- COLOURS
- ARTIFICIAL SWEETENERS
- FLAVOURS
- ANTICAKING AGENTS
- EMULSIFIERS

WHY INTENTIONAL FOOD ADDITIVES ?

- Improve or maintain nutritional quality- vit.A, D to margarine.
- Improve shelf value and curtail wastages- Ca-propionate in bread.
- Make food readily available everywhere any time (year round) – citric acid in fruit juices.
- Maintain food quality characteristics – corn starch in sugar to avoid lumping.
- Facilitate fast and convenient preparation of food -phosphate in instant pudding.
- Make food more attractive and appealing - use of artificial colors and flavors.

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Factors encouraging development and use of chemical food additives

- **Population growth**
- **Urbanization**
- **Labor cost**
- **Public health concerns**
- **Special diets**
- **Convenience food**
- **Fresh food year round**
- **Flavourful, ethnic and snack food**

food additives

- **Preservatives** – prevents spoilage - Ca-propionate in bread sorbic acid in cheese, Na –benzoate in soft drinks
- **Antioxidants** - prevents rancidity- BHA, BHT
- **Sequestrants** – metal scavengers-EDTA, Citric and adipic acid
- **Acidulants** – controls PH, enhance Flavors : phosphoric, lactic, citric acids.
- **Surface active agents**: emulsifiers, wetting agents - lubricants monoglycerides , diglycerides
- **Stabilizers and Thickners** : in gravies, cake toppings, chocolates.
- **Bleaching agents and Maturing agents** : benzoyl peroxide, borates, iodates
- **Natural supplements** :enhance food value– Vit. A,B,C,D, Iodine , lysine
- **Colourants** : turmeric, amaranth, tartrazine, carmine, erythrosine
- **Non-nutritive Sweeteners** : Saccharin, Cyclamates, Aspartam
- **Flavors** : Vanillin (vanilla), ethyl butyrate (pineapple) , methyl anthranilate (grape)

Risk analysis of some specific food additives

1. **The potential harm** -health hazards causing toxic effects like:
- Tumorogenesis:- development of tumors (malignant / nonmalignant)
- Teratogenesis :- development of congenital defects.
- Mutagenesis :- modification in genes and chromosomes

1. **The degree of risk-** significant due to prevalence of food additivesand limitation in technology.
   Hence safety evaluation of food additives is critical and essential.
- **Safety Evaluations involves:**
  Additives are expressed in terms of ADI-Acceptable Daily intake for man as tolerance designation.
  ADI is based on body weight, as the amount of food additive that can be taken daily in a diet over a lifetime without risk.

Results of Safety evaluations

Sr.no	Additive	use	Benefits	Risks
1	Sodium Nitrate & Sodium Nitrite	preservative	additive for cured meat products inhibits growth of clostridium bacterium,	forms N-nitrosamines which is carcinogenic and mutagenic- tumors in liver & stomach, binds with DNA.
2	Diethyl pyrocarbonate	preservative	In fruit juices, wine, beer	Reacts with amino acids & proteins forms Ammonia,DEP reacts with ammonia at PH 4-9 to form urethane (ethyl carbonate) it is carcinogenic.
3	BHA & BHT (BHA-ADI-0.3 mg/kg of body wt.) (BHT-0.125 mg/kg body wt.)	antioxidant	Antimicrobial activity against pathogens & viruses	Goes in liver produce peroxide which is carcinogenic & mutagenic causes stomach cancer.

Results of Safety evaluations

4	Phosphoric acid	Inorganic Acidulant	In cola type of soft Drinks& canned food.	Excess intake reduce optimum Ca : P ratio & Osteoporosis-brittle bones
5	Brominated vegetable oils	Emulsifying agent	In soft drinks To give it a clear appearence	It deposits brominated fat on heart – toxic effect.
6	Potassium bromate ($KBrO_3$)	Bleaching & maturing agent in flour	In baked bread	Deposits bromate residues – kidney stones (banned)

Results of Safety evaluations

7	Saccharin	Calorie free artificial sweetener (300 time sweeter)	In variety of products. Daily dose As per WHO- 0.43 to 4.3 mg/kg body wt. daily.	Tumor in bladder in rats in excess dose.
8	Cyclamate Ca or Na salt of Cyclamic acid	Sweetner (30 times more sweet than sugar)	Variety of food products. Daily WHO dose 4-10 mg/kg body wt.	Cancer of bladder in Rats
9	Monosodium glutamates	Flavor enhancer	Frozen non veg. foods, dry soups& cheese spreads	In adults produce Chinese Restaurant Syndrome- burning sensation in neck back Headache, chest pain Safe for adults.

TOXIC EFFECTS OF FOOD ADDITIVES

Kamakshi Nayak

T.Y.B.Sc. (Zoology)

What is a Food Additive?

An additive is added to a food product either intentionally, to produce a desired effect or unintentionally through processing, storage or packaging.

***Direct** food additives are those that are added to a food for a specific purpose in that food.*

***Indirect** food additives are those that become part of the food in trace amounts due to its packaging, storage or other handling. For instance, minute amounts of packaging substances may find their way into foods during storage.*

List of Some Food Additives & There Effects On Human Body

1. E102

TARTRAZINE

- *What : Colouring containing synthetic azo dye.*
- *Found : In soft drinks, packet desserts, fruit flavored cordial, pickles.*
- *Effects :*
- *Provoke migraine.*
- *Itching.*
- *Blurred vision.*

- *Purple patches on the skin.*
- *Irritability.*
- *Restlessness.*
- *Inattention and wakefulness in young children.*
- *It has immunosuppressive effects.*

2. E110

SUNSET YELLOW

- *What : Coloring containing synthetic azo dye.*
- *Found : In cereals, bakery items, crumbed foods, sweets, snack foods, ice cream, drinks and canned fish; also in many medications.*
- *Effects :*
- *Eczema.*

- *Swelling of the blood vessels.*
- *Nasal congestion.*
- *Behavioural problems and wakefulness in children.*
- *It is able to cross the placenta and is potentially dangerous to asthmatics.*

3. E123

AMARANTH

- *What : Colouring containing synthetic coal tar dye and azo dye.*
- *Found : In jelly crystals, packet cake mixes, fruit-flavoured fillings.*
- *Effects : Over activity in children.*
- *It has immunosuppressive effects.*

4. E127

ERYTHROSINE

- *What : Colouring containing synthetic coal tar dye.*
- *Found : In glace &canned red cherries, strawberries quick custard mix, biscuits, packet trifle mix.*
- *Effects:*
- *It can cause phototoxicity (sensitivity to light).*

- *Large dietary intakes of this additive could affect the thyroid.*
- *It has estrogen-like growth properties and could be a significant factor in human breast cancer.*

5. E211

SODIUM BENZOATE

- ***What : Preservative.***
- *Found : Used in soft drinks, fruit drinks, toppings & maple syrup.*
- *Effects :*
- *Asthma.*
- *Gastrointestinal symptoms.*
- *Behaviour problems in children.*

6. E220

SULPHUR DIOXI DE

- *What : Preservative.*
- *Found : Used in dried fruit, soft drinks, cordials, fruit drinks, beer, wine, sausages, other processed meats, hot chips, instant mashed potato, prawns.*
- *Effects :*
- *Asthma and skin rashes especially in young children.*
- *Irritability and occasionally death.*

6. E220

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- *What : Preservative.*
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- *Effects :*
- *Asthma and skin rashes especially in young children.*
- *Irritability and occasionally death.*

- *Effects :*
- *Irritability*
- *Restlessness*
- *Inattention and sleep disturbance in children*
- *Migraines*
- *Skin rashes*
- *Gastrointestinal upsets*

8. E320 ***BHA (BUYLATED HYDROXANISOLE)***

- *What : Antioxidant used as a preservative in oils and fats.*
- *Found : Fried foods, softened butter, dairy blends, margarine, hot chips, frozen chips, crisps, biscuits, ice-cream cones.*

- *Effects :*
- *Eczema.*
- *Irritable bowel symptoms.*
- *Migraine.*
- *Irritability.*
- *Restlessness.*
- *Inattention.*
- *Wakefulness and depression.*

9. E621

- ***MONOSODIU M GLUTAMATE***
- *What : Flavor enhancer (MSG) .*
- *Found : Snack foods, instant noodles, biscuits, prepared meals, sauces, gravies, stocks and stock cubes, canned tuna, many frozen foods.*

- *Effects:*
- *Migraine.*
- *Asthma.*
- *Eczema.*
- *Irritable bowel symptoms.*
- *Heart palpitations.*
- *Dizziness.*
- *Nausea.*
- *Attack-type symptoms.*
- *Not permitted in foods intended specifically for infants and young children.*

- *Effects:*
- *Migraine.*
- *Asthma.*
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- *Irritable bowel symptoms.*
- *Heart palpitations.*
- *Dizziness.*
- *Nausea.*
- *Attack-type symptoms.*
- *Not permitted in foods intended specifically for infants and young children.*

- *Effects :*
- *Headache.*
- *Mood alteration.*
- *Insomnia .*
- *Fatigue and dizziness .*
- *Gastrointestinal symptoms and allergic reactions.*
- *Linked to brain tumours.*

HOW TO AVOID

- *Don't eat products containing sugar substitutes such as saccharine and aspartame.*
- *Avoid products with a long shelf life – the better they do on the shelf, the worse they are for your body.*
- *Don't eat partially hydrogenated or hydrogenated trans fats.*

- *Avoid products that have been enriched. They have been completely devitalized during processing.*
- *Avoid food that has been genetically modified or engineered. Nearly all processed food contains GMOs.*
- *Avoid products made with ingredients euphemistically described as "natural flavoring" or "natural coloring."*

- *Avoid products with added sugar – watch for words with "-ose" endings such as glucose.*
- *Incorporate a multi-vitamin into your health regimen.*
- *If you've had a history of eating products high in sugar and are concerned about diabetes, incorporate disease-fighting products such as garlic, vitamin E, and aloe vera into your diet.*

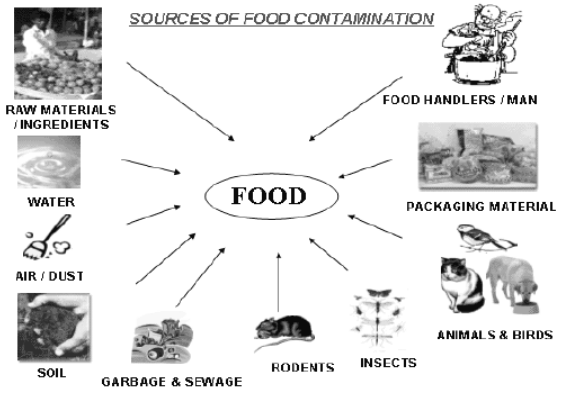
Contamination of meat, milk and eggs

Presented
By
Purva Acharekar

Toxic Shock

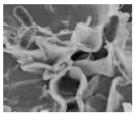
Contamination of

Meat		**Bacteria**
Milk	**With**	**Antibiotics**
Eggs		**Hormones**
		pesticides
		Dioxin



Bacterial contamination

- causes- Improper handling, preparation or storage
  Nonhygienic practices
- Ex.- Salmonella
  E.Coli
  Campylobactor
  Clostridium botulinum
  Listeria monocytogens



Symptoms

Nausea
Abdominal pain
Vomiting
Diarrhea
Fever
Headache

Measures for avoiding contamination of food.

- *GAMMA IRRADIATION.*
- *ELECTRON BEAM IRRADIATION*
- *X-IRRADIATION.*
- *AWARENESS.*

CONTAMINATION OF MEAT.

Use of Antibiotics

1. *To promote rapid growth in animals*
2. *To prevent them from dying from the diseases.*

Effects

1. *Daily exposure to low doses of arsenic can cause cancer, dementia, neurological problems, and other ailments in humans.*
2. *Evolution of new strains of antibiotic-resistant superbacteria*

Antibiotic contamination

Eating Meat Means Eating Poison—Literally !!

We do know the effect of one of these antibiotics because it includes a known poison. Roxarsone, an antibiotic commonly used on factory farms, contains arsenic, which helps to kill off parasites in the animals' feed.[35] The problem is that some of the arsenic stays in the animals' flesh, so every time we eat meat, we're getting a dose of this poison as well. According to a study published by the USDA, most meat contains toxic arsenic, and chicken flesh contains four times more arsenic than other meats

CONTAMINATION OF EGGS

CONTAMINATION OF EGGS.

Eggs Contamination

The risk of eggs being contaminated with harmful bacteria and causing illness is very low. The odds of becoming ill from consuming eggs is no greater than with any other perishable type of food and the risk is often less than many foods. It is estimated that only 0.005% (1 in 20,000) of eggs may be contaminated with the salmonella bacteria, but even with a risk this low, it is wise to cook eggs to the proper doneness to ensure safety. Proper cooking kills the salmonella bacteria in any eggs that may have it.

Measures concerning contamination of eggs.

- Pasteurization.
- Proper storage.
- Other methods.

Hormone

- *Cows are injected with hormones to make them grow larger and produce more milk.*

Effects

- *Disturb the natural balance*
- *Disrupt the development of brain and sex organs*
- *Premature sexual development*
- *Ovarian cyst*
- *Early sexual development in young girls*
- *Gynecomastia- enlarge male breast*

Pesticides

- *Crops to farm feeds*
- *Accumulate in bodies of animals over a time*
- *Causes birth defects and cancer*

Dioxin

- *Source- ,byproducts of industrial and combustion processes including household fires*
- *Food high in animal fat such as milk meat fish and eggs are the main source of dioxin and PCB*
- *Effects-cancer, damage to immune and reproductive system*

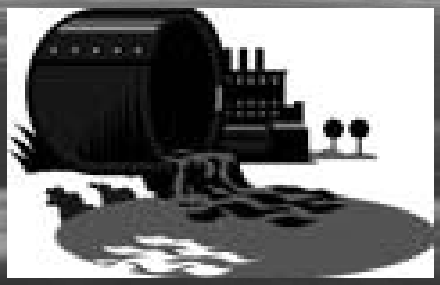
Cross Contamination

Cross contamination is also important to guard against. Various types of foods should be kept separate from each other during storage and preparation. Never store ready to eat foods next to raw eggs, raw meats, or raw fish. Germs from perishable food items may contaminate the ready to eat foods. If cutting boards are used in your kitchen, it is a good idea to use one for meats and a different one for fruits and vegetables. Never use the same knives and utensils for preparing multiple food items unless they are washed before using them on a different item. The knife that was used to cut raw beef should not be used to chop a hard-cooked egg unless the knife has been thoroughly washed first. It is also important to wash your hands often during food preparation to avoid transferring harmful bacteria from one food item to the next. If you were handling raw meat, for example, you would want to wash your hands thoroughly before chopping vegetables to reduce the risk of transferring bacteria from the meat to the vegetables.

Additional Points to Consider Concerning Contamination

•It is best not to separate egg whites and yolks by splitting open the eggshell and passing the contents between the two shell halves. The egg may become contaminated if bacteria are present on the shell. Bacteria may be present on the shell even after it is cleaned and the shell may also become contaminated from other food sources that it may come in contact with. Do not use the two halves of the shell for removing bits of the shell from an egg mixture and never use the shell halves to measure other foods for a recipe.
•Salmonella may be found not only in eggs, but in other foods such as chicken, cheese, orange juice, tomatoes, and alfalfa sprouts. It can be spread quite easily from one food to another, which is why it is important to guard against cross contamination during food preparation.
•Cross contamination can occur when bacteria are transferred from one food to another, from contaminated kitchen equipment to food, or from people to food.
•The number of incidents of people becoming infected from salmonella in eggs has steadily declined during the past few years. This is due mainly to quality control measures on the farm, in processing facilities, and during shipping to food stores and also because of increased awareness of proper food handling procedures by food service personnel and consumers.

WATER CONTAMINATION



"Contaminants in Water "

Miss. Tejashree Dange

T.Y.B.Sc (Chemistry)

SOURCES

- **Municipal sewage**
- **Pesticides and fertilizers from agricultural fields**
- **Sediment**
- **Lead pipes**
- **"Natural" contamination such as arsenic or radon that occurs in water as a result of leaching or release of the contaminant from rock**
- **Spills and leaks of petroleum products**
- **Mining waste**

EFFECTS

- **Pathogens (germs) - make people sick, especially those with weakened immune systems**
- **Lead- cause brain damage in infants and children**
- **Trihalomethanes-liver damage**
- **Arsenic, radon, the rocket fuel perchlorate and other carcinogens or otherwise toxic chemicals**

PREVENTION

- Water pipes must be sound and well-maintained
- Preservation of trees
- Lakes, streams, reservoirs and wells must be protected from pollution
- Modern treatment facilities are a must
- Legislation

Contaminants in Beverages

Presented by
Sonal Salvi (142)
S.Y.BSc. (CZ)

PESTICIDES IN BEVERAGES

12 major cold drink brands contain a prominent environmentalorganization based in New Delhi. deadly cocktail of pesticide residues." Mirinda lemon was named as the drink with the highest levels of pesticides.

Down To Earth, an Indian Science and Environment magazine has found that 12 major cold drink brands sold in and around Delhi contain a deadly cocktail of Pollution Monitoring Laboratory (PML) of the Center for Science and Environment (CSE).

Laboratory Tests Alarming

A total of 36 soft drinks samples of 12 brands were tested for 16 organochlorine pesticides, 12 organophosphorus and four pyrethroides pesticides most commonly used in India

Market leaders Coca-Cola and Pepsi had almost similar concentrations of pesticide residues. Total pesticides in all PepsiCo brands on an average were 0.0180 mg/l (milligramme per litre), 36 times higher than the EEC limit for total pesticides (0.0005 mg/l). Total pesticides in all Coca-Cola brands on anpesticide residues. The results are based on tests conducted by the Polluaverage were 0.0150 mg/l, 30 times higher than the EEC limit.

While contaminants in the 'Dil mange more' Pepsi were 37 times higher than the EEC limit, they exceeded the norms by 45 times in the 'Thanda mat lab Coca-Cola' product.

Mirinda Lemon topped the chart among all the tested brand samples, with a total pesticide concentration of 0.0352 mg/l.
PML also tested two soft drink brands sold in the US, to see if they contained pesticides and found that they did not have them.

Laboratory Tests Alarming

All samples contained residues of four extremely toxic pesticides and insecticides: lindane, DDT, malathion and chlorpyrifos. In all samples, levels of pesticide residues far exceeded the maximum residue limit for pesticides in water used as 'food', set down by the European Economic Commission (EEC) . PML also tested two soft drink brands sold in the US, to see if they contained pesticides and found that they did not have them.

Supply Of Water

Ground Water is extracted

The use of land for agriculture and the practices followed in cultivation greatly affect the quality of groundwater

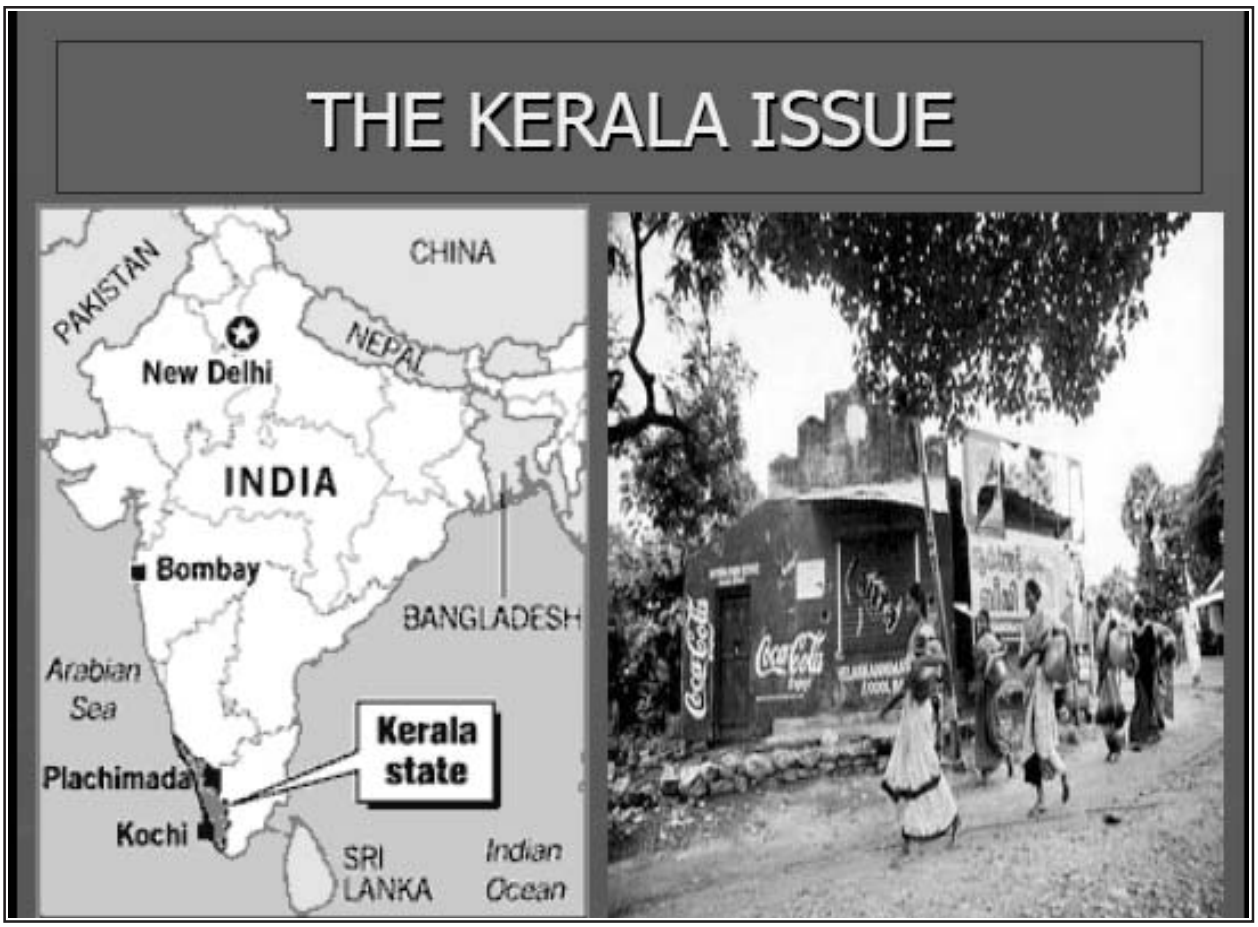
Intensive cultivation of crops causes chemicals from fertilizers (e.g. nitrate) and pesticides to seep into the groundwater, a process commonly known as leaching
The high nitrate content in groundwater is mainly from irrigation run-off from agricultural fields where chemical fertilizers have been used

➢*Supply of water*

➢Most detergents and washing powders contain phosphates,
➢The various substances that we use for keeping our houses clean add to water pollution as they contain harmful chemicals
➢Waste water from manufacturing or chemical processes in industries contributes to groundwater pollution.

HOW TO CONTROL-CONTAMINATION

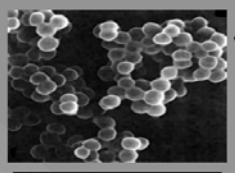
- Rules & Regulations should be strict
- Chemical Industries should install proper effluents treatment facilities
- Minimizing the use of chemical fertilizers
- The individual and the community can help minimi



Harmful Bacteria In Food

AMRUTA A. SHALIGRAM
T.Y.BSc-A
R.NO.77

Introduction



- Ingesting food that has been contaminated by ***bacteria***, viruses, parasites or chemicals causes food borne illness. Food-safety hazards can be introduced into food service operations in a number of ways, such as food, equipment, supplies and customers. The hazards may be biological (bacteria, viruses, parasites and fungi);

Major food borne illness include Salmonella Bacteria

- A large group of bacteria, salmonella can make people sick with a disease called salmonellosis. These bacteria are found in the natural environment, animal feed and animal intestines.

Symptoms:

- Salmonellosis symptoms may include diarrhoea, abdominal cramps, vomiting and fever. These symptoms usually appear six to 48 hours after exposure and can persist for several days.

Prevention

- Avoid cross-contamination, refrigerate food, thoroughly cook all meat to proper internal temperatures, rapidly cool cooked meats, practise good personal hygiene and proper hand washing.

Sources

- . Foods that are most likely to carry salmonella bacteria include raw and undercooked meats (especially poultry), raw milk, eggs and sprouts. Fruits and vegetables can become contaminated with salmonella bacteria if they have been exposed to contaminated soil, or have come in contact with a contaminated product or surface (such as a countertop or hands during food preparation).

E.Coli0157:H7 Bacteria

This is found in the intestines of cattle, poultry and other animals. When an animal is butchered, the bacteria can be transferred to the meat's outer surface. E.coli 0157:H7 infection can be spread by hand-to-hand contact with an infected person or even from surfaces he/she may have touched.

Symptoms:

- . A small number of people who become infected with E.coli do not get sick at all; some experience flu-like symptoms i.e, smallpox; others experience severe, even life-threatening symptoms. Symptoms include diarrhoea, severe abdominal pain, vomiting and low-grade fever.

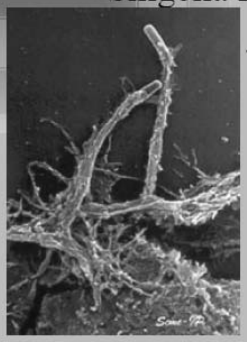
Symptoms:

- It may also cause an unusual type of kidney failure and blood disorder called haemolytic uremic syndrome (HUS).HUS is commonly called hamburger disease, un-pasteurized milk untreated water, vegetables and un-pasteurized apple juice/cider contaminated with E.coli have made people ill.

Prevention:

- Thoroughly cook ground beef to at least 70 C (158 F) for 15 seconds; avoid cross-contamination; avoid fecal contamination from food service employees by practising good personal hygiene and proper hand washing.

Shigella Bacteria



- A gram(-) bacteria found in the intestinal tract of humans, shigella is rarely found in other animals. Its presence in foods is a sign of human contamination and lack of hygiene by food handlers. Another means of transmission is ingesting of contaminated water, such as water supplies contaminated by untreated sewage.

Symptoms:

- Symptoms include diarrhoea, abdominal pain, fever, vomiting and dehydration. The most common foods to carry shigella are salads (potato, shrimp, tuna, chicken, macaroni, fruits, and lettuce). Chopped turkey, rice balls, beans, puddings, strawberries, spinach raw oysters, luncheon meats and milk may also carry shigella.

Prevention

- **Avoid cross-contamination; avoid fecal contamination from food service employees by practicing good personal hygiene and proper hand washing; use sanitary food and water sources.**

Cross contamination

- Diseases can also be spread by **cross-contamination**, which is the transfer of harmful substances or microorganisms to food by a variety of means. Utensils, washcloths, and human hands can contaminate ready-to-eat foods. Contamination can also occur via food-to-food, such as when thawing meats drip on ready-to-eat foods.

What can I do to prevent cross contamination?

- **When shopping** ?- separate raw meat from other foods in your shopping trolley. Place these foods in plastic bags to prevent their juices from dripping onto other foods. The poultry industry now provides whole chickens in leak-proof packs and these should be selected wherever possible

To prevent cross contamination:

- In the refrigerator - place raw meat in containers to prevent their juices dripping onto other foods. Juices will contain harmful bacteria if they are present on the meat
- Defrosting - ***completely defrost meat before cooking so it will cook evenly. Ensure juices do not drip onto other foods***

To prevent cross contamination:

- In the kitchen - harmful bacteria can spread throughout the kitchen and get onto chopping boards, utensils, and bench tops. To prevent this:
- Wash hands with soap and hot water before and after handling raw meat
- Wash chopping boards, dishes, utensils and benches with hot, soapy water after preparing each food item. Preferably, use one chopping board for fresh produce and a separate one for raw meat
- It is not necessary to rinse raw meat before cooking. Studies have shown that rinsing can spread bacteria around the kitchen

In kitchen

- Cook raw meat thoroughly until juices run clear. This is especially important for poultry meat
- When marinating, boil used marinade before brushing onto cooked meat
- When serving, never put cooked food back on the same plate or chopping board that previously held raw meat.

Hazardous Effects of Lead & Benzene Present In Food

Swati S.Kadlag
T.Y.BSc.-A
R.No.36

Introduction

Due to the likely contamination of food and beverage products with pesticides, herbicides and many other materials that are considered a health risk, all such products on sale today must be carefully assayed. In addition, tests that identify the area or country in which the food was processed or grown may also be needed

The source of many plants (herbs and spices) can often be identified from the peak pattern of the chromatograms obtained directly from head space analysis. Similarly, unique qualitative and quantitative patterns from a GC analysis will often help identify the source of many alcoholic beverages.

LEAD

- Lead is a naturally occurring bluish-gray metal found in small amounts in the earth. It has no special taste or smell and can be found in all parts of our environment . Human activities such as mining, manufacturing, and the burning of fossil fuels are the major sources of environmental lead.

LEAD

- Because of health concerns, lead from gasoline, paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years .

USES

- It has many different uses, most importantly in the production of batteries, but also in ammunition, metal products (solder and pipes), roofing, and devices to shield x-rays . It has been used both for the bright colors on ceramic dishes and for the smooth, transparent glaze .

Sources of Lead in food & beverages

- The major sources of lead in drinking water are lead plumbing, soil carried into water by rain and wind, and wastewater from industries that use lead . Food can contain lead if lead-containing dust gets onto crops while they are growing or during food processing . Lead can also get into food through food containers. pieces of china, pottery dishes,etc.

Examples.

- acid foods and drinks will leach lead out of dishes much faster than non-acid foods. Spaghetti sauce, salsa, soy sauce, orange juice, applesauce, coffee, tea, cola drinks, and salad dressing are examples of acid foods. The major exposure of lead to the general population in food is through fruits and grains, according to the Agency for Toxic Substances and Disease Registry, part of the U.S. Public Health Service.

Symptoms

- Some older pieces of china may contain lead which can leach out from the surface of the dish and get into foods and beverages. Then, when the food is eaten, the lead gets into the body. It Can cause neurological disorders, reproductive problems, diminished intelligence and a host of other ills .

Precautions

- Precautions that can be taken to reduce your exposure to lead in food include, avoiding the use of glazed pottery and pewter dishes to serve or store food, avoiding the storage of beverages in leaded glass decanters, keeping the home clean and as dust free as possible, eating a variety of foods, and eating foods rich in calcium, iron and Vitamin C so your body will absorb less lead from specific food sources that have been exposed to lead .

Benzene

- Benzene is listed as a poisonous chemical shown to increase the risk of leukemia and other cancers(oral cancer).

Benzene

- The problem is caused by two common ingredients – sodium benzoate and ascorbic acid (vitamin C) – which can react together to cause benzene formation.The US Department of Health and Human Services reported that in an internal memo: *"Benzene formation occurs at part per billion (ppb) levels in some food formulations containing sodium benzoate and ascorbic acid [vitamin C]."*

Sodium Benzoate

- Use:
- Sodium benzoate, also known as E211, is used as a preservative by a range of food and drink producers. Its main advantage is its effectiveness at killing off bacteria under the acidic conditions of most beverages.

Ascorbic Acid

- Use:
- Ascorbic acid, or vitamin C, is found naturally in fruit and vegetables but is also added as an antioxidant in food and drink production to help prevent spoilage and extend shelf-life.

According to <u>Lawrence:</u>

- Glen Lawrence, another chemist who conducted benzene testing for the FDA, has also confirmed to **Beverage Daily.com** that sodium benzoate and ascorbic acid do react to form benzene in soft drinks .

According to <u>Lawrence,</u>

- His study showed that ascorbic acid initially reacted with metals, such as iron or copper, found in the water to create 'free radical' particles known as hydroxyl radicals.
- Sodium benzoate, meanwhile, breaks down into benzoic acid when placed in acidic conditions, such as in a soft drink.

According to <u>Lawrence</u>

- The hydroxyl radical attacks the benzoic acid, removing the carbon dioxide from it and leaving benzene in its wake. Lawrence's study said this reaction could take place *"under conditions prevalent in many foods and beverages"*.

According to <u>Lawrence</u>

- Lawrence said: *"There is no good reason to add ascorbic acid (vitamin C) to soft drinks, and those that may have ascorbic acid naturally in them (juices) should not use sodium benzoate as a preservative. So it is really very easy to avoid the problem."*

Thank You

V.P.M"s

B.N. Bandodkar College of Science, Thane

Department of Chemistry

Seminar on Contaminants in Food and Beverages

2 nd Preparatory Workshop : July 27, 2007 (Time 10.00a.m. to 01.00 pm)

Venue:- Thorale Bajirao Peshwe Sabhagruha, Thane College Campus, Thane

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Chief Guest Inaugural Lecture

Contaminants in Food and Beverages	Dr. R.K. Shastri

Presentation by College Teachers

A review of Mycotoxins as Contaminants in Food with special reference to Aflatoxins	Dr. Moses J. Kolet
Detection and determination of Chloramphenicol residue in Food and Agricultural products by liquid chromatography	Dr. U.R. Pandit
Component of Food and their contaminants	Dr. R.P. Chavan (Dnyansadhana College, Thane)

Presentation by College Students

Contamination of Food by Fungi	Rakesh Kale (S.Y.B.Sc)
Contamination in food oil on edible oil	Pooja Dandekar (T.Y.B.Sc)
Coca cola Case	Raghunath Sakha (T.Y.B.Sc)

Dr. Ranjan Shastri

ACADAMIC ACHEVEMENTS

University of Poona

GOLD MEDELS at B.Sc. And M.Sc

Ph.D.

National Chemical Laboratory , Poona

POSITIONS HELD

Sr. Scientist,
R&D Manager
Sr. R&D Manager
From April 1976 to
September 1993
SANDOZ (INDIA) LIMITED,

- Synthesized more than 10000 New compound for Biological Evaluation

- Member of the invention team for the two successful products
SAN 582 (H) and Cyproconazole [Azole fungicide]

- Designed and implemented Research Programs
leading to potential crop protection.

Developed several analytical methods for the determination of Pesticides' Residue in variety of environmental substrates

Developed concepts and methodologies for treatment of effluent in Laboratory and implement them in plant.

Undertook programs to reduce the generation of waste by suitably altering manufacturing process

Special Training in the area of Environmental Sciences
1988 to 1991
SANDOZ Agrochemical Division, Switzerland

Received Training in the area of

GLP Good Laboratory Practices
GFE Good Field Practices

Research Papers

Published Eight papers in a National and International Journal

Research Guide

Guided for 3 M.Sc. Students and 1 Ph. D student

At present working as

Technical Director for Two companies
And
Advisor Technology
to
Various Chemical Companies

Visiting faculty to

Post Graduate Diploma in Analytical Chemistry : R.N. Ruia College, Mumbai

CONTAMINANTS IN FOOD & BEVEREGES

Dr. R. K. Shastri

July 27, 2007

Contamination

- **Contaminate (verb)**
- **Pollution**
- **Toxicants**
- **Impurities**
- **Residual unwanted materials**

Contamination

- **Bulk drugs (pharmaceuticals)**
- **Pesticides**
- **Raw agricultural commodities**
- **Processed food**
- **Drinking water/ air**
- **Beverages (juice/soft drinks etc)**

Bulk drugs

- **Impurities**
- **Harmful effects**
- **Heavy metal contamination**
- **Thalidomide episode**

Pesticides

- **Impurities**
- **Phytotoxicity (injury to the host)**
- **Heavy metal contamination**
- **Loss of crop**

Contaminants:

Pesticide Residues

- **Raw agricultural commodities**
- **Processed food**
- **Drinking water/ air**
- **Beverages (juice/ soft drinks etc)**

Contaminants: Pesticide Residues

What are pesticides?

- **A chemical /biological substance which kills the insect(excluding honey bees) weeds and fungi selectively by not harming the host is called as pesticide**
- **The pesticide is not toxic to the mammals and is only toxic to the target pest**

Contaminants: Pesticide Residues

Major Types of Pesticides

- **Insecticides**
- **Herbicides**
- **Plant growth regulators**
- **Fungicides**
- **Rhodenticides**
- **House hold (Insect repellants)**

Types of Pesticides…

Insecticides

- **Organo-chlorine**
- **Organo-phosphates**
- **Carbamates**
- **Synthetic pyrethroids**
- **Benzoyl ureas**
- **Natural products**

Types of Pesticides…

Herbicides

- **Phenoxyacetic acids**
- **Chloroacetamides**
- **Phenoxy phenoxy propionic acids**
- **Phenyl ureas**
- **Nitro anilines**
- **Sulphonyl ureas**

Types of Pesticides…

Fungicides

- **Inorganic**
- **Products based on 2,6-dimethyl aniline**
- **Benzimidazoles**
- **Triazoles**
- **Strolbilurim**

Types of Pesticides…

Rhodenticides

Products based on 4-hydroxy coumarin

Household products

- **Allethrin**
- **Prallethrin**
- **Trans-fluthrin**
- **Propoxur**

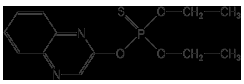
Pesticide Residues…

Application of Pesticides

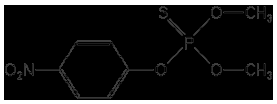
- **Number of products are used to combat with the pest**
- **Protection of a crop**
- **Agricultural practices**

Pesticide Residues…

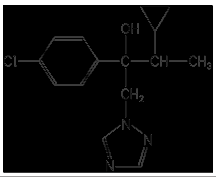
Metabolism in plants/animals



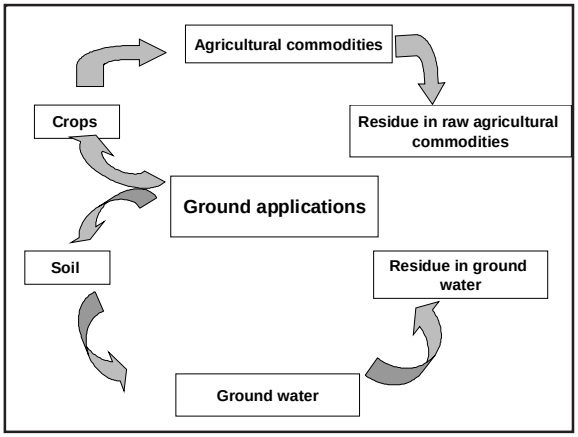
Quinalphos



Methyl parathion



Cyproconazole



Pesticide Residues…

Developments

- **Earlier dosages – Very high**
  [1.0ai -2.5ai kg/ha]
- **Environmental concern:**
  focus on inventing potent molecules
- **Dosages reduced to 150-200 g ai/ha**
- **Further efforts gave more potent products**
  Dosages now are 1.5g- 5g ai/ha
- **Modern analytical techniques**

Pesticide Residues…

Raw agricultural commodities → **Processed food**

Raw agricultural commodities	Processed food
Tea (green leaves)	Black tea
Spices	
Coffee seeds	Instant coffee
Oil seeds	Oil
Oil meal	Fodder
Raw food	Cooked food
Sugar cane	Sugar

Pesticide Residues…

Estimation

- **LD_{50} (value)**
- **NOEL (no observed effect level)**
- **ADI**
- **Residues**

Pesticide Residues…

LD_{50} (oral)

- **It is a lethal dose (LD) of the pesticide expressed as mg/kg which kills 50% of TEST ANIMALS during the test.**
- **Each pesticide has a characteristic LD_{50} value**
- **The other LD_{50} values are for**
  - **Dermal toxicity**
  - **Inhalation toxicity**

Pesticide Residues…

NOEL

NOEL = NOAEL (no observed adverse effect level)

NOEL is determined experimentally for

- **Birth defect**
- **Cancer**
- **Reproduction changes**
- **Damage to the nervous system**
- **Effect on kidney or liver**

Pesticide Residues…

ADI [Allowed Daily Intake]

- Allowed daily intake for a given pesticide is

  "A measure of the quality of a particular pesticide in food that can be consumed daily over a lifetime without any risk to health. It is expressed in relation to the body-weight".

Pesticide Residues…

Residues

It is the amount of pesticide or toxic chemical remaining with the commodity (product) after the commodity is

- **Harvested**
- **Processed**

Pesticide Residues…

Residues Determination

Field trial part

- **GFP**
- **3 doses : normal, 1.5 N, 2N**
- **3 replicates**
- **Sampling**
- **Sampling preservation until analysis (-20 deg Celsius Cold storage)**

Purpose is to determine

- **Waiting period**
- **Pre harvest interval**

Residues Determination…

Analytical part

- **Extraction**
- **Defatting**
- **Partitioning**
- **Purification by chromatography**
- **Concentration**
- **Dilution to a volume by a solvent**
- **Uses: Florosil, Silica gel, Neutral alumina, Activated carbon ,C18 SiO_2 columns (solid phase extraction)**

Residues Determination…

Quantification by GC or HPLC

- **Reproducibility**
- **Linearity**
- **Limit of detection**
- **Limit of determination**
- **Quantification by external standard method**
- **GC/MS technique**
- **LC/MS technique**

Residues Determination…

Residues are expressed as

- mg / kg = ppm
- mcg / kg = ppb
- pico gm / kg = ppt

Residues Determination…

Analytical methods

- **Should be sensitive**
- **Should have modern detectors [NPD, ECD]**
- **Capillary column up to 60-100 m length should be used**
- **Validation is must**
- **Multi-residue methods [EPA]**
- **The entire analytical work should be done as per the guidelines of GOOD Laboratory Practices [GLP]**

Aflatoxins

- Corn
- Soybeans
- Groundnuts
- *Aspergillus flavus*

Extremely carcinogenic

Aflatoxins …

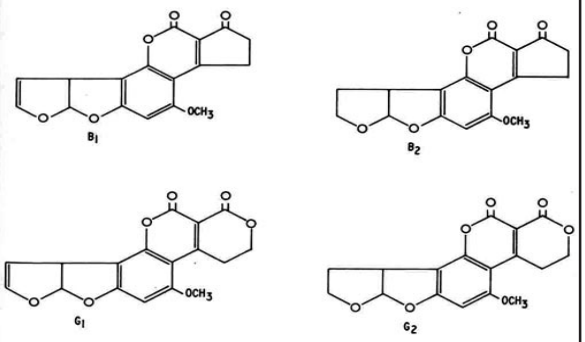


Fig. 1 Structures of aflatoxins B_1, B_2, G_1, and G_2.

Aflatoxins…

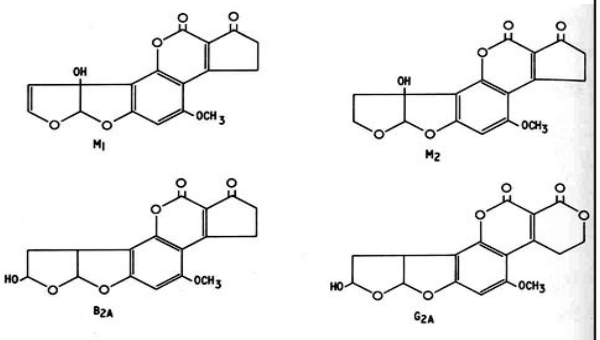


Fig. 2 Structures of aflatoxins M_1, M_2, B_{2A}, and G_{2A}.

Summary

- Residual pesticide contaminants are always expected to be present in raw food materials.
- Processing of food decreases their levels.
- Modern residue determination methods are sensitive up to ppt level.

To conclude….

Contamination in food can be effectively controlled by discriminate and intelligent pest management by farmers and enforcing authorities.

Thank You

A REVIEW OF MYCOTOXINS AS CONTAMINANTS IN FOOD, WITH SPECIAL REFERENCE TO AFLATOXINS

Dr.Moses J Kolet
Reader in Botany
B.N.Bandodkar College of Science
Chendani, Thane (W) 400 601

- Mycotoxins :
- Mycotoxins are toxic substances produced by fungi (molds) growing on crops/grains in the field or in storage.
- Myco = of fungal origin
- These toxins are secondary metabolites.

History

- Mycotoxins have caused epidemics in man and animals during historic times.
- St.Anthony's Fire-several epidemics in medieval Europe
- Alimentary toxic aleukia-killed over I lakh people
- Stachybotryotoxicosis-killed thousands of horses

How was the concept of Mycotoxins developed ?

- An outbreak of an unknown disease killed poultry birds in 1960s
- This was named Turkey X disease
- After investigations it was finally traced to mycotoxins in groundnut meal feed imported from Brazil
- The feed was shown to contain a compound that could cause cancer
- Today we know this mycotoxin by the name of **AFLATOXIN** – A CLASS I CARCINOGEN

Mycotoxins – Who are the culprits ?

- Evidence that fungi growing in food and feed produce mycotoxins has now emerged
- Thousands of fungi grow on stored agri-products but only a few produce mycotoxins
- Major mycotoxigenic fungi belong to only 3 genera:
- 1 *Aspergillus*
- 2 *Penicillium*
- 3. *Fusarium*

Entry of Mycotoxigenic Fungi

1. In the field.
2. After harvest and during storage

Fungi	Substrate	Mycotoxin
Aspergillus flavus	Maize, groundnut, oilseed, cotton seed	Aflatoxin
Aspergillus parasiticus	Maize, groundnut, oilseed, cotton seed	Aflatoxin
Aspergillus nomius	Maize, groundnut, oilseed, cotton seed	Aflatoxin
Aspergillus ochraceus	Barkey wheat	Ochratoxin
Aspergillus carbonerius	Grapes wine coffee	Ochratoxin
Fusarium oxysporum	Wheat barley maize	Fumonisins
Fusarium sp.	Wheat barley maize	T-2 toxin
Penicillium verrucosum	Wheat barley maize	Ochratoxin
Claviceps purpurea	Rye	Ergot alkaloids
Stachybotrys	hay	satratoxins

Mycotoxicoses

- Present major problems for clinicians.
- Diseases produced by mycotoxins are difficult to diagnose.

Why so ?

- Very few mycotoxins produce overt signs of poisoning or other symptoms

Why ?

- They are bizarre molecules with molecular weight 50 - >500.
- **Such small molecules induce no response in human immune system !**
- Major danger of mycotoxin in diet is our inability to detect them biologically.

Toxicity of Mycotoxins

- ✓Acute
- ✓Chronic
- ✓Mutagenic
- ✓Teratogenic

Acute toxicity

- Deterioration of liver and kidney functions, leading to death in extreme cases
- Interference with protein synthesis
- Skin sensitivity affected
- Necrosis of skin
- Immunodeficiency
- Neurotoxins cause trembling in small doses and brain damage or death in slightly higher doses

Chronic toxicity

- Induction of cancer (Liver, oesophagus)
- Induction of tumors
- Induction is never detected at the time of ingestion and remains undetected till the disease is advanced

Mutagenic & Teratogenic toxicity

- Replication of DNA is affected producing mutagenic and teratogenic effects

Mycotoxin Toxicity: Effect on Humans

- Symptoms are as diverse as the chemical structures of the compounds
- Physiological and pathological changes
- Food poisoning
- Inhibition of protein synthesis
- Increase of tryptophan in blood and brain (affects appetite, muscular co-ordination and sleep
- Anorexia
- Nausea
- Vomiting

- Headache
- Abdominal pain
- Chills
- Diarrhoea Giddiness
- Convulsions
- Alteration of capacity of cells to proliferate
- Reproductive and mammary changes
- Role in hormonal balance and breast cancer
- Precocious pubertal changes in children
- Breast enlargement in boys
- Role in cancer

How many mycotoxins are there ?

- Today 300 - 400 mycotoxins are known
- Mycotoxins of human concern based on toxicity:

Aflatoxin
Deoxyniva-lenol (DON) or Vomitoxin
Zearalenone
Fumonisin
T-2 toxin
Ochratoxin A

Some lesser known Mycotoxins

- Alternariol
- Citrinine
- Cyclopiazonic acid
- Diacoumarol
- Ergotamine
- Ergotoxin
- Fumitremorgen
- Fusaric acid
- Fusariocin
- Islanditoxin
- Luteoskyrin
- Neosolaniol
- Oosporein
- Patulin
- Penicillic acid
- Penitrem
- Phomospin
- Rubratoxin
- Sporidesmin
- Tremorgens

Aflatoxins

- Aflatoxins are a group of highly toxic carcinogenic secondary metabolites produced by fungi namely:-

1. *Aspergillus flavus*
2. *Aspergillus parasiticus*
3. *Aspergillus nomius*

Where do they come from ?

1. Moisture in crops – inadequate drying
2. Contamination during handling, storage and processing of foods

Where are Aflatoxins found ?

- Aflatoxin producing fungi can grow on almost every raw as well as processed food
- Conditions to initiate Aflatoxin production are more specific
- Presence of lipids (oils) in foods favors Aflatoxin production
- Groundnuts, corn (maize), nuts and their products are susceptible for Aflatoxin accumulation
- Aflatoxin M_1 and M_2 are found in milk

Types of Aflatoxins

- Naturally produced Aflatoxins – B_1, B_2, G_1, G_2
- They undergo modifications during cellular metabolism and processing of foods to produce several derivatives such as M_1, M_2, P_1, etc.

International limit 15μg per kg food

Aflatoxin B_1

- Best described Aflatoxin
- Molecular weight: 312
- Chemical Formula: $C_{17}H_{12}O_6$
- Highly unsaturated structure
- Can cause damage even at extremely low doses of 0.3ppm

Effects of Aflatoxins on Human Health

- Acutely toxic
- Carcinogenic
- Mutagenic
- Teratogenic
- Immunosuppressor
- Reports of outbreaks of hepatitis resulting from Aflatoxin ingestion
- Outbreaks of Aflatoxicoses-60% mortality
- Varied effects such as transient rash, nausea, headaches

Aflatoxin B_1

- It is the most potent aflatoxin
- **Classified as Class I Human carcinogen**
- It selectively targets human gene **p53** described as 'Guardian of the genome'

Control Measures

- Control of insects in the field and during storage
- Detect early in the field
- Mycotoxin analysis
- Control moisture content of grains/feed
- Keep processing equipment clean
- Use fresh feeds
- Remove old stock
- Never mix old and new feed/grain stock
- Use mould inhibitors
- **Mycotoxins are not degradable. They tend to remain constant or increase in stored foods**

Thank You !

Detection and determination of sulfonamides residues in food products by LC –MSMS

By:Dr.U.R.Pandit

Analysis of Sulfonamides using LC-MSMS

	Molecular Weight
1. Sulfamerazine (SMR)	=264
2. Sulfadimidine (SDD)	=278
3. Sulfamonomethoxine (SMM)	=280
4. Sulfadimethoxine (SDM)	=310
5. Sulfaquinoxine (SQX)	=300

Sources Of Sulphonamides

A. As these compounds are effective against gram positive and gram negative organisms, they are used in the agriculture industry.
B. They are used in against bacterial species - paenibaccillus larvae and melissococcus pluton in honey bees.
C. Used as feed additives for growth promotion

Effects Of Sulphonamides residues

A. Development of antibiotic – resistant bacteria.
B. Allergic reactions in humans.
C. Some sulphonamides have been associated with carcinogenicity.

Maximum residue limits allowed (in legislation)
(Total concentration of all sulphonamides)

100µg per kg
(0.1 ppm)

Why LC- MS-MS

- **Specific**
- **Sensitive and accurate**
- **Minimal sample preparation**
  Simple Methanol extraction
- **Rapid**
  Total analysis time is Less
- **Simultaneous analysis for many compounds in single chromatographic analysis.**
- **Readily adaptable for the determination of new drug analogues**

LC conditions

Mobile Phase: 0.3% CH3COOH aq. (solvent A)
ACN/H2O = 80/20 with0.3% CH3COOH (solvent B)
Column: Symmetry Shield RP18, 2.1x150mm, 3.5um

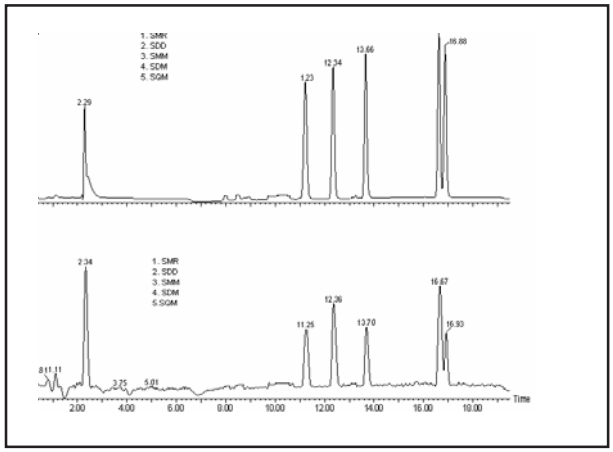
MS conditions

Capillary: 4.27kV
Cone: 36V
Scan: scan from 150 to 550

Sulfonamides

- system: Waters Alliance 2690
- gradient program

Time (min)	% A	% B	Flow (ml/min)
0.00	100	0	4.00
2.00	100	0	4.00
3.00	0	100	4.00
3.50	0	100	4.00
3.60	100	0	4.00
6.00	100	0	4.00



Sample Preparation

Extraction from Honey
Solid phase extraction

5 g honey
+50ml of 30% Sodium chloride (dissolved)
+60ml DCM (extraction)
⇩
Dry the extract (DCM) with anhydrous Sodium sulfate
⇩
Applied to Sep-Pak Florisil catridge
⇩
Wash with 10mL ACN/DCM (2:8)
⇩
Elute with 10mL Methanol/DCM (2:8)
⇩
Dry and reconstituted in HPLC mobile phase

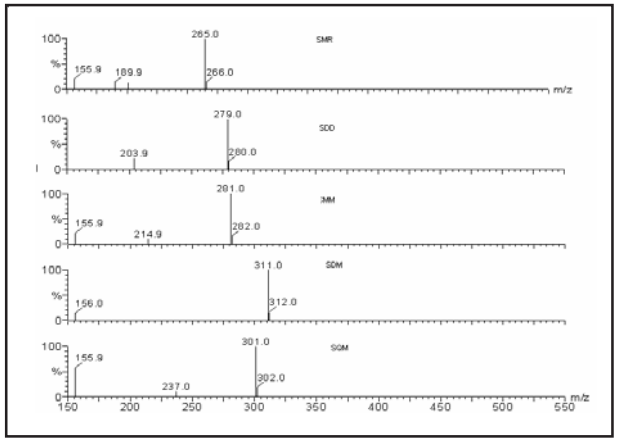
Advantage of solid phase extractio

1.It removes impurities to greater extent.
2.Increases the column life.
3.Simple method to use.

Ref: J. AOAC int.,75:786, (1992)

Extraction from Milks
(Liquid – Liquid extraction)

3g Milk + 10 ml acidified methanol
Mix well (3 min.)
?
Centrifuge for 10 min (3500 RPM)
Take supernent solution + 10 ml acidified methanol.
Mix well (3 min.)
Centrifuge for 10 min. (3500 RPM)
Evaporate the supernant solution in vacuum evaporator to dryness at 50°C.
Add 5 ml acidified methanol. Mix well.
Filter through 0.2µ nylon membrane filter.



Analysis of Sulfonamides using LC-MS/MS

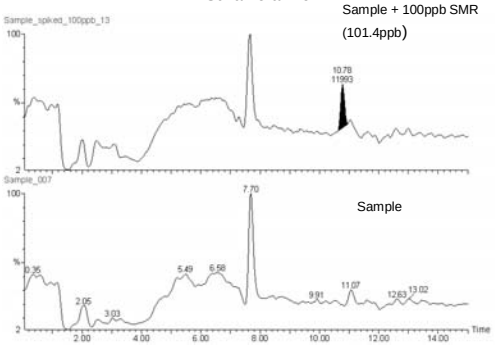
Precursor and fragment ions of sulfonamides obtained under optimal ESI (+) MS-MS conditions

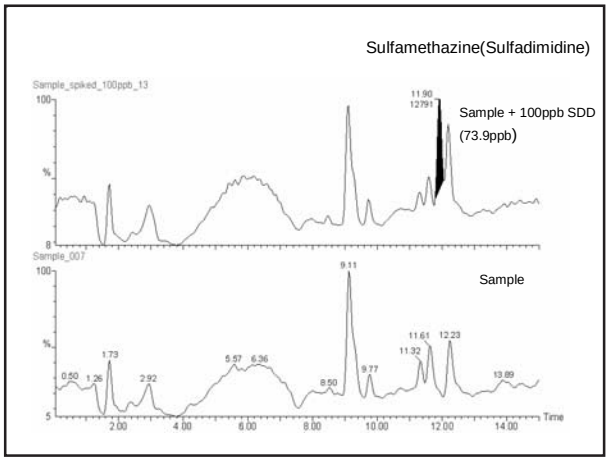
	Precursor ion (m/z)	Fragment ions (m/z)	Cone voltage (V)	Collision energy (eV)
SMR	265	172, 156*, 108, 92	32	16

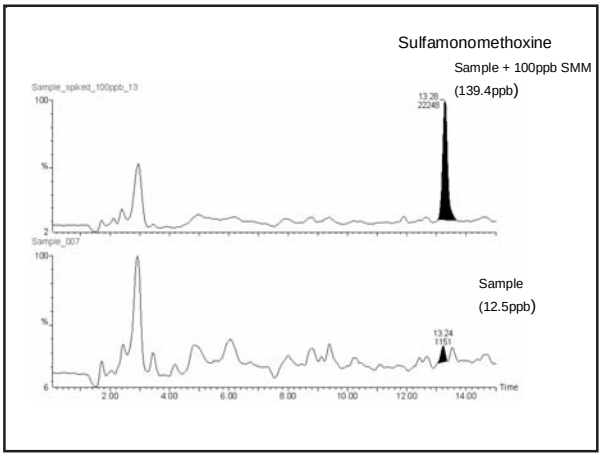
* most abundant fragment ion

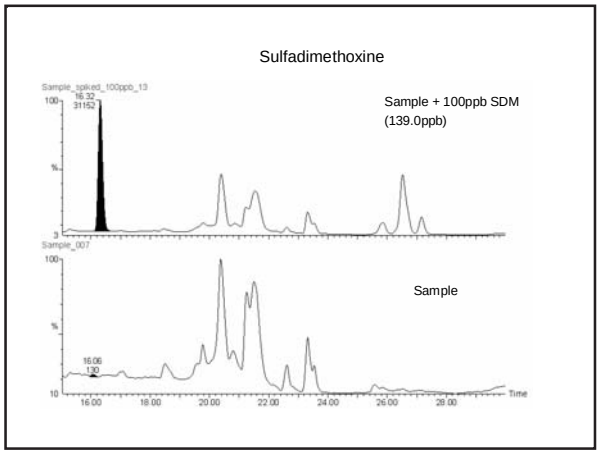
Sulfamerazine

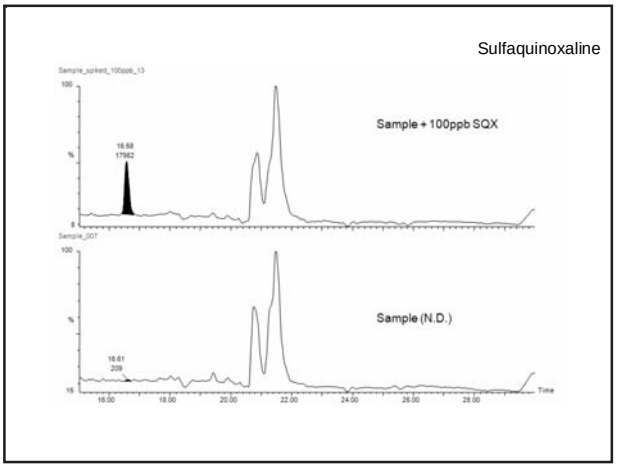
Sample + 100ppb SMR (101.4ppb)

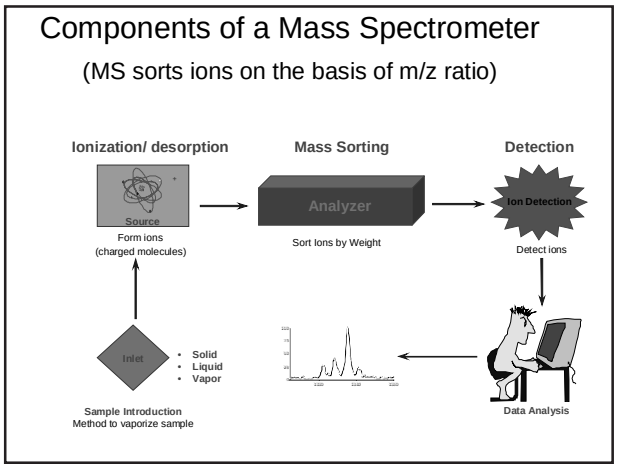


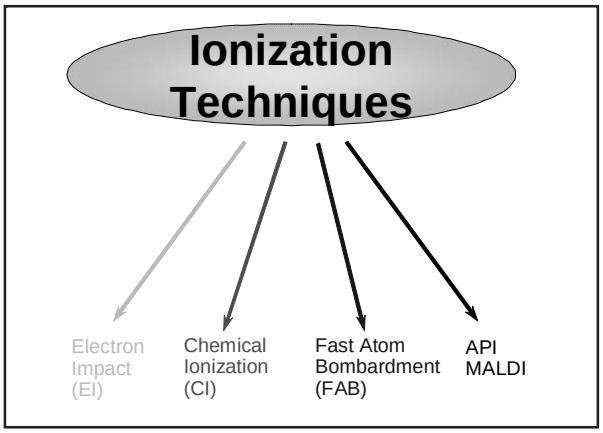

Sulfamethazine(Sulfadimidine)
Sample + 100ppb SDD
(73.9ppb)
Sample
Time


Sulfamonomethoxine
Sample + 100ppb SMM
(139.4ppb)
Sample
(12.5ppb)
Time

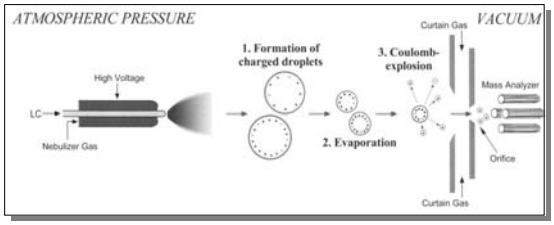

Sulfadimethoxine
Sample + 100ppb SDM
(139.0ppb)
Sample
Time


Sulfaquinoxaline
Sample + 100ppb SQX
Sample (N.D.)
Time


Components of a Mass Spectrometer
(MS sorts ions on the basis of m/z ratio)
Ionization/ desorption
Mass Sorting
Detection
Source
Form ions
(charged molecules)
Analyzer
Sort Ions by Weight
Ion Detection
Detect ions
Inlet
Solid
Liquid
Vapor
Sample Introduction
Method to vaporize sample
Data Analysis


Ionization Techniques
Electron Impact (EI)
Chemical Ionization (CI)
Fast Atom Bombardment (FAB)
API
MALDI

IonSpray - ESI



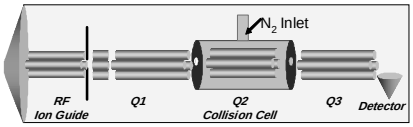
Mass Analysers

1. Quadrupoles.
2. Time of flight (TOF) analysers.
3. Magnetic sectors.

Detectors

1. Photomultiplier
2. Channel electro multiplier
3. Microchannel plate

Schematics of a Triple Quadrupole MS



- RF Ion Guide: Focusses ion beam into Q1
- Q1: Analyzer Quadrupole 1
  - can be scanned or set to pass one specific m/z
- Q2: Collision Cell
  - can be pressurized with N_2 for fragmentation of ions
  - can be at low pressure for bandpassing all ions
- Q3: Analyzer Quadrupole 3
  - can be scanned or set to pass one specific m/z

Information Expected From LC/MS/MS

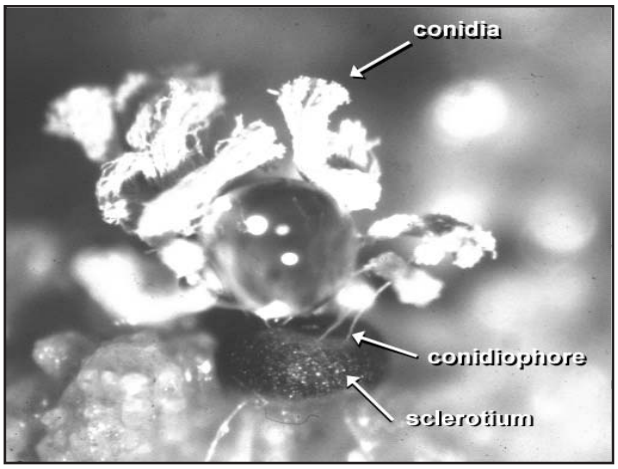
- Isolation of the impurities.
- Molecular Weight.
- Accurate mass measurement.
- Mass determination with high resolution.
- Impurity Detection at low level.
- Search Capabilities based on suspected modifications.
- Structure elucidation and Confirmation of the structure.
- Quantitative analysis (Actual).

THANK YOU

TITLE CONTAMINATION IN FOOD

AIM- TO STUDY THE EFFECT OF FUNGI ON DIFFERENT SPECIES

AUTHORS.
RAKESH. V. KALE
DR. MOSES. J. KOLET
DR. ANITA GOSWAMI



Grain Mold Pathogens

- Molds are fungi that grow by producing long filaments called hyphae (*Figure 1*). In general, hyphae are important to the survival and dispersal of fungi. Hyphal growth allows the fungus to colonize a food source (e.g., a corn kernel) as well as to grow from one food source to another; e.g., from root to root through soil or from one kernel to an adjacent kernel in a pile of stored grain (*Figure 1*). A network of hyphae is referred to as mycelium. This hyphal network is responsible for "cementing" kernels together in grain piles resulting in columns of grain that cannot be separated. Grain mold fungi also produce spores (conidia) capable of aerial dispersal in the field as well as within a grain storage bin (*Figure 2*). It is usually masses of spores that give the mold a characteristic color. Spores are dispersed passively by wind and rain. Insects can serve as vectors of these fungi usually by transporting the spores on the surface of their bodies; this is particularly important within grain storage bins. Managing grain storage insects can reduce contamination by grain molds and mycotoxins. Most species of grain mold fungi are well adapted to the conditions of grain production and postharvest handling and storage. They can survive long periods in storage facilities making sanitation of the facility an important part of a grain mold management plan.
- The most striking external symptom of grain mold is the presence of the mold itself. The degree of growth on the kernels and the appearance of the mold (e.g., color and density) varies with the species of mold, the quality of the grain being colonized, and the prevailing environmental conditions (*Figure 3*). Incidence (the proportion of ears with mold) and severity (the proportion of infected kernels on an ear) of disease depends on many factors.
- *Aspergillus* species tend to be more prevalent when there is drought during the latter half of the growing season. *Fusarium verticillioides* is associated with a high proportion of corn kernels under most growing conditions but *Fusarium* ear and grain mold develops more often when cool wet weather during silking is followed by hot dry weather. *Gibberella* grain mold is more prevalent in hybrids with tight husks. Unlike *F. verticillioides, F. graminearum* is rarely seed-borne.

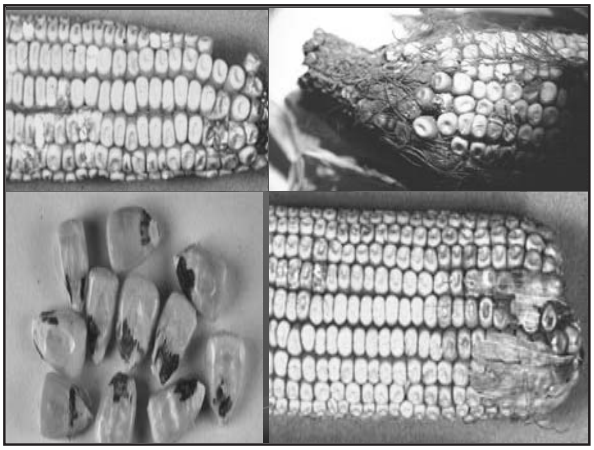


Table I. Toxigenic fungi, their metabolites and target effects.

Grain Mold Fungus	*Toxin Produced*	*Toxic Effects*	*Species Affected*
Aspergillus flavus	aflatoxin	acute toxicity (liver) liver cancer immune suppression	many human humans, animals
Aspergillus alutaceus	ochratoxin	acute toxicity (kidney) cancer	swine, poultry human
Fusarium verticillioides	fumonisin	blind staggers pulmonary edema esophageal cancer	horse swine human
Fusarium graminearum	trichothecenes	acute toxicity immune suppression	many (not ruminants) many
	vomitoxin	acute toxicity	many
	zearalenone	reproductive dysfunction	swine
Penicillium spp.	ochratoxin	acute toxicity (kidney) cancer	swine, poultry human

Table III. Key management steps to minimize grain mold and mycotoxin contamination.

- Ensure proper storage conditions — grain moisture, temperature, relative humidity
- Minimize mechanical damage — harvest and postharvest shipping and handling
- Minimize insect damage — pre-harvest and postharvest storage
- Plant tolerant hybrids — some tolerant hybrids available
- Sanitation of storage facility — critical management practice
- Chemical management — propionic acid, mineral oils
- Assay moldy grain for mycotoxins — Toxicology Lab, Vet Diagnostic Center, UNL
- Segregate, blend, or destroy contaminated grain — as per FDA regulations

Contaminants in food and beverages

Contamination in food oil (Edible Oil)

Presented by: Pooja S. Dandekar
T.Y. B.sc (Chemistry)

1

Contents

- Types of oil
- Sunflower oil and its contaminants
- Risk factors of contamination (Sunflower oil)
- Fish oil and its contaminants
- Side effects of the contamination
- Benefits of Fish oil
- Remedies to reduce contamination (Fish oil)

2

Types of oil

- Oil is a collective term for more or less viscous, generally organic chemical liquid depending on their chemical composition a distinction may be drawn between:
  - Fatty oil
  - Essential oil
  - Mineral oil
  - Silicone oil

Note: Fatty oil is also known as sweet oil.

3

Sunflower oil and its contaminants

- It is vegetable origin.
- High quality edible oil.
- Obtained from fatty kernels of sunflower

Types of Sunflower oil

- Cold pressed crude oil (color: Light yellow)
- Hot pressed crude oil (color: Brown)
- Refined oil (colorless)

4

Contaminants of sunflower oil

- Acid value
  - 0.9 -1.1 %
- Rancidity
  - Promoted by light, atmospheric oxygen, moisture
- Ferrous and rust particles
- Sea Water
- Unshelled kernels
- Packaging
- Transport
- Cargo handling

5

Risk factors of contamination (Sunflower oil)

- RF temperature

Designation	Temperature range
Travel temperature (Favorable temperature range)	15°C (5 - 26°C)
Solidification temperature	-16°C - -18°C
Pumping temperature	approx. 15°C

- RF moisture
- RF Ventilation
- RF Gases
- RF Contamination behavior
- RF Shrinkage / Shortage

6

Risk factors of contamination (Sunflower oil)

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- RF Gases
- RF Contamination behavior
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6

Benefits of Fish oil

- Reduces heart deceases
- Lowers the risk of cancer
- Chronic deceases such as:
  - Asthma
  - Depression
  - High blood pressure
  - Rheumatoid Arthritis

10

Benefits of Fish oil

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10

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  - Depression
  - High blood pressure
  - Rheumatoid Arthritis

10

Coca Cola

By

Raghunath Sakha
T.Y.B.Sc.(Chemistry)

- On August 5, 2003, ***The Center for Science and Environment***, an NGO in India, attacked the safety of Coca-Cola .

- Tribal women courting arrest during a protest against Coca Cola's exploitation of ground water in front of the plant at Plachimada village

Communities Reject Coca-Cola in India

Coca-Cola is in trouble in India .

The Reasons for the contaminants:

- **The processes used in manufacturing Coca-cola are inherently damaging.**
- **The factories spew out toxic waste that threatens health and the environment.**
- **The company drilled more than six wells and illegally installed high-powered electric pumps to extract millions of litres of water.**

Warnings to the parents:

- **Chemical in soft drinks 'can wreck your child's DNA'.**
- **Parents are warned to limit their children's consumption of soft drinks.**

- **Take care of your child.**

ORGANIC CONTAMINANTS IN THANE CREEK WATER AND THEIR CONCENTRATIONS.

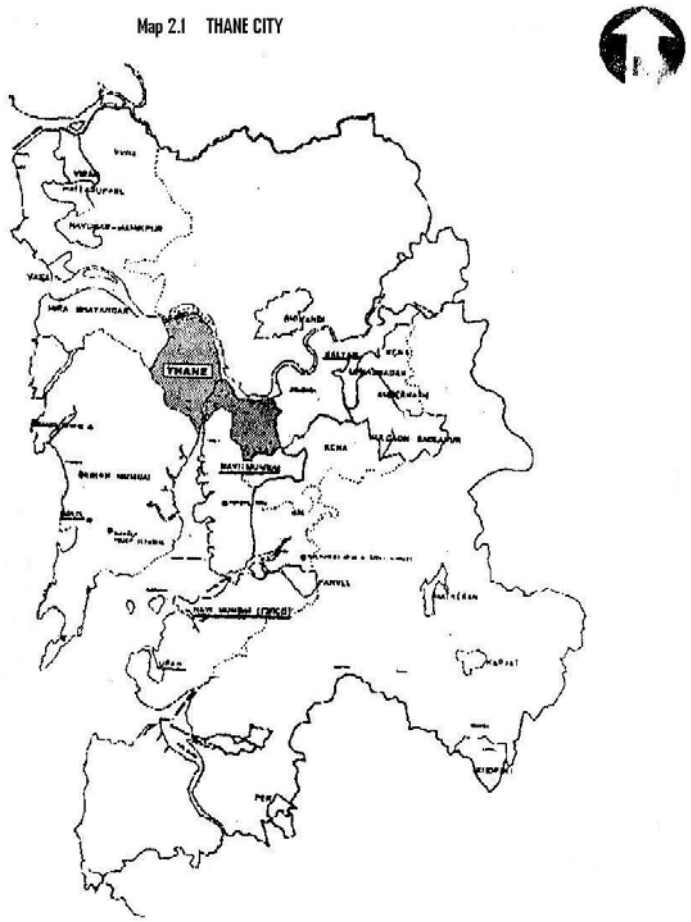
Ravindra P. Chavan, R.S. Lokhande and S.I. Rajput

Reader in Chemistry Dnyansadhana College, Thane, India
Professor Department of Chemistry University Mumbai, India.
Ex-Principal – S.M. A Science College, Chalisgaon, Maharashtra India.

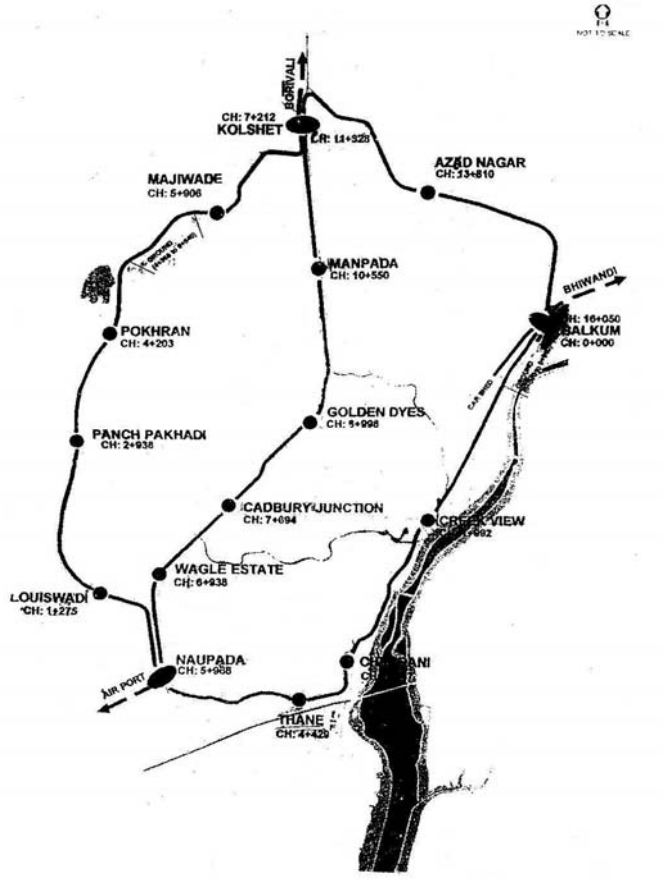
Abstract : The present investigation was carried out during the period of June 2002 - May 2004 to study the different organic contaminants presents in Thane Creek water. The creek water shows high of B.O.D and C.O.D. along with high concentration Value of phenolic comp. Detergents Methanol, ethanol, Acetone and low concentration of Dichloromethane and ether. Which are toxic to aquatic life and Human life. The origin of these contaminants is mainly from the entry of effluents from surrounding industries.

INTRODUCTION

The Thane Creek is situated at $70^0.55''$ to $70^0.00$ longitude and $19^0.00''$ to $19^0.15''$ latitude at Thane City, for fish collection fishrmen used 26 Km. area of creek. Fishes are important as food for human contains vitamins and if also gives economical help to the surrounding Fishrmen. Thane, New Mumbai cities are well developed Industrial Zone for chemical and bio-product industries. The effluents of the industries pollute water due to organic contaminants. Now a day fishermen experience less fishes in Thane creek its is because of organic contaminants in creek, several species of prawns, carbs, bivalves, gastropods and finfish which were caught in upper region (Tandel 1984, Pejawar 1984).



THANE CREAK
Map 2.3 Thane creak with Ulhas river



MATERIALS AND METHODS :

Thirteen sampling stations on either sides of the creek at a distance of 13 km were selected the first sampling station was at the distance of 10 km. from sea. For each sampling stations water sample were studied for monsoon season, winter season and summer season for two consecutive years. In each season fortnightly samples was collected, means in each season eighty time samples were collected and average were calculated. The concentration organic contaminants like oil and grease, phenolic compounds detergents, methanol, ethanol, acetone, dichloromehane, chloroform, benzene, 1-4 dioxane were studied because of conc of Organic contaminants the value BOD and COD varies from low value to high value. Thirteen sampling stations were selected for measurement of concentration of organic contamination 1) Custom office 2) Thane Station, 3) Bandokar college, 4) Mahagiri 5) Kalwa bridge (Kalwa side) 6) Kalwa bridge (mid zone) 7) Kalwa bridge (Thane side) 8) Akash Ganga – 1 9) Akash ganga -2 10) Akash ganga Nallah 11) Saket 12) Parcik Naka 13) Mumbra Reti Bunder.

All the samples were collected stored and analysed as per the methods given in APHA , AWWA, WPCF (1980) and Trivedy and Goel (1986).

RESULT'S AND DISCUSSION

Chemicals and reagents of standard quality. A.R. grade and glass wares of borosil and pyrex marks were utilized through out the experimental work for determination of pH and detergents PH meter and spectrophotometer were standardized by standard solution and calibrated for organic, contaminants like methanol, ethanol, ether Acetone, dichloromethane, chloroform, Benzene 1-4 dioxane – Gas chromatography of head space Analyser.

Table 3.1 : Maximum & Minimum values of the Different Parameters of the Water during Monsoon Season (June. – Sept., 2002) at different sites of the Thane Creek

Physical Parameters	H/L Tide	Maximum	Minimum
pH	H.T.	7.20 at (2,5,13)	7.162 at (10)
	L.T.	7.25 at (3)	
Temperature	H.T.	26.33 at (7)	26.05 at (2)
	L.T.	25.59 at (9)	25.21 at (13)
BOD	H.T.	33.12 at (10)	25.25 at (9,13)
(mg. / lit. as 02)	L.T.	39.87 at (5)	35 at (7)
COD	H.T.	49.37 at (7)	42 at (1)
(mg. / lit. as 02)	L.T.	51.37 at (12)	45 at (1)
Specific Parameters			
Oil & Grease	H.T.	NIL	NIL
(mg. / lit.)	L.T.	NIL	NIL
Phenolic Comp.	H.T.	0.18 at (4,5)	0.15 at (1,2,9)
(mg. / lit.)	L.T.	0.20 at (12)	0.17 at (9)
Detergents	H.T.	0.29 at (4)	0.107 at (7)
(mg. / lit.) as MBA'S	L.T.	0.37 at (4)	0.12 at (8,11,13)

Methanol (mg/lit.)	H.T.	1.40 at (6,7)	0.94 at (1)
	L.T.	1.95 at (1)	1.60 at (11,12)
Ethanol (mg/lit.)	H.T.	0.14 at (4,6,13)	0.12 at (5,10,11,12)
	L.T.	0.31 at (7)	0.11 at (6)
Ether (mg/lit.)	H.T.	0.025 at (2)	0.011 at (5,9,13)
	L.T.	0.060 at (9)	0.012 at (11,12,13)
Acetone	H.T.	0.081 at (12)	0.067 at (2)
(mg/lit.)	L.T.	0.083 at (12)	0.071 at (2)
Dichloro Methane	H.T.	0.20 at (1)	0
(mg/lit.)	L.T.	0.31 at (1)	0
Chloroform (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
Benzene (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
1-4 dioxane (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL

H. T. = HIGH TIDE L. T. = LOW TIDE

Figures in bracket indicate the number of sampling station.

Table 3.2 : Maximum & Minimum Values of the Different Parameters of the Water during Winter Season (Oct. – Jan., 2002-03) at different sites of the Thane Creek

Physical Parameters	H/L Tide	Maximum	Minimum
pH	H.T.	7.24 at (3)	7.10 at (5)
	L.T.	7.38 at (11)	7.23 at (7)
Temperature	H.T.	26.98 at (4)	26.75 at (7,8,9)
	L.T.	25.96 at (8)	25.12 at (6)
BOD	H.T.	154.37 at (8)	94.12 at (11)
(mg. / lit. as 02)	L.T.	95.37 at (10)	61.62 at (7)
COD	H.T.	337.75 at (8)	159 at (3)
(mg. / lit. as 02)	L.T.	165.12 at (4)	119.37 at (6)
Specific Parameters			
Oil & Grease	H.T.	NIL	NIL
(mg. / lit.)	L.T.	NIL	NIL
Phenolic Comp.	H.T.	0.18 at (5)	0.14 at (7,8,10)
(mg. / lit.)	L.T.	0.22 at (9,12)	0.15 at (7)
Detergents	H.T.	0.20 at (5)	0.14 at (9)
(mg. / lit.) as MBA'S	L.T.	0.41 at (2)	0.15 at (7)

Contd.

Methanol (mg/lit.)	H.T.	2.24 at (4)	1.98 at (7)
	L.T.	2.08 at (9)	1.68 at (5)
Ethanol (mg/lit.)	H.T.	0.024 at (7)	0.0013 at (6)
	L.T.	0.0216 at (8)	0.0016 at (12)
Ether (mg/lit.)	H.T.	0.002 Showing Con.	0.014 at (12)
	L.T.	0.002 Showing Con.	0.014 at (2)
Acetone	H.T.	0.21 at (1,3)	0.17 at (2,7)
(mg/lit.)	L.T.	2.23 at (10)	0.15 at (7)
Dichloro Methane	H.T.	0.66 at (1)	0.078 at (9)
(mg/lit.)	L.T.	2.54 at (10)	0.045 at (7)
Chloroform (mg/lit.)	H.T.	0.67 at (9)	0.064 at (7)
	L.T.	NIL	NIL
Benzene (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
1-4 dioxane (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL

H. T. = HIGH TIDE L. T. = LOW TIDE

Figures in bracket indicate the number of sampling station.

Table 3.3 : Maximum & Minimum Values of the Different Parameters of the Water during Summer Season (Feb. – May., 2003) at different sites of the Thane Creek

Physical	H/L Tide	Maximum	Minimum
pH	H.T.	7.37 at (7)	7.18 at (5)
	L.T.	7.22 at	7.15 at (5,13)
Temperature	H.T.	27.68 at (5)	27.36 at (11)
	L.T.	27.57 at (11)	27.35 at (2)
BOD	H.T.	72.75 at (8)	62.25 at (13)
(mg. / lit. as 02)	L.T.	84.32 at (13)	65.87 at (3)
COD	H.T.	153.80 at (5)	135.75 at (1)
(mg. / lit. as 02)	L.T.	207.72 at (9)	102.13 at (1)
Specific Parameters			
Oil & Grease	H.T.	NIL	NIL
(mg. / lit.)	L.T.	NIL	NIL
Phenolic Comp.	H.T.	0.30 at (9)	0.20 at (7)
(mg. / lit.)	L.T.	0.25 at (13)	0.12 at (10,12,13)
Detergents	H.T.	0.322 at (13)	0.12 at (10)
(mg. / lit.) as MBA'S	L.T.	0.307 at (11)	0.10 at (10)

Contd.

Methanol (mg/lit.)	H.T.	1.44 at (7)	1.24 at (1)
	L.T.	1.53 at (11)	1.28 at (1)
Ethanol (mg/lit.)	H.T.	0.430 at (10)	0.009 at (5,12)
	L.T.	0.656 at (1)	0.014 at (9,11)
Ether (mg/lit.)	H.T.	0.014 at (11)	0.009 at (5,12)
	L.T.	0.028 at (8)	0.014 at (9,11)
Acetone	H.T.	0.207 at (1)	0.158 at (10)
(mg/lit.)	L.T.	0.195 at (1)	0.160 at (10)
Dichloro Methane	H.T.	NIL NIL	
(mg/lit.)	L.T.	NIL NIL	
Chloroform (mg/lit.)	H.T.	0.031at (2,7)	0.011 at (11)
	L.T.	NIL	NIL
Benzene (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
1-4 dioxane (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL

H. T. = HIGH TIDE L. T. = LOW TIDE

Figures in bracket indicate the number of sampling station.

Table 3.4 : Maximum & Minimum Values of the Different Parameters of the Water during Mansoon Season (June-Sept. 2003) at different sites of the Thane Creek

Physical Parameters	H/L Tide	Maximum	Minimum
pH	H.T.	7.17 at (3)	7.115 at (7)
	L.T.	7.16 at	7.12 at (11)
Temperature	H.T.	25.78 at (12)	25.55 at (13)
	L.T.	25.71 at (1)	24.86 at (6)
BOD	H.T.	75 at (9)	58 at (2)
(mg. / lit. as 02)	L.T.	74 at (9)	58 at (2)
COD	H.T.	134 at (12)	108 at (8)
(mg. / lit. as 02)	L.T.	181 at (10)	88 at (8)
Specific Parameters			
Oil & Grease	H.T.	NIL	NIL
(mg. / lit.)	L.T.	NIL	NIL
Phenolic Comp.	H.T.	0.19 at (2)	0.14 at (12)
(mg. / lit.)	L.T.	0.18 at (2,3)	0.14 at (11)

Contd.

Detergents	H.T.	0.02 at (7)	0.08 at (12)
(mg. / lit.) as MBA'S	L.T.	0.116 at (5,7)	0.08 at (12)
Methanol (mg/lit.)	H.T.	1.07 at (8)	1.00 at (12)
	L.T.	1.10 at (9)	0.68 at (1)
Ethanol (mg/lit.)	H.T.	0.12 at (1)	0.06 at (12)
	L.T.	0.23 at (13)	0.06 at (10)
Ether (mg/lit.)	H.T.	0.025 at (12)	0.011 at (3)
	L.T.	0.022 at (1)	0.009 at (8)
Acetone	H.T.	0.17 at (2)	0.13 at (13)
(mg/lit.)	L.T.	0.17 at (8)	0.12 at (5)
Dichloro Methane	H.T.	NIL	NIL
(mg/lit.)	L.T.	NIL	NIL
Chloroform (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
Benzene (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
1-4 dioxane (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL

H. T. = HIGH TIDE L. T. = LOW TIDE
Figures in bracket indicate the number of sampling station.

Table 3.5 : Maximum & Minimum Values of the Different Parameters of the Water during Winter Season (Oct.- Jan., 2003-04) at different sites of the Thane Creek

Physical Parameters	H/L Tide	Maximum	Minimum
pH	H.T.	7.16 at (13)	7.10 at (5,7)
	L.T.	7.18 at (7)	7.12 at (4,12)
Temperature	H.T.	25.24 at (8)	24.05 at (2)
	L.T.	25.22 at (8)	23.98 at (13)
BOD	H.T.	76.75 at (9)	54.75 at (4)
(mg. / lit. as 02)	L.T.	76.75 at (9)	59.50 at (2)
COD	H.T.	107 at (12)	93.87 at (8)
(mg. / lit. as 02)	L.T.	124.08 at (10)	83 at (1)
Specific Parameters			
Oil & Grease	H.T.	NIL	NIL
(mg. / lit.)	L.T.	NIL	NIL

Contd.

Phenolic Comp.	H.T.	0.135 at (1)	0.092 at (10)
(mg. / lit.)	L.T.	0.137 at (9)	0.10 at (11)
Detergents	H.T.	0.0825 at (1)	0.60 at (10)
(mg. / lit.) as MBA'S	L.T.	0.0762 at (1)	0.0425 at (13)
Methanol (mg/lit.)	H.T.	1.047 at (1)	1.020 at (9,10)
	L.T.	1.042 at (1)	1.020 at (9)
Ethanol (mg/lit.)	H.T.	1.063 at (13)	0.040 at (11)
	L.T.	0.070 at (13)	0.040 at (11)
Ether (mg/lit.)	H.T.	0.0150 at (9)	0.0120 at (4)
	L.T.	0.0150 at (3)	0.0120 at (4)
Acetone	H.T.	0.146 at (2,3)	0.0122 at (6)
(mg/lit.)	L.T.	0.145 at (13)	0.0127 at (6,10)
Dichloro Methane	H.T.	NIL	NIL
(mg/lit.)	L.T.	NIL	NIL
Chloroform (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
Benzene (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
1-4 dioxane (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL

H. T. = HIGH TIDE L. T. = LOW TIDE
Figures in bracket indicate the number of sampling station.

Table 3.6 : Maximum & Minimum Values of the Different Parameters of the Water during Summer Season (Feb.-May, 2003-04) at different sites of the Thane Creek

Physical Parameters	H/L Tide	Maximum	Minimum
pH	H.T.	7.20 at (1)	7.14 at (3)
	L.T.	7.21 at	7.16 at (6,7)
Temperature	H.T.	27.90 at (4,6)	27.81 at (8)
	L.T.	27.98 at (23)	27.80 at (11)
BOD	H.T.	72.12 at (1)	56.75 at (9)
(mg. / lit. as 02)	L.T.	73.80 at (11)	58.87 at (9)
COD	H.T.	94.75 at (3)	74.50 at (8,9)
(mg. / lit. as 02)	L.T.	91.5 at (11)	77 at (4)

Contd.

Specific Parameters			
Oil & Grease	H.T.	NIL	NIL
(mg. / lit.)	L.T.	NIL	NIL
Phenolic Comp.	H.T.	0.125 at (1)	0.10 at (5)
(mg. / lit.)	L.T.	0.147 at (1)	0.10 at (3,5,7,12,13)
Detergents	H.T.	0.066 at (1)	0.045 at (2)
(mg. / lit.) as MBA'S	L.T.	0.072 at (5)	0.051 at (13)
Methanol (mg/lit.)	H.T.	1.07 at (5)	1.03 at (8,9)
	L.T.	1.06 at	1.03 at (11)
Ethanol (mg/lit.)	H.T.	0.051 at (1)	0.025 at (13)
	L.T.	0.047 at (1)	0.026 at (7)
Ether (mg/lit.)	H.T.	0.018 at (5,9,11)	0.011 at (7)
	L.T.	0.019 at (9)	0.012 at (8)
Acetone	H.T.	0.13 at (9)	0.166 at (12)
(mg/lit.)	L.T.	0.13 at (10)	0.12 at (3,6,7,11)
Dichloro Methane	H.T.	NIL	NIL
(mg/lit.)	L.T.	NIL	NIL
Chloroform (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
Benzene (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL
1-4 dioxane (mg/lit.)	H.T.	NIL	NIL
	L.T.	NIL	NIL

H. T. = HIGH TIDE L. T. = LOW TIDE
Figures in bracket indicate the number of sampling station.

(Michro-9) were used and was standardized by authentic sample. The maximum and minimum concentrations of organic pollutants are given in table 3.1 to table 3.6 of year 2002-2004 of monsoon season, winter season and summer season along with organic contaminants. The change in pH, temp. B.O.D. and C.O.D. value also given in the same table.

The pH was slightly alkaline through out the study period it varied from 7.10 to 7.38. Thus the pH was observed to be in the range of TLV. During study period water temperature was found higher in summer season and lower during winter season. The maximum temp. was 27.98^0c at Mumbra Retibunder at low tide and minimum temperature recorded 23.98^0c at Mumbra Retibunder. The B.O.D. value of Thane creek at high tide was 154.37 and low tide 95.37 at station no. 8 and 10 respectively during winter season 2002-2003 and the lowest value was 25.25 mg/lit during monsoon season of year 2002-03 at station of no.9 and 13 of high hide. The C.O.D. value higher 337.5 at high tide at station no. 8 and 165.12 value at low tide during winter season of year 2002-03 and the lowest value

was 42 mg./lit. During monsoon season of year 2002-03 at station No.1 g. high tide. Oils and Greases:- In all season (Monsoon, Winter and Summer) the value of Oil and greases was not detected during high tide and low tide of year 2002-03 and year 2003-04.

Phenolic Compound -The phenolic compounds higher value recorded at high tide was 0.30 mg/ lit at station no 9 of summer seasons 2002-03 and lower value during winter season at high tide was 0.092 mg/lit at station no 10 of the year 2003-04. Detergent -The detergent value of 2002-03 was higher in winter season 0.41 mg/lit at high tide at station no 2 and lowest value was 0.045 mg/lit in winter season at station no.13 in the year 2002-03. Methanol-The methanol value was recorded higher during summer season at high tide 2.24 mg/lit at station no. 4 and lower during the monsoon season at high tide 0.68 mg/lit at station no. 1 in 2002.03. Ethanol -The ethanol value was recorded highest during summer season 0.656 mg / lit at high tide at station no. 1 and lower value was recorded during winter season 0.0013 mg/ lit at high tide at station no 6 in year 2003-04. Ether -The ether value recorded highest during monsoon season 0.060 mg/lit at station no. 9 and lowest value during winter season 0.0014 mg/ lit at station no. 12 during the year 2003-04. Acetone -Acetone value in year 2002-03 was recorded highest during winter season 0.23 mg/lit at station No. 10 and lowest value during monsoon season 0.0122 mg/lit at station no. 6 of high tide during the year 2003-04. Dichlormethane -The Dichloromethane value recorded highest 2.54 mg/lit at station no 10 during winter season of low tide and lowest was 0.045 mg/lit during winter season of low tide in year 2002-03. Chloroform -The value of Chloroform varies from 0.011 mg/lit to 0.67 mg/lit in the winter and summer season of year 2002-03 only. Benzene - Was not detected. 1-4 Dioxane -Was not detected The over all study shows that the Thane creek water is polluted by organic contaminants having high concentration of phenolic comp, Detergents, Methanol, ethanol, Acetone and low conc. Dichloromethane and ether.

Recommendations

1. To establish the legal basis for banning the pollution of navigable waterways.
2. Investigation of water pollution related to disease and public health.
3. Prohibiting oil discharge in Coastal Water.
4. Pollution control law of regulation of waste disposal.
5. Federal grants for water treatment plants.
6. Restoration and maintenance of country water.
7. Land and water conservation fund act money made available for local states and federal acquisition of open space and parkland.

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ENVIRONMRNTAL CLEANUP- EXTRACTIVE SEPARATION AND ESTIMATION OF TOXIC METALS

YOGESH. V. GHALSASI

Research laboratory,
Dept. of Chemistry,
K. J. Somaiya College of Science and Commerce,
Vidyavihar (E),
Mumbai 400 077, India

- **ENVIRONMENTAL POLLUTION BY TOXIC METALS IS MAJOR THREAT TO SOCIETY**
- **TOXIC METALS LIKE LEAD AND COPPER ARE WELL KNOWN POLLUTANTS**
- **LEAD AND COPPER WERE ALSO FOUND PRESENT IN FOD SAMPLES LIKE RICE GRAINS AND LEAFY VEGETABLES LIKE SPINACH**
- **CHRONIC EXPOSURE TO COPPER CAUSES NEPHRITIS. EXPOSURE TO LEAD CAUSESSCARING AND SHRINKING OF KIDNEY TISSUE.**
- **EXCESS OF COPPER IN ENVIRONMENT AND AQUATIC LIFE IS HARMFUL FOR LIVING ORGANISMS**
- **CHRONIC COPPER CAUSES GASTROINTESTINAL CATARRAH AND HEAMACHROMATOSIS**
- **IN VIEW OF THESE SEVERE EFECTS OF COPER AND LEAD, A SIMPLE AND RAPID METHOD FOR THEIR SEPARATION AND**

Why Solvent Extraction

- **Method is simple and rapid**
- **Method is highly accurate and precise**
- **Free from many interferences**
- **Very economic and convenient**
- **Wide range of Applications**

Tributyl Phosphine Oxide (TBPO)

- **Wide range of extractants were used or extraction of lead and copper, however, neutral organophosphorous compounds are found to be most potent extractants.**

  $C_4H_9P=O$ a neutral organophosphorous compound used as a potent extraction for metals like U, Th, Cu, Cd, Bi etc.

- **Extraction Methods using TBPO offer very clean and efficient separation of desired constituents and is free from many interferences.**

Salicylate media

- **Generally metal extractions are carried out from mineral acid media like HCl etc.**
- **Na salicylate solution is used as an effective media for the separation of metals.**
- **Salicylate media is weakly acidic media which reduces corrosive effects of strong mineral acid media.**
- **Most of the Metal complexes with sodium salicylate poses a ring structure which easily facilitates their transfer into the organic phase.**

Table1: Optimum Extraction Conditions

Metal ion	Aqueous phase		Organic phase (5 cm^3 in Toluene)	Extraction period	Stripping solution	Determination
	Salicylate, mol/dm^3	pH				
Pb (5-40 µg)	6.25×10^{-3}	3.8-4.2	2.29×10^{-2} mol/dm^3 TBPO	30 sec.	0.1 mol dm^{-3} HNO_3 (2X5 cm_3)	Determined spectrophotometrically by PAR
Cu (1-40 µg)	2.5×10^{-2}	2.9-3.1	$2.28X\ 10^{-1}$ mol/dm^3 TBPO	60 sec.	0.05 mol dm^{-3} HNO_3 (2X5 cm_3)	Determined spectrophotometrically by PAR

Nature of extracted species

Nature of extracted species is deduced from log-log plots.

Slope for plot of log Distribution ratio v/s log of Salicylate concentration for lead and copper at fixed pH and TBPO concentration are 1.7 and 2.2 respectively

Slope for plot of log Distribution ratio v/s log of TBPO concentration for lead and copper at fixed pH and Salicylate concentration are 1.8 and 2.0 respectively

Extraction takes place by salvation mechanism where initially two salicylate ions get coordinated with metal ion. This neutral metal salicylate is further solvated by two TBPO molecules rendering it hydrophobic, facilitating transfer into the organic phase.

The actual composition of the extracted species can be given by following reactions.

$$M(H_2O)_4^{2+} + 2H_{Sal}^{-} = M(H_{Sal})_2(H_2O)_2 + 2H_2O$$

Metal salicylate

$$M(H_{Sal})_2(H_2O)_2 + 2TBPO = M(H_{Sal})_2\,2TBPO + 2H_2O$$

Solvated metal salicylate

Table 2: Diverse ion effect

Aqueous Phase: 1.7X10^{-3} mol dm^{-3} sodium salicylate at pH 3.2 with 40 µg of pb(II) and 20 µg of Cu(II)

Organic phase: 2.5X10^{-1} mol dm^{-3} TBPO dissolved in toluene

Foreign ions	Tolerance limit, µg	Foreign ions	Tolerance limit, µg	Foreign ions	Tolerance limit, µg
Zn(II)	100	Zr(IV)	1200	Fe(III)	none
Cu(II)	200	Hf(IV)	400	Y(III)	1500
Mn(II)	2000	Ti(IV)	500	EDTA	*none
Ba(II)	400	Ce(IV)	200	Th(IV)	200
Cd(II)	100	Te(IV)	200	SO_4^{2-}	300
Mg(II)	200	V(V)	2000	Cl^-	1000
Sb(III)	500	U(VI)	1000	NO^{3-}	2000
Al(III)	500	Cr(VI)	250	SCN^-	250
La(III)	2000	Mo(VI)	150		

Table 3 : Separation of Pb(II) from binary and multicomponent mixtures.

Composition of the mixture, μg	Recovery,∗%	Relative error, ∗%	Estimation procedure for the added ion
Pb, 40; Cu, 40	99.5 99.0	0.5 1.0	PAR[17]
pb, 40; Ti, 50	99.5 99.3	0.5 0.7	H2O2[17]
Pb, 40; Fe, 100	99.1 99.6	0.9 0.4	thiocyanate[16]
Pb, 40; Cr, 100	99.0 99.4	1.0 0.6	DPC[17]
Pb, 40; Te, 100	99.3 99.3	0.7 0.7	$SnCl_2$[17]
Pb, 40; V, 50	99.7 99.6	0.3 0.4	PAR[18]
Zn, 100; Pb, 40 Cu, 100; Ni, 100 Co,50	99.0	1.0	
Pb, 40; Sb, 100 Te, 100; U, 100 Cr,100	99.1	0.9	

∗ Average of triplicate analysis

Table 4 : Separation of Cu(II) from binary and multicomponent mixtures.

Composition of the mixture, μg	Recovery,∗%	Relative error, ∗%	Estimation procedure for the added ion
Zn, 40; Cu, 40	99.5 99.0	0.5 1.0	PAR[17]
Cu, 40; Fe, 100	99.5 99.3	0.5 0.7	Thiocyanate[17]
Cu, 40; Co, 100	99.1 99.6	0.9 0.4	Nitroso-R-Salt[16]
Cu, 40; Sb, 100	99.0 99.4	1.0 0.6	Iodide[17]
Cu, 40; Te, 100	99.3 99.3	0.7 0.7	$SnCl_2$[17]
Cu, 40; Cr, 50	99.7 99.6	0.3 0.4	DPC[18]
Cu, 40; Pb, 100 Pb, 100; Ni, 100 Co,50	99.0	1.0	
Cu, 40; Sb, 100 Te, 100; U, 100 Cr,100	99.1	0.9	

∗ Average of triplicate analysis

Table 5 : Analysis of waste water samples

Sample	Lead content found by AAS	Lead found by proposed method	Standard deviation	*Relative standard deviation (%)
Industrial waste water	1.3ppm	1.32 ppm[a]	0.006	0.85
Well water from Thane	0.32 ppm	0.33 ppm	0.004	0.58

a-ppm : parts per million
*- : Average of six determinations

Table 6: Analysis of Environmental samples

sample	Pb(II) found by proposed method, μgm^{-3}	Cu(II) found by proposed method, μgm^{-3}	Pb(II) found by AAS method, μgm^{-3}	Cu(II) found by AASmethod, μgm^{-3}
Air borne particulate matter				
Tilak nagar area	0.83 0.52	0.36 0.108	0.84 0.51	0.38 0.108
Dadar area	0.84 0.47	0.52 0.103	0.85 0.47	0.56 0.102

Table 7: Analysis of food samples
Vegetable crops are often grown in polluted and degraded environmental conditions in the semiurban (or urban fringe) zone and are subject to further pollution from vehicles and industries during marketing. There is therefore significant cause for concern regarding contamination.

sample	*Pb(II) found by proposed method, mg/kg	* Cu(II) found by proposed method, mg/kg	Pb(II) found by AAS method, mg/kg	Cu(II) found by AASmethod, mg/kg
Leafy vegetable Spinach from thane market	0.19	0.04	0.21	0.05
Leafy vegetable Spinach from dadar market	0.27	0.06	0.27	0.06
Rice grain from thane market	2.6	0.86	2.44	0.88
Rice grain from Dadar market	2.7	0.86	2.76	0.88

* Average of six determinations

Conclusions

1. The solvent extraction methods developed for lead and Copper can be summarized as follows.
2. The methods are simple, rapid and precise.
3. It needs no pre equilibration or use of salting out agents. Extraction occurs in single step.
4. The methods are highly reproducible and the total analysis time is only about 20 minutes.
5. The methods are highly selective, they provide clear cut separation and quantitative estimation of lead and copper from associated elements, Environmental samples and food samples.

Monitoring of Pesticidal Contamination of Vegetables from Maharashtra

Anita S. Goswami-Giri

B.N.Bandodkar College of Science, Chedani bunder road Thane(MS)India-400 601.

Abstract: Samples of brinjal. lady finger and onion leaves analysis carried out by analytical technique. Samples contained residues above MRL values. The contamination was mainly with organophosphates followed by organochlorines. Among organophosphates, residues of monocrotophos, quinalphos and chlorpyriphos exceeded the MRL value in 36% and 23% samples of brinjal and fenugreek. Residues of monocrotophos were higher than MRL value in 3 samples of brinjal and lady finger. chlorpyriphos in samples of onion leaves and quinalphos in of lady finger. Among synthetic pyrethroids, cypermethrin was the major contaminant and its residue exceeded the MRL value in sample each of brinjal, lady finger .The residues of some organochlorines, i.e. HCH, DDT and endosulfan were found in all the samples but did not exceed the tolerence limit.

Key word: Vegetables, Maximum residue limit (MRL) - monitoring , organochlorines , organophosphates , brinjal , fenugreek, onion leaves.

Introduction

Food is major pathways to body burden. Vegetable group constitutes part of core Indian diet. Vegetables are the second largest production in the worldwide. Significant production is in urban and pre urban areas. Many studies reveal contamination of vegetables with heavy metals and pesticides. The main source of contamination to vegetables crops are the air, water, soil, pesticides (pre harvesting) from which these are taken up by the roots or foliage. During transport, marketing and retailing (post harvesting), vegetables are gradually becomes polluted because of rapid urbanization and industrialization.

It has been reported that sewage effluents of municipal origin contain appreciable amount of major essential plant nutrients. Therefore the fertility levels of the soil are improved considerably under sewage irrigation of crop field[1]. However Studies on the water of Vasai creek, Maharashtra, reveal that the presence of toxic heavy metals and pesticides reduce soil fertility and agriculture output.[2]

Comprehensive studies related to the analyses of pesticides in the vegetables around the particular creek are only few in the country. Therefore the present study has been undertaken, to assess the extent of heavy metal contamination and pesticidal contamination in Vegetables.

Materials and Methods:

Sampling of vegetables

A total three vegetables; brinjal, fenugreek, onion leaves were collected from three different local market . Put in sterile polyethylene bags and transported on ice to the laboratory where they were analyzed immediately or stored at 4^{o}C until analysis within 24 hours.

Chemical analysis for pesticide residues

Extraction:

Approximately 1000 gm of each fresh vegetables was homogenized in a mortar and extracted by Soxhlet extractor. Test were carried out in accordance with previous studies[3] .The samples were cleaned concentrated eluted with hexane in a solid-phase extraction column.

Result and Discussion:

Pesticide Residues on brinjal, fenugreek, onion leaves

Table 1 shows pesticide prevalence, residue level recorded on brinjal, fenugreek, onion leaves and maximum residue limits (MRLs) for consumption.

In Maharashtra, farmers are using pesticide on vegetables. Insecticides are the most widely used among the different classes of pesticides.41% and 37 % of these insecticides are pyrethroids and organophosphates respectively. Rest are organ chlorines and carbamates.

The result is percentage contamination of pesticide in vegetables, which is shown in table 1.however some samples of vegetables are shown below detectable limits. Recommend values of residue level 0.05 to 0.2 for chlorpyriphos, DDT- 3.5, qunalphos -0.05.

A rough calculation shows risk potential because of this contamination however, the data shows clearly that these more potent agrochemicals are used irrespective of whether they are approved for vegetables production or not.[4]

The result of this study that typical pesticides contamination level of vegetables in Maharashtra markets pose a threat to human health. Due to waste water, education and awareness campaigns in the markets and households may decrease the risk .

Washing or cooking food before eating is common in Maharashtra. It may eliminate pesticide residue but still detail study required .

Table 1 Pesticide prevalence: Residue level on brinjal, fenugreek, onion leaves

Pesticide	Brinjal with pesticide residues (%)	Fenugreek with pesticide residues (%)	Onion leaves with pesticide residue (%)
Chlopyrifos	36	23	0.01
Organophosphates	0.2	14.3	65-78
Monocrotophos	11	12	0.72-1.8
Quinalphos	0.5	17.84	0.05
DDT	33	3.5	34

There is no such MRL value of pesticide but presence of pesticide is the contamination of it in vegetables.

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A Brief Review of Mycotoxins as Contaminants in Foods with Special Reference to Aflatoxins

Moses J. Kolet[1], S.A. Vaidya[2], S.K. Deshmukh[3]

1.Reader, Department of Botany, B.N. Bandodkar College of Science, Thane
2.Reader, Department of Botany, CHM College, Ulhasnagar
3.Sr. Scientist, Nicholas Piramal India Ltd. Mumbai

Abstract: Mycotoxins are secondary metabolites of fungal origin. They are important contaminants of food. They elicit toxic responses, referred to as mycotoxicoses, in human beings and animals alike. Instances of mycotoxin toxicity have occurred since ancient times but the concept of mycotoxins developed in 1960s. Of the thousands of fungi that colonize food commodities, only a few can produce mycotoxins. Various types of mycotoxicoses, fungal organisms responsible, their mycotoxins and toxic effects are discussed in the paper.

Aflatoxins are a group of highly carcinogenic mycotoxins produced by three species of the fungus *Aspergillus.* Aflatoxins B1 is a Class I human carcinogen. Conditions for contamination of foods by aflatoxins, aflatoxicosis and human health are discussed.

Initial screening of oilseeds from Thane district for aflatoxins was carried out and results are discussed in the paper.

Mycotoxins are secondary metabolites produced by fungi colonizing crops in the field or grains, oil-seeds and agri-products during storage. Although they are synthesized by fungus, they apparently have no role in its metabolism, growth and reproduction and hence their designation as secondary metabolites. Mycotoxins are unerringly capable of eliciting a toxic response, referred to as mycotoxicoses in human beings and warm-blooded animals. They have been linked with several physiological and pathological changes and disorders. The toxic response manifests itself through various organs namely the liver, kidney, lungs and nervous system.

Historical Aspects

Classical instances of mycotoxins have been known since ancient times through cases of ergotism and mushroom poisoning. Mycotoxin related toxicity has caused epidemics in humans and animals, although the cause could not be ascertained and attributed to mycotoxins. St.Anthony's fire (Ergotism) accounted for the most important epidemics in medieval Europe resulting from consumption of ergot (*Claviceps purpurea*) contaminated rye. The true magnitude of mycotoxin related toxicity however remained unrealized until the middle of the twentieth century. Alimentary toxic aleukia is, arguably, the only, mycotoxicosis, other than ergotism, to have caused human deaths on a colossal scale. Initially recorded in the nineteenth century as a food intoxicant, the first epidemic in 1932, followed by more severe ones during the second world war, recorded mortality rates of up to 60% and resulted in the loss of approximately 1,00,000 lives in Russia (Joffe, 1971;Palti, 1978). The disease was attributed to consumption of mouldy food grains, contaminated with mycotoxins produced by infection of species of fungus *Fusarium* on the overwintered grains. In Japan, investigations on 'cardiac beriberi' in the late nineteenth century indicated the role of mouldy rice contaminated with fungi (Uraguchi & Yamazaki, 1978). Stachybotryotoxicosis, one of the earliest and intensively investigated mycotoxicosis, which killed thousands of horses in the former USSR in the 1930s, was traced to poisoning by mouldy hay contaminated with mycotoxin producing fungus. *Stachybotrys atra* (Forgacs, 1972). Aflatoxins, a group of highly toxic metabolites, produced by the fungus *Aspergillus* were linked to the mysterious death of turkeys and diseases in many other animals including man (Smith and Moss, 1985).

The concept of mycotoxins developed in the 1960s. A sudden outbreak of an unknown disease killed a large number of poultry birds. This disease, affecting ducklings in Kenya and young turkeys in U.K, designated as Turkey X disease, was traced to presence of mycotoxins in the groundnut meal feed imported from Brazil (Blount, 1961). Around the same time, a potentially carcinogenic compound was shown to be present in the contaminated groundnut meal, which was later proved as the same mycotoxin, aflatoxin, that had caused the Turkey X disease (Wogan & Pony, 1970). This created the much required awareness regarding mycotoxicosis as a threat to human and animal life, thereby triggering massive and thorough research on the topic. Research on mycotoxins has provided valuable new insights into our understanding of food poisoning.

Ample evidence of fungi, that commonly colonize food and feed, producing mycotoxins has emerged in the past five decades. The growth of fungus and subsequent production of mycotoxins is a result of a combination of interactions between the fungus, substrate and environment, also dependent on the species as well as strain (Sweeney & Dobson, 1998; Pitt *et al.*, 2000). Thousands of fungi routinely colonize stored grains, agricultural products, forage and feeds but only a few are known to produce mycotoxins (Miller, 1994). Infection and colonization can occur in the field in standing crops, after harvest, during drying of grains or subsequent strorage. The major mycotoxigenic fungi related to human food chain apparently belong to three genera - *Aspergillus*, *Fusarium* and *Penicillium*. All of them are very common inhabitants of soil, indoor and outdoor environment, causing deterioration of several manmade articles and cultural property (Gilman, 1967; Kolet, 2003) and are widely believed to be potential health hazards as well as stimulators of allergic responses (English, 1980; Bennett, 1994). Table 1 illustrates mycotoxin related diseases and disorders. Table 2 shows toxigenic fungi, their mycotoxins and potential activity.

Mycotoxicosis poses challenges before clinicians owing to the fact that it is extremely difficult to diagnose, as very few mycotoxins produce overt signs of poisoning or related symptoms (Samson, 1992; Pitt *et al*., 2000). This happens probably because most mycotoxins are bizarre molecules with variable structures, their molecular weights ranging from 50 to more than 500, and, such small molecules induce no immediate response in the human immune system. A major drawback and danger of mycotoxin contamination in food is our inability to detect them biologically (Pitt, 2000). Also, the fact that production of actual symptoms requires few days to years or even decades, makes it near impossible to pin point the source of a disease or disorder that manifests itself after so long a period.

Four fundamental types of toxicity levels are characteristic to mycotoxins: Acute toxicity, Chronic toxicity, Mutagenic toxicity and Teratogenic toxicity.

The most commonly described effect of acute mycotoxin toxicity is deterioration of hepatic and renal functions, leading to death in extreme cases. Some mycotoxins affect skin sensitivity, even resulting in necrosis and extreme immunodeficiency; some cause disturbances in synthesis of proteins while neurotoxic mycotoxins cause sustained trembling in animals, which at higher doses can damage the brain and even lead to death (Subramanian, 1983; Oyeka, 2004). Chronic mycotoxin toxicity primarily results in the induction of cancer, especially of the liver, oesophagus and lungs as well as induction of tumors. The toxicity is never detected till the disease manifests itself. Some mycotoxins interfere with normal replication of DNA, thereby inducing mutagenic and teratogenic effects (Rodricks, 1977; Stoloff, 1983;Pitt, 2000).

Classification:

Currently, between 300-400 mycotoxins have been isolated from various fungi and classified according to the biological effects of their toxigenic action (Subramanian, 1983;Oyeka, 2004).

Table 3 shows the classification of mycotoxins into groups according to their action while Table 4 lists some other known and important mycotoxins.

Symptoms:

The symptoms of mycotoxin toxicity are as diverse as the chemical structures of the compounds themselves. In human beings, mycotoxicosis may bring about wide ranging effects and inductions (Joffe, 1971;Uraguchi, 1978;Subramanian, 1983; Oyeka, 2004) as are listed below:

i. Abdominal pain
ii. Anaemia
iii. Anorexia
iv. Bleeding from the nose, throat and gums
v. Breast enlargement in boys
vi. Burning sensation in the mouth, palate, pharynx, oesophagus and stomach
vii. Cardiovascular damage
viii. Chills
ix. Convulsions
x. Destruction/Exhaustion of bone marrow
xi. Disturbance of haematopoetic system
xii. Diarrhoea
xiii. Fever
xiv. Food poisoning
xv. Giddiness
xvi. Haemorrhagic rash
xvii. Haemorrhage in kidneys, lungs, pleura and adrenalin glands
xviii. Headache
xix. Increase in trytophan level in blood and brain, thereby affecting appetite, muscular corordination and sleep pattern
xx. Inhibition of protein synthesis
xxi. Leukopenia
xxii. Lowering of body temperature
xxiii. Lowering of blood pressure
xxiv. Nausea
xxv. Neurotic angina
xxvi. Precocious pubertal changes in children
xxvii. Physiological and pathological changes
xxviii. Reproductive and mammary changes
xxix. Respiratory failure
xxx. Role in hormonal balance and breast cancer
xxxi. Role in induction of cancer
xxxii. Role in renal failure

In animals, mycotoxins are known to cause equally wide ranging and many a times more shocking effects (Hayes, 1977;Palti, 1978;Uraguchi, 1978;Subramanian, 1983;Oyeka, 2004) as listed herein:

i. Abortion
ii. Acute & chronic liver damage, liver diseases & carcinoma
iii. Anorexia
iv. Blindness
v. Centro lobular necrosis
vi. Circulatory disturbances & failure
vii. Convulsions followed by death
viii. Dehydration
ix. Depression of spinal & medullary functions
x. Diarrhoea
xi. Development of abnormalities
xii. Enlarged uterus, atrophied ovaries
xiii. Facial eczema
xiv. Food poisoning
xv. General toxicosis
xvi. Haemorrhage in internal organs
xvii. Increased foetal mortality
xviii. Hepatic carcinoma & necrosis
xix. Interruption of oestrus
xx. Itchiness
xxi. Jaundice
xxii. Lacrymation
xxiii. Liver damage & haemorrhage, causing rapid death
xxiv. Liver cirrhosis & fibrosis
xxv. Loss in weight
xxvi. Nasal discharge
xxvii. Nervous symptoms
xxviii. Paralysis of diaphragm & thorax
xxix. Progressive ascending paralysis
xxx. Renal necrosis
xxxi. Respiratory disturbance & failure
xxxii. Salivation
xxxiii. Somnolence
xxxiv. Spastic, hyperkinetic or convulsive signs
xxxv. Swelling of hind legs
xxxvi. Vomiting
xxxvii. Death occurs in acute cases of mycotoxin toxicity

Many fungi with the potential to produce mycotoxins are commonly and frequently observed as contaminants on food and agricultural products. It is true that mycotoxins cannot be synthesized in food unless there is fungal growth. However detection of fungal colonization on food does not automatically mean the contamination of mycotoxins, but ample potential for their production always exists(ISU, 2005). On the other hand, absence of toxigenic fungi also is no guarantee that the food item is safe and free from mycotoxin contamination as toxins persist long after all signs of the colonizing fungi have disappeared with time (Peckham *et al*., 1971). A combination of several factors including nutrients available in the food, environmental factors and preservatives is known to affect production of mycotoxins in food (ICMSF, 1996)

AFLATOXINS

Aflatoxins are a group of highly toxic carcinogenic secondary metabolites produced by fungi, namely i. *Aspergillus flavus* ii. *Aspergillus parasiticus* and iii. *Aspergillus nomius* (Pitt, 1992). They are one of the most important, thoroughly studied and well-documented group of mycotoxins, having direct relevance to human and animal health. Aflatoxin B_1 is considered to be Class I human carcinogen (IARC, 1993).

The naturally produced aflatoxins undergo modifications during metabolism and food processing to further produce several derivatives with variable and wide ranging toxic, mutagenic and teratogenic effects (Wong & Heish, 1976;Palmgren & Hayes, 1987). The structure and chemistry of aflatoxins has been studied in great detail. Chemically, aflatoxin belongs to the category of *bis furano-isocoumarins* (Subramanian, 1983). Detroy et al (1971) described 18 aflatoxins of which around 13 are naturally occurring. Four of them viz. aflatoxin B_1, B_2, G_1 and G_2 are common contaminants in food commodities. B and G refer to blue and green fluorescence respectively, produced by the toxins when separated by thin layer chromatography and viewed under ultraviolet light. Their hydroxylated derivatives are also known, as well as the aflatoxins M_1 and M_2 which are produced when natural aflatoxin B_1 and B_2 are partly metabolized by animals and excreted in milk and urine (Frobish *et al*., 1986;Guerre *et al*., 2000). Aflatoxin P_1, a urinary metabolite of experimental value is also a derivative of aflatoxin B_1.

Among the aflatoxins, the best studied, described and documented is aflatoxin B. It has a molecular weight of 312. Its chemical formula is $C_{17}H_{12}O_6$ (Oyeka, 2004).

The implicated fungi have been isolated from aflatoxin contaminated food material. They are basically storage moulds, however, weak parasitic activity is also reported (Subramanian, 1983). They come from contamination during handling, storage and processing of foods. Presence of higher moisture content in grains due to inadequate drying is a prime factor favouring their colonization by aflatoxin producing fungi. These fungi are known to grow on almost every raw as well as processed food. They readily grow on foods, once their abundant spores in the environment get an opportunity to settle, further aided by favourable tropical temperatures and water activity. Pitt (1995), specified parameters favouring activity of aflatoxigenic fungi in foods. Aflatoxin contamination is fundamentally a problem in tropical and allied areas only.

The conditions for initiation of aflatoxin production are more specific in comparison to other mycotoxins. Presence of lipids (oils) in foods largely favours the production of aflatoxins. Hence, groundnuts and corn (maize) are substrates of choice for accumulation of aflatoxin. Aflatoxin is present in significant amounts in various edible nuts, grains and their processed products. While rice and other food grains show lesser tendency to produce aflatoxins, the level of contamination is high in parboiled rice (Subramanian, 1983). Soyabean, reportedly has lower ability to accommodate aflatoxin due to presence of an inhibitor protein but misidentifications are however common due to

presence of a chemical compound similar in fluorescence characteristics and Rf value (Samarajeewa, 2004).

Aflatoxins and Human Health:

Aflatoxin B_1 has an unsaturated structure and can inflict damage even at extremely low doses (Rippon, 1974). Aflatoxin related health implications are well documented (Shank, 1978;Hendrickse, 1997;Hendrickse, 1997;Pitt, 2000;Oyeka, 2004). The effects on human health are summarized below:

i. Carcinogenic (especially cancer of the liver)
ii. Headache
iii. Mutagenic
iv. Nausea
v. Outbreaks of aflatoxicosis
vi. Outbreaks of hepatitis
vii. Rare incidences of acute toxicity
viii. Renal diseases
ix. Teratogenic
x. Toxicological action
xi. Transient rash
xii. Exposure to aflatoxin M_1, is a major potential threat to human health especially to infants and children (Bosch & Peers, 1991)
xiii. Aflatoxins may also act synergistically with other mycotoxins and microbial agents in weakening human resistance to diseases (Samarajeewa, 2004)

Similar effects are elicited in animals (Robens, 1990;Bray & Ryan, 1991)

Modern techniques in molecular biology have facilitated deeper understanding on interactions of aflatoxins at cellular level. Aflatoxin has a unique capacity to selectively target gene p53, described as the 'guardian of the genome', thereby throwing open the possibility of rapid accumulation of mutations in the cells, eventually leading to cancer (Puisieux et al., 1991;Smela et al., 2001)

Owing to their extreme toxicity, low acceptance/tolerance limits for aflatoxins in food have been prescribed by many countries. While 15mg/kg of total aflatoxin is stated as the maximum level permitted in foods in world trade (Pitt, 2000), studies have revealed that the actual levels of aflatoxins in some tropical foods and blood samples are much higher (Miller, 1996;Pitt & Hocking, 1996). The intricate, complex nature of international trade compounded with diverse foods, climatic and environmental conditions, differences in aflatoxin tolerance levels (FAO, 1997) in different parts of the world and the dire need of some food commodities such as milk powder for impoverished and malnourished children make it difficult to set a fixed value as uniformly acceptable level.

Current Work from Thane District

Samples of oil seeds from Thane, Kalyan and Ulhasnagar, in Thane district were screened for aflatoxins. The experiments were carried out in September, 2007. Five types of oil-seeds viz. castor, maize(corn), mustard, groundnut and sesame were investigated. Apparently healthy and damaged oil seeds were procured from the retail markets in the respective cities. Samples were drawn from fresh and one-year old lots and exposed to the black light test at a wavelength of 365nm (ISU, 2005). Samples of entire grains as well as damaged and broken grains were qualitatively screened for

aflatoxins. The results are documented in Table 5.

Results hinted at the presence of mycotoxins in few of the samples investigated. Castor did not show presence of mycotoxins except for a single heavily damaged seed which could render the entire lot unacceptable (ISU, 2005). The heavy damage probably facilitated entry of mycotoxigenic fungal colonizers. Mustard seeds did not reveal mycotoxins. Maize grains from old stock demonstrated some glowing particles revealing possibility of aflatoxins. Undamaged groundnuts did not reveal aflatoxin contamination, however damaged nuts indicated their presence. Sesame showed possibility of aflatoxin contamination in only one sample. Plant pathologists prescribe this test only as an initial screening and do recommend a thorough further verification by laboratory analysis.

Table 1. Mycotoxin related diseases and disorders in human beings and animals (Subramanian, 1983; Marasas et al., 1988)

No.	Disease / Disorder	Contaminated food	Mycotoxigenic food contaminants
1	Aflatoxicosis	Aflatoxin contaminated nuts, grains and processed products, milk and milk products	*Aspergillus flavus, A.nomius, A.parasiticus*
2	Alimentary toxic aleukia	Mildewed cereals	*Fusarium poae, F.sporotrichioides, Cladosporium epiphyllum, C.fagi*
3	Mouldy Rice Toxicosis (Cardiac beriberi)	Mouldy rice	*Penicillium citreonigrum,P.citrinium, P.islandicum, P.pulvillorum*
4	Dendrodochiotoxicosis (Horse, sheep, pigs)	contaminated wheat straw	*Myrothecium verrucaria*
5	Equine leukoencephalomalacia (ELEM)(Horses, rabbits)	Mouldy corn	*Fusarium verticillioides (F.moniliformae), F.oxysporum*
6	Facial Eczema (Sheep, cattle)	Infected grass, mouldy feed	*Sporidesmium bakeri, Periconia minutissima*
7	Fescue foot (cattle)	Contaminated feed & fodder	*Fusarium poae, F.sporitrichioides*
8	Oestrogenic Syndrome (Pigs)	Mildewed cornfeed	*Fusarium germinearum, Fusarium* sps.
9	Stachybotryotoxicosis (Horses, sheep, calves, pigs, guinea pigs, rabbits)	Contaminated fodder	*Stachybotrys atra*
* diseases of animals may also affect human beings in direct contact with the fungus			

Table 2. Toxigenic fungi, their mycotoxins and toxic potential (Subramanian, 1983;Blackwell *et al.*, 1995;Dutton, 1996; Pitt, 2000; Oyeka, 2004)

Fungi	Mycotoxin	Toxic Potential
Aspergillus flavus, A.nomius, A.parasitcus	Aflatoxin	Class I carcinogen; Acute poisoning; Jaundice
Apergillus nidulans, A.rugulosus, A.versicolor, Drechslera sps.	Sterigmatocystin	Hepatotoxin, Hepatocarcinogen
Aspergillus ochraceus, A.carbonarius, Penicillium verrucosum	Ochratoxin A	Nephrotoxin; Accumulates in blood, milk, binds with macromolecules in plasma and plasma proteins
Fusarium graminearum	Zearalenone	Precocious pubertal changes in children; probable role in breast cancer
Fusarium oxysporum, F.verticillioides	Fumonisin	Class II carcinogen
Fusarium sps.	Deoxynivalenol (DON)/(Vomitoxin)	Human toxicosis, emetic, food refusal
Fusarium poae, Fusarium sps.	T-2 toxins	Severe anaemia, emetic, destruction of bone marrow, agranulocytosis
Myrothecium verrucaria	Roridin, Verrucarin	Targets cardiovascular system & CNS
Penicillium citreonigrum, P.citrinum, P.ochrosalmoneum, P.pulvillorum	Citreoviridin	Cardiovascular damage, Paralysis, Respiratory failure
Penicillium islandicum	Islanditoxin, Cyclochlorotine, Luteoskyrin, Rugulosin	Hepatotoxin, Hepatoxic carcinogen
Penicillium citrinum, P.viridicatum, Aspergillus terreus, A.niveus	Citrinin	Nephrotoxin
Stachybotrys atra	Stachybotryotoxin, Satratoxin, isosatratoxin, verrucarin	Affects skin & mucous membrane; general toxicosis affects circulatory system; necrosis in tissues causes haemorrhage; affects nervous system; causes abortions

Table 3. Classification of Mycotoxins according to biological effects (Subramanian, 1983)

Group	Mycotoxins
Hepatotoxins sterigmatocystin	Aflatoxin, B_1, G_1; Austocystin cyclochlorotine, luteoskyrin, maltoryzine rubratoxin B, rugulosin, spordesmin,
Nephrotoxins	Ochratoxin A, citrinin
Neurotoxins	Citreoviridin, Patulin, Roquefortine
Tremorgenic toxins	Penitrem A,B,C; Paxilline, Cyclopiazonic acid; Fumitremorgen A (FTA).FTB & FTC;Verruculogen TR1 & T Austamide,Oxaline
Dermatotoxins	T-2 toxin, Butenolide
Emetic & Feed	Trichothecenes, Deoxynivalenol/Vomitoxin, T-2 toxin refusal toxins
Cardiotoxins	Viridicatumtoxin, Xanthoascin
Gastrointestinal toxins	Austdiol
Hemolytic toxins	Toxins from *Aspergillus fumigatus*
Teratogenic toxins	Ochratoxin A, aflatoxin B, rubratoxin B
Cytochalasins	cytochalasin, A,B,C,D,E & F, Zygosporin D,E,F & G, (cytological effects) Chaetoglobosin C
Carcinogenic mycotoxins (circumstantial evidencep in humans & laboratory tests on animals)	Aflatoxins, cyclochlorotine griseofulvin, luteoskyrin, Patulin, enicillic acid, rugulosin, sterigmatocystin

Table 4. Partial list of other known mycotoxins (Subramanian, 1983;North Carolina Cooperative Extension Services, 1994)

Alternariol	Fusariocin
Brevianamide A	Fusarius
Diacetoxyscipenol	Monoacetoxyscirpenol
Diacoumarol	Neosolaniol
Disthylstisbestrol	Oosporein
Ergometrine	Paspalitrems
Ergotamine	Phomin
Ergotoxin	Tryptoquivaline
Fusaric acid	Tryptoquivalone

Table 5 Initial Screening for the presence of Aflatoxin

Oilseeds	Undamaged oilseeds						Damaged/broken oilseeds					
	Fresh stock			1 Year old stock			Fresh stock			1 Year old stock		
	Thn	Kyn	Unr	Thn	Kyn	Unr	Thn	Kyn	Unr	Thn	Kyn	Unr
Castor	-	-	-	-	-	-	-	-	-	+	-	-
Mustard	-	-	-	-	-	-	-	-	-	-	-	-
Maize (Corn)	-	-	-	-	-	+	-	-	-	+	+	+
Groundnut	-	-	-	-	-	-	-	-	+	+	+	+
Sesame	-	-	-	-	-	-	-	-	-	-	-	+
(Thn: Thane; Kyn: Kalyan; Unr: Ulhasnagar) ('-' : Aflatoxin absent; '+': Aflatoxin poss												

Preventive Measures for control of mycotoxins in food:

Some recommended control measures for proper management of mycotoxin contamination (Joffe, 1971;ISU, 2005) are listed below:

i. Control of insects in the field and during storage
ii. Detect early in the field
iii. Routine checks of grain samples
iv. Mycotoxin analysis
v. Aeration of bins keeps stored grains dry
vi. Control moisture content of grains/feed
vii. Control other sources of moisture
viii. Keep processing equipment clean
ix. Use fresh feeds
x. Remove old stock
xi. Never mix old and new feed/grain stock
xii. Use safe mould inhibitors
xiii. Food commodities should not come in contact with soil
xiv. Proper education and orientation

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{dÚm àgmaH$ _S> imM,
~r. EZ. ~mXmS>H$aV H$mbO Am\$ gm`Ýg, RmU
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_ZmndH$ HmVH H$éZ, H$mbOÀ`m ^{dî`mVrb Jmadembr dmQ>Mmbrg
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Ir. IrH$mV eH$a Xr{jV

Ir Or BSpñQO

gm`Ýg, BbŠQm{ZH$, H$s{_H$ëg dJa gd àH$maÀ`m
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Lecture on regulatory aspext of contamination in Food & Beverages

Mr. H.D. Salunkhe,
Joint Commissioner (Kokan Division)

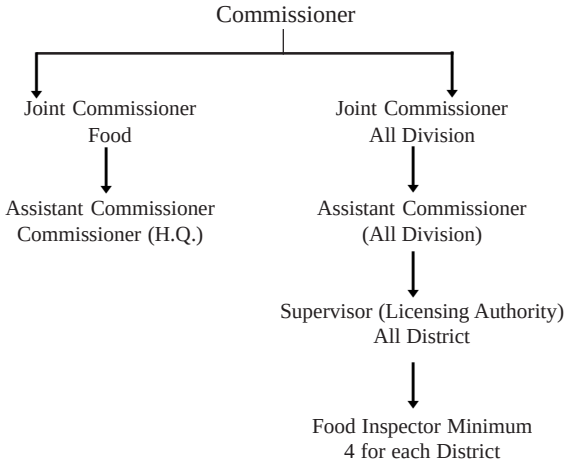
Subject : Role of F.D.A. in Prevention of Adulteration of Food Articles

- Introduction of F.D.A.
  - Main object of F.D.A.
  - Machinery available with F.D.A.
  - Law enforced by F.D.A.
  - Important provision of P.F.A. Act
    - Definition of Food
    - Adulterated Food
    - Duties of Food Inspector
    - Duties of Food Supervisor (Licensing Authority)
    - Duties of Assistant Commissioner (Local Health Authority
    - Duties of Food Joint Commissioner (Consenting Authority)
    - Duties of Commissioner (Food Health Authority)
  - Procedure of drawing food samples and prosecution
  - Food testing Laboratories and their capacities and duties (Public Analyst)
- Figures of prosecution samples inspection, suspension & cancellation of License.

Introduction of F.D.A.

- **Commissioner**
- **Joint Commissioner**
- **Assistant Commissioner**
- **Food Supervisor**
- **Food Inspector**

STRUCTURE



Mail objects of F.D.A.

- To control adulteration Food Articles
- To control manufacturer, distribution and sale of drugs & medicines and to ensure availability of standard quality at reasonable price.

Law enforced by F.D.A. to control the food adulteraion

- P.F.A. Act. 1954
- P.F.A. Rules 1955
- M.P.F.A. Rules 1962

Important Provision of P.F.A. Act

- P.F.A. Act. 1954
- P.F.A. Rules 1955
- M.P.F.A. Rules 1962

Procedures for drawing food samples

- Preparation
  - Samples
  - Samples material
  - Panch witness
  - purchase bill
  - Panchanama
  - Form 14A
  - Sealing of sample
  - Form 6
  - Delivery of documents to Vendor

And next day sending samples for analysis P.A. Report
proposal for consent to prosecute & launching prosecution

Capacities of Public Health Laboratories and Duties of P.A.

Figures of inspection, sampling, prosecutions, suspension & cancellation of License

Methodology adopted by F.D.A.

- Licensing
- Inspection
- Sampling
- Norms of F.I.
- Prosecution
- License suspension, cancellation & warning
- Public awarness by exhibition and pamplet distribution

Act has given Right to consumers for drawing the sample Section 12 of P.F. A. Act.

CONTAMINATION OF FOOD AND WATER DUE TO MUNICIPAL SOLID WASTE: SPECIAL FOCUS ON BIO-MEDICAL WASTE MANAGEMENT

DR. SANJAY JOSHI
DR. VIKAS HAJIRNIS
PROF. VIDYADHAR WALAVALKAR

Municipal solid waste

- **Garbage mounds rotting in the streets create an unhygienic environment for a city's inhabitants**
- **The gravity of the problem is increasing rapidly in Metropolitan cities in particular**
- **This is mainly due to massive migration of people form rural to urban regions**
- **Ever-increasing population is causing an overburden upon the basic amenities including solid waste management**

Municipal Solid Waste

- **A UN Report of 1995 states that 40 percent of the India's total population will be clustered in the Indian cities by the year 2025**
- **Thus Urban India is on the brink of massive Waste Disposal Crisis**
- **MSW Management Rules of 2004 are barely enough even to maintain a system of waste collection and disposal**

Municipal Solid Waste

- **The most important aspect of MSW management is the community participation**
- **Common people are the generators of the waste and need to be made aware of health hazards of mismanaged MSW**
- **Enviro-Vigil is trying hard in this area of awareness creation**

Municipal Solid Waste

- **Until recently, the hospital waste was one of the major solid waste components found in the city garbage**
- **Major part of this waste is extremely hazardous and is responsible for transmission of pathogens through contaminated food and water**

WHAT IS BIO-MEDICAL WASTE?

- **The Bio-Medical (hospital) waste is the waste generated in a hospital during diagnosis of a disease and treatment of a patient**
- **It consists of –**
  - **a) Human Anatomical Waste**
  - **b) Pathological and Hazardous material that can cause serious health problems**
  - **c) Plastic Waste**
  - **d) Glass Waste**
  - **e) General Waste**

Hazards due to BIO-MEDICAL WASTE

- **This kind of waste when mixed with common municipal waste can easily contaminate food and water through unprotected, unscientific handling and direct exposure to disease transmitting agencies**
- **In this age of dreadful and commonly occurring diseases like Hepatitis, AIDS and many more, this kind of waste must be managed and handled with utmost care in a scientific manner**

BIO-MEDICAL WASTE DISPOSAL

- **The hospital waste is disposed as per the rules defined under "Bio-Medical Waste Management and Handling Rules (1998)" of Ministry of Environment & Forest, Government of India.**

Common Bio-Medical Waste Treatment Facility of Enviro-Vigil

- **Enviro-Vigil has set up a Common Bio-Medical Waste Treatment Facility for Thane Municipal Corporation**
- **It houses a pyrolytic incinerator, an autoclave and other necessary infrastructure specified in the rules**
- **Segregated BMW from more than one thousand hospitals is collected, transported, treated and disposed off strictly in accordance to the rules**

Segregation at Source: Key to Success

- Waste is segregated at source into different coloured plastic bags specially manufactured for the purpose
- Segregation is done as follows

Human Anatomical Waste AND Pathological and Hazardous material : YELLOW BAG

Segregation at Source: Key to Success

Plastic Waste: RED BAG

Glass Waste: BLUE BAG

General Waste: BLACK BAG

Metal Sharps: BLACK CANNISTER FILLED WITH SODIUM HYPOCHLORITE

Enviro-Vigil's Common BMW Treatment Facility

Treatment Facility is provided with the following Equipments and Provisions as per the Guidelines issued by CPCB

Incinerator : Diesel fired, with Venturi scrubber, burning capacity of 50 kg/h,PLC based with tamper proof panel and a recording device

Autoclave : PLC based with tamper proof control panel and recording device

Shredder : Run on electricity and used for shredding sterilized plastic material

Facilities for : Bin washing, floor washing and vehicle washing

Other Requirements: Sharps pit, effluent treatment plant and secured landfill for the burial of ash

Incinerator in working…..

Enviro-Vigil's Common BMW Treatment Facility

- **Thane Municipal Corporation's Rajiv Gandhi Medical College and Shri. Chhatrapati Shivaji Maharaj Hospital Campus, Thane-Belapur Road, Kalwa, Thane, Maharashtra**
- **Secluded from the residential and sensitive areas**
- **Located along the scenic banks of Thane Creek**
- **Facility has been set up in compliance with CRZ (Coastal Regulatory Zone) Rules**

Present Scenario

- **As of this date, we are catering to the need of almost 1050 hospitals with approx. 7200 beds Transport Vehicle**
- **We have 5 vehicles, which are three wheeler tempos and a manually driven tricycle**
- **These are fully dedicated for the collection of Bio-Medical Waste from the source of generation**
- **These vehicles are designed and modified as per the prescribed rules**

Salient features…….

- **We have obtained ISO 9001:2000, quality system Certificate from Det Norske Veritas (DNV) , Netherlands for our CBMWTF**
- **So far, we are running this CBMWT facility almost for past FOUR years without any serious problem.**
- **CBMWTF is self funded without any govt. funding or otherwise and as yet we have been able to run it quite successfully**
- **The funds generated from this facility are used for our other projects, maintenance, salaries of our employees etc.**

Is the city of Thane free from the hazards of BMW?

- To some extent, YES!
- Although we have not been able to reach ZERO BMW target yet, so far we have been able to create awareness about the hazards of BMW in the health care workers and other fractions of the society
- Such scientific treatment of BMW will certainly reduce the high risk of water and food contamination to a large extent

Who are we? What on the Earth are we doing?

Enviro-Vigil is an environmental NGO committed to provide Clean, Healthy and Hygienic Environment to the citizens of Thane

With a group of dedicated and committed volunteers, we have undertaken many environmental activities

Some of these activities are……

- **School of Environment to provide informal education to the school children**
- **Organizing seminars on the theme "Green Careers", carrier opportunities in the field of environment**
- **A monthly magazine entitled "Aaple Paryavaran" (Our Environment) in our native language ,i.e.Marathi is being published for the past two years**

Activities

- We provide consultancy for Rain Water harvesting to various residential societies in Thane city
- Organizing public meetings and discussions on environmental issues from time to time
- Educating the people about ill effects of Ganapati idol immersion on the lake water ecosystem and providing alternatives
- Creating public awareness regarding solid waste management with the involvement of famous cinema and stage actors and actresses
- Development of "Theme Park"for solid waste management to educate the people in this regard

Recognition!

- **In Recognition of Enviro-Vigil's modest contribution in the area of Water Education and Awareness Creation, Enviro-Vigil has been selected for an award of "Best Water NGO, 2006-2007"**
- **This award has been instituted by the Water Digest, New Delhi, in collaboration with UNESCO and CNBC TV 18**

Recognition!

- **In Recognition of its work in the area of Bio-Medical Waste Management, Enviro-Vigil was recently awarded Green Cube Award (G-3 for Good Green Governence) for the year 2006**
- **This award has been instituted by the Srishti Publications, New Delhi**

Thane Bharat Sahakari Bank Ltd.

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Thane - 400 601.

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Section I

About

Contaminants in Food and beverages

Section II

Preparatory Workshops

Section III

Research Papers

Section IV

Presentations
October 06, 2007