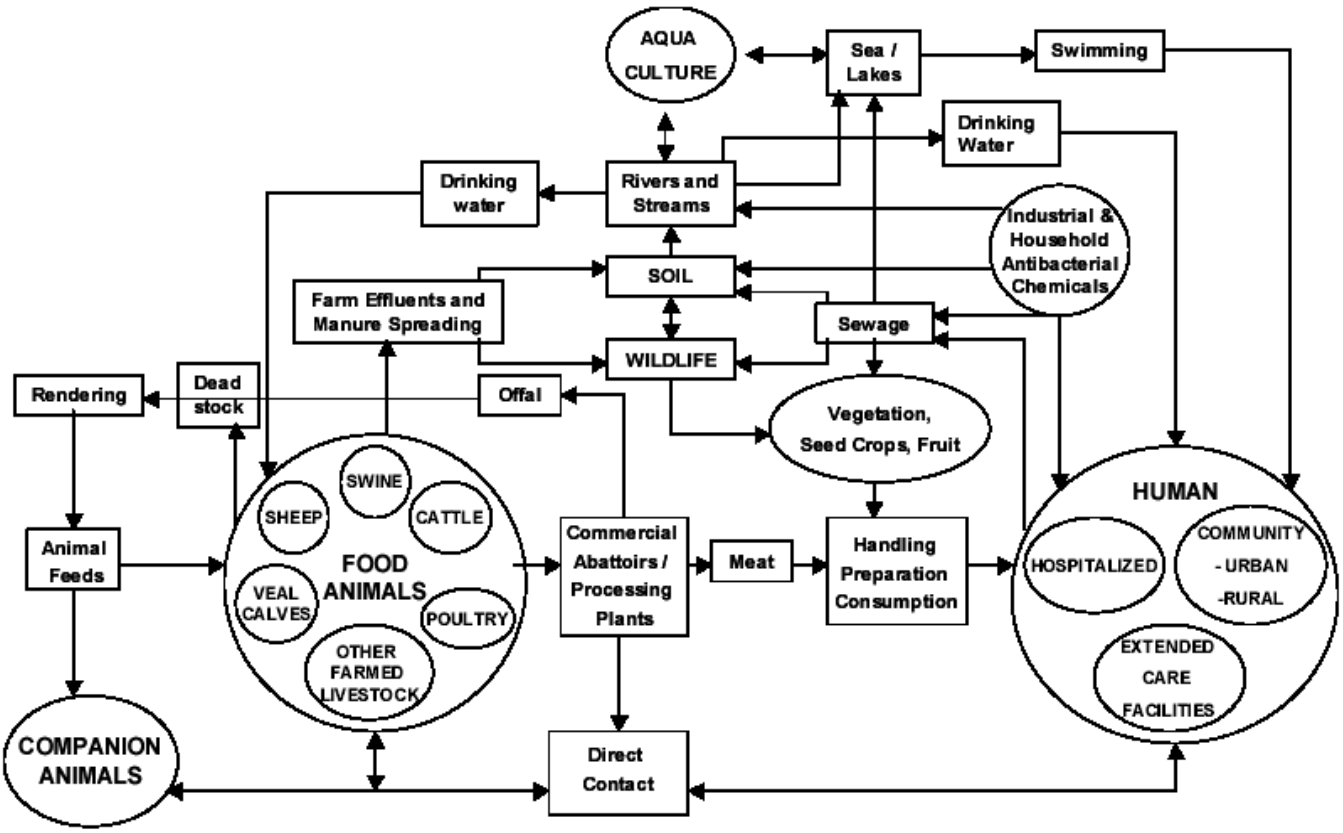
FOOD SAFETY – Know what you eat or drink

Global demands for food supply have resulted in an increasing need for Food Safety in all aspects of the food chain - from the environment in which the food is grown or livestock is raised; to the food consumed by farm animals, game animals, and insects; to processing and manufacturing facilities, distribution and handling, preparation and storage methods; eventually, to food consumption by humans. Refer bellow the food chain.



Nowadays quantification of contaminants, adulterants, additives, toxins, microbes, and residues in food to meet the rigorous demands of testing for Food Safety, and the source may be environment, agricultural process, food processing, food packaging – whatever it is. Pesticide residues, Adulterants & additives, bacteria and natural toxins, irradiation by-products, genetically modified foods, food processing contaminants, dioxins, PCBs and Furans, food packaging, Fatty acids, emerging contaminants (acrylamides, perchlorate, PFOA, Benzene, phytoestrogens), melamine, etc. There is no end really.

From the desk of Abhijit Bhar mail to: abhijit.bhar@gmail.com for more analytical information

Starting from serals and vegetables, where we are getting pesticides, PCBs, PAH; in milk getting adulteration of animal fats, mixing of melamine, traces of dioxins and furans which is using in milk products; edible oils adulterated with low grade seed oils, animal fats, traces of pesticides; alcoholic beverages for alcohol, aldehydes and ketons, also traces of pesticides; meet for steroids and drugs and of course for pesticides residues; allergen in flavoured foods. Packed foods are more concerned for polymer adhesives and residual solvents by migration from packaging materials; stability of the food quality in packed food; sulphur components in soft drinks and leaguers (the main source of contamination here is CO2). There is no end.

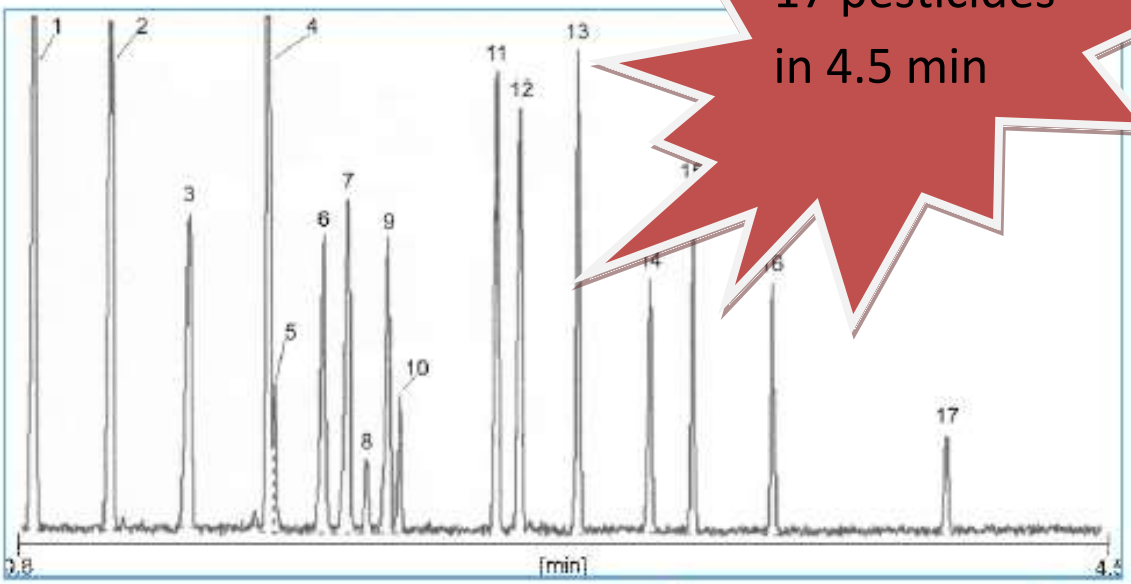
More and more accurate analysis with detection limit as low as possible with minimize the analytical error in quantification is very important. If we can minimize the sample preparation steps, we can minimize the analytical errors, as during sample preparation the contamination can come from solvents, glass apparatus and other chemicals using for extraction. We have to start the analysis from the environment (Air the animal breath, water they take and feed they take), the vegetables we cultivate, the source of milk and meet (birds and animals), the process to make it "ready to go" to the market, the packaging material and process and finally the finished products in fast food corner. I am talking about fast food corner as it was discovered that acrylamide could be formed during heating biological materials similar to food at temperature of 100^0C,similar to condition for cooking in household kitchens, unexpectedly very high levels in potato products.

Recently the Dynamic Head Space with FAST GC and FST GC-MS analysis is helping us to achieve lower detection limit with no sample preparation most of the times, especially for those components where derivatization is not required.

Recent instrumentation helps to avoid sample preparation and do FAST GC-FID/ECD/NPD/FPD/MSD analysis. The FAST analysis not only reduce the analysis time, but because of the FAST elution of components, peaks are sharp and so the intensity is high, which helps to go lowest detection level.

Fast GC application: Pesticides

17 pesticides
in 4.5 min



Courtesy of Prof. C. Bicchi, C. Brunelli
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Peak Identification	
1	α-HCH
2	γ-HCH
3	Chlorotalonil
4	Heptachlor
5	Parathion-Me
6	Paraoxon-E
7	Malathion
8	Fenitrothion
9	Parathion-Et
10	/
11	Chlordane-Trans
12	Chlordane-Cis + α-End.
13	Dieldrin
14	β-Endosulfan
15	o,p'-DDT
16	p,p'-DDT
17	Tetradifon

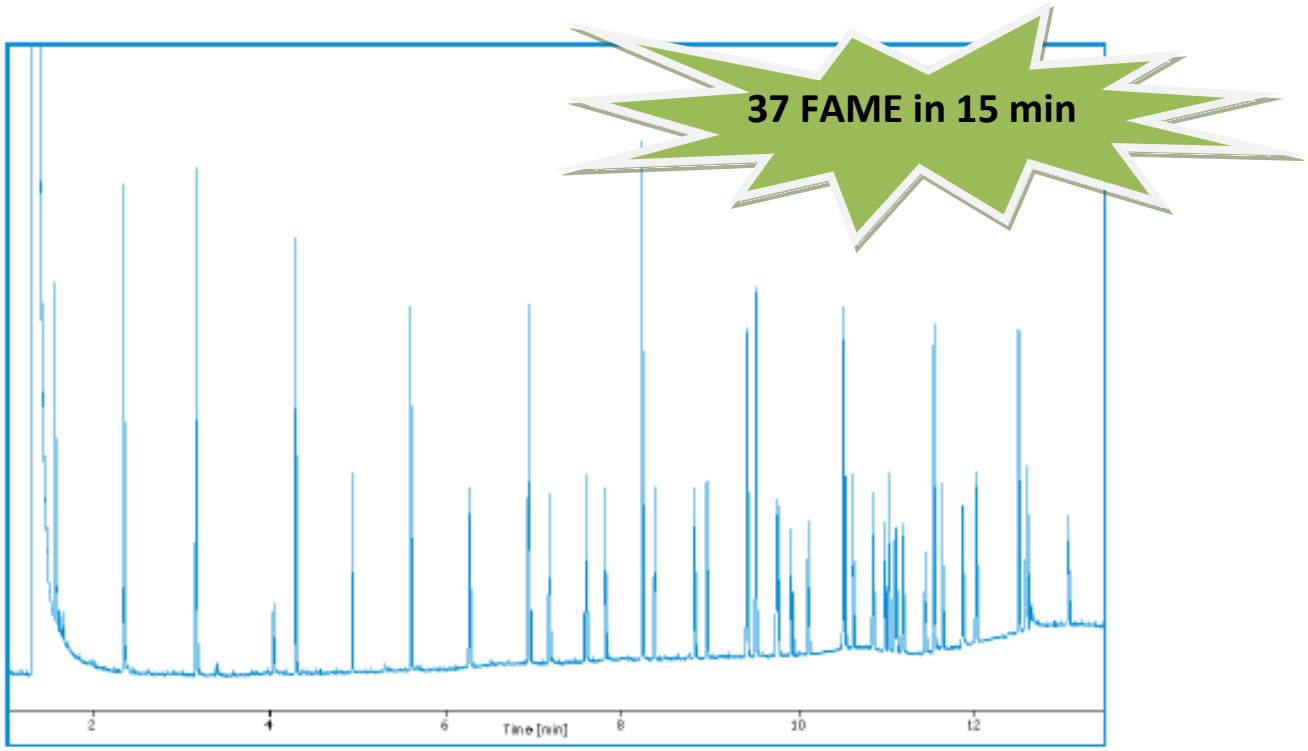
GAS CHROMATOGRAPH PARAMETERS

Oven: 50°C - 0.1 min - 15°C/min - 250°C - 5 min
Inj: SL/IN 230°C
Det: FID 250°C
Carrier: H_2 0.5 ml/min
Split: 1:200
Column: DN-5 FAST 5m, 0,10mm, 0,10um

Volume injected: 1 µL

Fast GC application: fatty acid methyl esters (FAME)

Separation of a 37 component FAME mixture



Instrument parameters

Oven: 40°C, 1 min, 50°C/min, 105°C, 15°C/min, 260°C
Injector: PTV, temperature: 60°C, 0 min, 999°C/min, 400°C, 5 min
Carrier gas: Hydrogen, 0.5 mL/min, constant flow
Split flow: 25 mL/min, split ratio 1:50
Detector: FID, 400°C
Column: DN-WAX FAST 15m, 0.10mm, 0.10µm

Sample: 5000ppm in methylene chloride
Volume injected: 0.5 µL

In next issue I shall share some information about the effect of some of the components on human body which are present in today's food.

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