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CONTENTS

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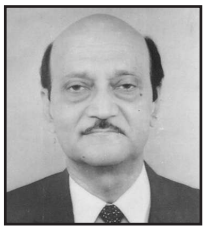
From the Editor's Desk



Wish you a very happy, prosperous and long life at the advent of the New Year is the normal way of wishing to your near and dear ones. But have we thought over the secrets of long life? Here is a receipe for your healthy and long life.

Ageing occurs when cells are permanently damaged by the continuous attacks of free radicals. They are formed daily through normal body processess, when the body eliminates toxins or fights disease. In addition to this, certain environmental pollutants can generate free radicals within the body. For instance, they are formed due to air pollution and radiation (when you are exposed to sunlight). These free radicals, thus formed, are highly unstable and are highly reactive. They can cause severe damage to the cell structure, which can potentially induce cencer, heart disease, inflammation in the arthritic joints, brain degeneration and also hasten the ageing process.

According to research scientists, about 80% to 90% of all degenerative diseases involve free radical activity, which leads us to believe that all maladies actually involve 'accelerated ageing'. If one can kill the free radicals or diffuse their activity, we can slow down the ageing process.

Chemically, free radicals are molecules that have a missing electron. Since free radicals are highly reactive and unstable, they seek out another electron to pair up with in order to turn stable. It thus causes further damage to the other existing normal cells. These free radicals can be neutralised by antioxidants — compounds that can give up one of their electrons.

Antioxidants are found in plenty in fruits and vegetables. They are chemically designed to diffuse the destructive free radicals. They stop the formation of free radicals, snuff them out and repair the damage. The most powerful anti-ageing antioxidants are vitamin C, vitamin E and betacarotene. Others include selenium, chromium, zinc, calcium, etc.

As we grow older, the number of free radicals in our bodies increases. Also, the ability to neutralise the free radicals decreases. Therefore, it makes sense to ingest supplements and vitamins after the age of 40.

Stress can also add to the damage caused by free radicals. These circulating stress chemicals also affect the fat and sugar metabolism, and interfere with the energy storage and energy expenditure affecting the person's weight.

You can eat plenty of antioxidant-rich foods such as carrots, lettuces, and oranges to combat stress. Cut down on refined, processed and junk foods, and eat more of natural foods, combined with physical exercise & rest.

Probably, the above recipe will provide you a nourishing menu for your long long life.

Happy New Year !!

Courtesy / Ack
Anjali Mukherjee
11.07.2016

S. K. Roy
Editor

About Ourselves

National Nutrition week was celebrated on the 3rd September 2016, in collaboration with CINI at the auditorium of Institute of Chemical Engineers, Jadavpur. Prof. Sunit Mukherjee, convenor of the Kolkata Chapter placed his view points on various aspects of Nutrition. S. K. Roy, also spoke on role of oils & fats in Nutrition Inaddition. Mr. Debargha Chatterjee of CINI, Dr. Sunil Nag, Prof. Utpal Roy Chowdhury and President Kolkata Chapter, Mr. B. Basak, also dealt with merits of proper nutrition.

Chairman CINI, Dr. Chowdhury, also graced the occasion by his presence. It was well attended by, the academicians and professionals, students and eminent industrial representatives. The programme had a repeat Telecast on T.V. Channels.

S. K. Roy with I.S.F. President Dr. Chooyuen May, October 2016

S. K. Roy, OTAI / Country representative I.S.F. attended the Internatinal Conference of International Society of Fat Research in Kualalumpur, Malayasia hosted by OFIC, at Hotel Istana w.e.f. 17th to 22nd October.

Prof. Santinath Ghosh memorial lecture was held in university college of Science on the 7th of January '17. Prof. D. K. Bhattacharyya, Dr. Mohua Ghosh, Dr. Sen, Dr. Ranjana, Dr. Pubali Dhar, Mr. Parasuram and S. K. Roy, attended the lecture meeting among others.

S. K. Roy of OTAI with Dr. (Prof.) ONG, President MOSTA and Chairman, Organising Committee OFIC, October 2016 for I.S.F.

It was a solemn occasion and was well attended. Dr. Mukul Das, reputed Scientist from Indian Institute of Toxicological Research Institute, Lucknow delivered the lecture and Prof. Siddhartha Dutta former Pro. Vice Chancellor Jadavpur University conducted the session as chairman.

Frying Oil Quality in The Perspective of Health

Azmil Haizam Ahmad Tarmizi, Che Anishas
Che Idris and Miskandar Mat Sahri, Malyasia

Oils and Fats International Congress 2016 (OFIC 2016, 19-21 October)
Host of : I.S.F.

Focus of presentation : Frying Oil Quality in The Perspective of Health

- The science behind frying
- Frying in food processing
- Consumers concern
- An animal study on oxidized cooking oils
- Comparative frying studies
- Take home message

Roles of frying

- Heat transfer media
- Remove water
- Unique Sensory properties
- Impart of fried food
- Provide high energy
- Modify food texture
- Source of vitamins
- Make food palatable
- Essential fatty acids
- Acts as lubricant

The Science behind frying

- Frying is a dehydration process that involves immersion of food in hot oil resulting in rapid heat and mass transfer.
- Temperature variation between food and oil results in water vapour release and oil intake into food.
- Exposure at high temperatures results in oil breakdown.

Chemistry of frying

Hydrolysis

- Interaction between oil and water
- Partial H_2O_2 decomposition
- FFA, MAG, DAG, volatile compounds
- Excessive smoking

Polymerisation

- Tertiary oxidation and thermal alteration
- Alteration of TAG and FA
- PTAG, OxTAG, dimers, CFAM
- Foaming and bitter taste in fried food

Oxidation

- Interaction between oil and oxygen (air)
- Primary and secondary oxidations
- H_2O_2, aldehydes, ketones, alcohols
- Increase in 10°C doubles the oxidation

Oil absorption during frying

- "…When the product is immersed into hot oil, the product temperature starts to increase and vigorous water vapour evolution creates an internal pressure that prevents majority of the surface oil from entering the structure. Hence, empty voids may not be filled with oil as long as water continues to evaporate..."

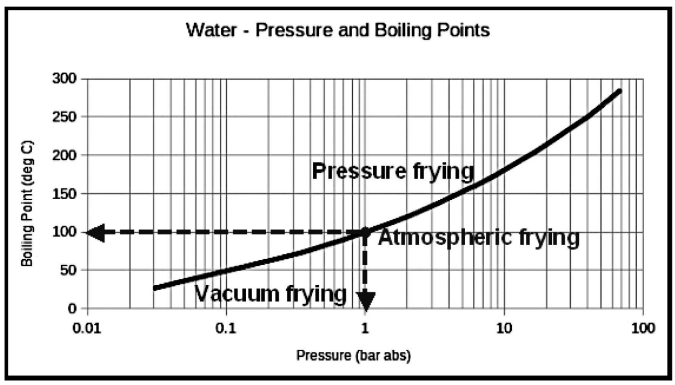
Oil absorption after frying

- "…When the product is removed from the fryer, it starts to cool and the internal pressure decreases abruptly due to water vapour condensation and reduction of the product temperature. This creates a vacuum force, resulting in suction of surface oil into the product structure (penetrated surface oil)..."

Effects of Frying Methods

Water – Pressure and Boiling Point

Pressure			Boiling Point	
psi	kPa	bar	deg F	deg C
0.5	3.45	0.034	79.6	26.4
1	6.90	0.069	102	38.7
2	13.79	0.138	126	52.2
3	20.69	0.207	141	60.8
4	27.58	0.276	153	67.2
5	34.48	0.345	162	72.3
6	41.37	0.414	170	76.7
7	48.27	0.483	177	80.4
8	55.16	0.552	183	83.8
9	62.06	0.621	188	86.8
10	68.95	0.689	193	89.6
11	75.85	0.758	198	92.1
12	82.74	0.827	202	94.4
13	89.64	0.896	206	96.6
14	96.53	0.965	210	98.7
14.69	**101.3**	**1.01**	**212**	**100**
15	103.4	1.03	213	101
16	110.3	1.10	216	102
17	117.2	1.17	219	104
18	124.1	1.24	222	106
19	131.0	1.31	225	107
20	137.9	1.38	228	109
22	151.7	1.52	233	112
24	165.5	1.65	238	114
26	179.3	1.79	242	117



Boiling point vs pressure

Frying Segments

Household

- Cooking
- Pan-, Stir-, Deep-fat frying
- Sauteing, grilling

Industarial frying

- Potato, tortilla, corn chips
- Pre-fried French fries, coated food
- Extruded, expanded snacks
- Instant noodles

Food service

- Mass catering
- Fast food restaurants
- Cottage industry
- Street hawking

Specialty application

- Japanese tempura frying

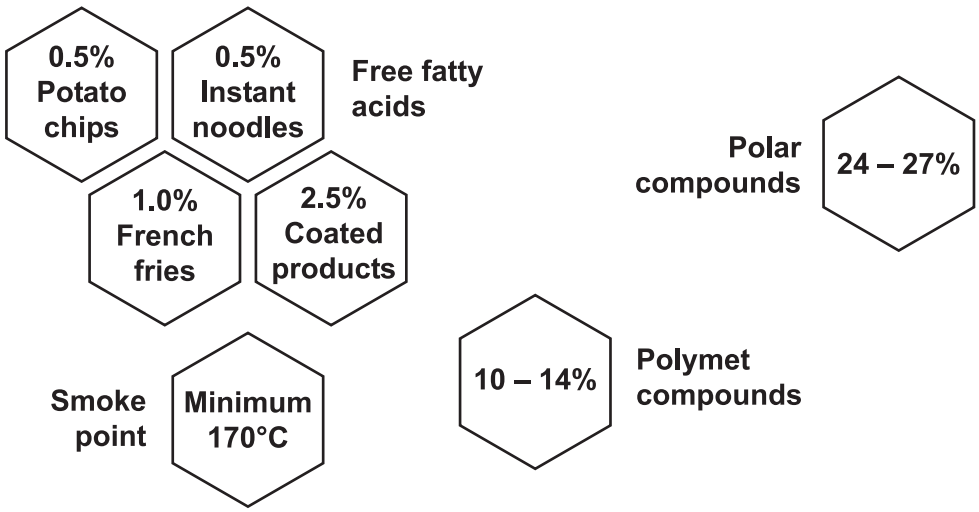
Industrial frying

- The Biggest Application : > 50% of the total oil used in food applications.
- Continuous Frying Condition : Most of the snack food is produced in mass quantities.
- Frying Oil Selection : Price, heat stability, and quality of the finished product.

How much oil is in your favourite snacks?

- Potato chips 30 - 40%
- Tortilla chips 22 - 26%
- Frozen French fries 4 - 7%
- French fries 12 - 15%
- Breaded products 13 - 20%
- Battered products 14 - 17%
- Instant Noodles 18 - 21%
- Doughnuts 22 - 26%

Thresholds of used oil



Consumers perspectives

"…Consumers are looking for fried food with least amount of oil without compromising with its appearance, taste, flavour and texture attributes…"

"…Oil quality and stability are of major concern as significant amount of frying oil is becoming part of fried food…"

"…Food industry is searching for strategies to reduce the operational cost of frying by reducing oil uptake as well as minimising oil quality deterioration…"

Virgin coconut oil (VCO) was heated to 180 C in a stainless steel wok and used to deep-fry 1 kg sliced sweet potatoes. VCO were heated five times (5HVCO) and VCO heated ten times (10HVCO),	Conclusion: Repeatedly heated VCO caused an elevation in the BP. The BP elevation was associated with a significant increase in the inflammatory bio-markers (VCAM-1, ICAM-1 and CRP), TXB2 and a significant reduction in the plasma PGI2 level.	Hamsi et al. (2015)
4L of oil was heated (above 300°C) above its smoke point for 30 min and then cooled to room temperature. From this, 1L was separated and labeled as singly heated cooking oil(SHCO). The same process was repeated to obtain oil heated 3 times (3RHCO).	Results of the present study confirm that the thermal oxidation of cooking oil generates free radicals and dietary consumption of such oil results in detrimental health effects.	Venkata & Subramanyam (2016)

Reused palm oil and sunflower oil were collected from the fast food joints and restaurants located in and around the Mangalore. (Recycled for 6 to 8 times).	Conclusions : From the present study, it can be concluded that reused sunflower oil and palm oil, can be toxic and can cause considerable damage to the vital organs of the experimental animals.	Shastry et al. (2011)
The corn oil was depleted of Vitamin E (ICN Biochemicals) and then oxidized by heating for 2 hours at 100°C.	Conclusions : the present study indicates that dietary oxidized lipids accelerate fatty streak lesion formation in rabbits.	Stapran et al. (1996)
The present study tested the hypothesis that dietary oxidized lipids accelerate the development of atherosclerosis.	Oxidized lipids are frequently present in the typical US diet, and our results suggest that consumption of these foods may be an important risk factor for atherosclerosis. Rabbits that were fed the oxidized-lipid diet had a >100% increase in total cholesterol in the pulmonary artery that was primarily due to an increase in cholesteryl ester.	

Could they be one of the risk factors for coronary heart disease?

- Epidemiological evidence has shown relationship between oxidised fat diets & the incidence of cardiovascular disease (Cohn; 2002)
- Several studies in experimental rabbits have shown that dietary oxidized fats promote the development of atherosclerotic plaques (Stapran *et al.*1994)
- Oxidized fats can result in both injury and dysfunction of macrophages, smooth muscle or endothelial cells (Chisolm & Steinberg; 2000)
- Vast studies have demonstrated that oxidized lipid converts lipoproteins to a more atherogenic form and that oxidized lipoproteins may play roles in atherosclerosis that eventually could cause coronary heart disease

Animal studies

- **Hamsi et al. (2015)**

  → repeatedly heated oil causes an elevation in the Blood Pressure (BP). The BP elevation was associated with a significant increase in the inflammatory bio-markers (VCAM-1, ICAM-1 and CRP), thromboxane A2 (TXB_2) and a significant reduction in the plasma prostacyclin (PGI_2)

- **Venkata & Subramanyam (2016)**

  → the thermal oxidation of cooking oil generates free radicals and dietary consumption of such oil results in detrimental health effects. Results showed elevated levels of glucose, creatinine and cholesterol with declined levels of protein and albumin in Wistar rats treated with repeatedly heated cooking oil.

- **Shastry *et al.* (2011)**

  → reused edible oil, can be toxic and can cause considerable damage to the vital organs of the experimental animals.

Specifications of frying oil

Properties	**Conditions**
Free fatty acid	< 0.1%
Peroxide value	< 4 meg O_2 kg-1
Smoke point	> 200°C
Polymer compounds	< 1%
Lauric acid content (C12:0)	< 1%
Linolenic acid content (C18:3)	< 2%
Induction period	> 15 h
Colour	Light yellow
Flavour	Bland

Blending liquid oils with palm olein for heat stability improvement in cooking oils

Country	Brand	Formulation
Malaysia	Neptune	Palm olein + Groundnut oil + Sesame oil
Vietnam	Marvela	Palm olein + Soybean oil + Canola oil
China	Tinghao	Palm olein + Groundnut oil
South Korea	Bosco	Palm olein + Rice bran oil
India	Godrej	Palm olein + Soybean oil
Algeria	Nakheela	Palm olein + Corn oil
South Africa	Fryall	Palm olein + Cottonseed oil
Italy	Frimax	Palm olein + Groundnut oil
Greece	Friol	Palm olein + Groundnut oil
USA	Smart Balance	Palm olein + Soybean oil + Canola oil + Olive oil

Manage your frying process

Loading and Storage	Frying Temperature
● Ensure the capacity of the storage tank / container is fully maximised to reduce headspace ● Fill the tank from bottom to avoid flashing and aeration ● Heat the oil at least 10°C above the melting point prior to loading for storage – palm-based oils ● Certificate of Analysis (COA) must be enclosed with the oil during delivery ● Preferably to utilise the oil as soonest – avoid pro-long storage	● Depend on food dimensions, matrices, structures ● Identify the optimum temperature and time for frying ● Slow heating of oil to minimise oil abuse ● Never let the heated oil idle – oxidation rate is at the highest stage ● Frying temperature must not exceed 200°C

Manage your frying oil

Oil filtration	Oil replenishment
● Skim food residues or particles on a regular basis to avoid oil breakdown – impart burned flavour in food and darkens the oil ● High level of minerals such as zinc, iron and copper in food residues could cause acceleration in oil oxidation	● Oil uptake by food must be only compensated only with fresh oil at predetermined frying intervals i.e. at the next-day of frying operation ● Avoid replenishment using used (abuse) oil – leads to foaming and accelerates breakdown of originated oil

manage your fryer

Fryer selection	Fryer hygiene
● Indirect-heating fryer is more preferable than the gas-flame fryer – causes hot-spot on the fryer surface ● Install thermostat to the fryer system – monitoring temperature profile ● Fryer to be fabricated using stainless steel – copper based alloy and brass could cause formation of soap and therefore oil breakdown	● Fill and rinse / circulate the fryer using hot water – repeat for few times ● Fill the fryer with a water-caustic soda solution and rinse / circulate for few hours at 80 oC ● Empty the fryer and repeat the first procedure ● Fill the fryer with water-vinegar solution, rinse (or circulate), discharge ● Repeat the first procedure until the pH of water inside the fryer is similar with the tap water

CONCLUSION

Consuming repeatedly heated cooking oil should be restricted due to the detrimental consequences on health.

Ack / Courtesy :
Azmil Haizam Ahmad Tarmizi, Che Anishas
Che Idris and Miskandar Mat Sahri, Malyasia

Diabesity : Focus on Insulin Regulation Rather than Dietary Fats

SH Goh and LY Chung

UTAR and University of Malaya Department of Pharmacy

Introduction

Agricultural success, or the Green Revolution, has provided in abundance of grain crops with declining prices over the past several decades, thus supporting the present world population of over 7.2 billion people. This abundance of carbohydrates had a significant influence on the design of the common food pyramid (e.g., USDA, AHA, etc.), which emphasizes grains and carbohydrates at the base. Furthermore, by the 1980s, bountiful harvests of corn became available, and high-fructose corn syrup became widely used, for sweetening of food and drinks. With carbohydrates and sugars being ubiquitous in diets for decades, obesity and Type 2 diabetes (T2D), together referred to as diabesity, have become prevalent in developed and developing countries. Diabesity is currently a growing problem (if not already an epidemic), with over-eating/over-nutrition in many "Western" diets, which are carbohydrate-centric at the base of the food pyramid but limited in dietary fats (placed at the very top). However, many communities with ethnic diets, which are low in processed carbohydrates and sugars, were unaffected until foods similar to Western fast-food diets became popularised or adopted (e.g. migrants to the US). Newer food pyramids and "My Plate" [USDA, 2011] have corrected the base of the pyramid slightly but still remain carbohydrate-centric with an emphasis on vegetables and fruits and added physical activity. There is more emphasis of low-glycaemic, whole grain foods, and physical activity is included but animal/marine proteins with their derived nutrients seem to be insufficiently emphasised.

Whereas dietary fats had once been considered the cause of obesity, recently the focus has correctly changed to sugars and carbohydrates, the excess of which are known to be metabolised readily to stroage fats. This outcome can reasonably be expected from a better understanding of the role of insulin/hormone regulation in the metabolism of dietary fats and sugars, wherein the fats are preferably metabolised for energy, and the excess carbohydrate sugars are converted to storage fat. This possible explanation is in line with epidemiological observations of increasing diabesity over the last five decades despita the many dietary guidelines available. Only recently, the dietary recommendations have been shifting towards fewer sugars and low-glycaemic index (GI) carbohydrates.

However, the dogmatic fear of dietary fat has led to widespread popularisation of low-fat products in supermarkets (with the calories shifted to carbohydrates by default); such practices will not help in reducing the body-weight of consumers. The role of fats, particularly saturated fats, in the diet is also put in a better perspective by recent reviews [Harcombe *et al*, 2015; USDA, 2015].

Diabetes

Dietary recommendations based on high-carbohydrate diets means that the body has to manage increasing blood sugars with increased insulin secretion. High levels of insulin can cause cellular resistance or insensitivity to insulin, and some effects of high insulin can also be damaging in the long run. Over time, insulin resistance leds to T2D [Rosedale, 2011].

Diabetes has affected civilized man since time immemorial, with tell-tale signs of high levels of sugar in the urine and blood. In earlier times, medicine had to address Type 1 or childhood diabetes caused by an in-born deficiency of the pancreas (or a deficiency caused by damage from a developed autoimmune disease) to secrete adequate amounts of insulin. In the modern world, with abundant food and a comfortable lifestyle, T2D has become a global problem and can be regarded as an epidemic in some societies. T2D was initially considered to be an adult-onset diabetes but is now of broader concern, because it has been affecting some children, as more people are adopting improper diets and lifestyles. T2D is often associated with obesity, hence the discussion of diabesity, but there is probably no causal relationship. As a milder form of diabetes, T2D develops with age and is recognised as partly genetic and partly environmental. The common link is in metabolic pathways involving insulin and in metabolic dysfunction arising from insulin resistance, which has led to a rethinking of the dietary contributions towards obesity, insulin resistance and cardiovascular disease.

Diabetes can be frightening disease, having been referred to as ‘silent living death’ or ‘living death’, as complications of high blood sugar wreak irreversible damage on many organs. Early symptoms are frequent urination and an excessive need to drink water. For several thousand years, diabetes was thought to be a disorder of the kidney and bladder. From ancient Egyptian, Greek, Roman, Chinese and Indian texts, the “excessive emptying”, “sweet flow” and “honey-like” urine led to the medical term *diabetes mellitus*. Diabetes is a serious condition, and ancient Romans referred to it as “a melting down of fresh and limbs into urine”, as occurred with untreated patients wasting away until certain death. Complications of the disease can include nerve damage, blindness, and unhealed wounds leading to amputations [Patlak, 2002]. Premature deaths result from heart disease and

strokes, as excessive circulating sugar molecules cause Maillard-type reactions (as occurs during cooking) involving proteins and oxidised polyunsaturated fats (glycation); sometimes inflammation ensues, eventually leading to the formation of cholesterol plaques in the arteries.

Insulin

Scientists of the early 19th century discovered the pancreas organ, the removal of which from animals caused diabetes. Later came the discovery of the hormone insulin, the polypeptide protein secreted by pancreatic islet β-cells. Since then, regular insulin injections have provided miraculous relief for diabetes patients. However, in the 1930s, a new problem was discovered (Harold Percival Himsworth). Whereas Type 1 diabetes could be cured by insulin, T2D differed in that an insensitivity (or resistance) of the body towards insulin occurred despite there being a sufficient level of insulin in the body. While Type 1 diabetes (sometimes referred to as juvenile diabetes) is mainly genetic and affects mostly the young, T2D is only partly genetic and develops gradually, primarily affecting the middle-aged and the elderly. There are drugs and herbal supplements to treat the symptoms and outcomes of T2D, but there is currently no complete cure.

The insulin hormone has wide-ranging roles in metabolism, although the principal roles are in the storage and release of energy molecules. Its normal function during an intake of carbohydrates, providing glucose, is to store this mainly in the liver as glycogen; however, high levels of glucose promote metabolic conversion to fats. When the need for energy arises, insulin promotes the release of fatty acids for metabolism and then glucose release. Storage as glycogen is limited in the liver and muscler, and most of the excess glucose needs to be converted to saturated fat for storage (skin, ectopic and abdominal fat). Insulin is also an anabolic hormone and helps in storing protein in muscles, as is well known among body builders.

Insulin also helps in the storage of Mg, which in turn is needed for the action and production of insulin. As insulin production requires Mg, the loss of Mg starts a vicious cycle towards insulin resistance. The lack of Mg causes vessel constriction and high blood-pressure. High blood-pressure is a major risk factor in cardiovascular disease (CVD). Insulin also causes sodium retention, leading to fluid retention and thus elevated blood-pressure.

The data for normal insulin-promoted metabolism of nutrients in healthy centenarians show low levels of glucose and triglycerides and therefore the absence of chronic diseases of ageing. It appears that it is insulin resistance that cause metabolic disorders (metabolic syndromes), which further give rise to chronic diseases, diabesity and heart disease. Insulin resistance has also been implicated in the loss of Ca, leading to osteoporosis.

There are even some reports of correlations of breast and colon cancer with insulin levels.

Insulin and high glucose levels also affect the release of other hormones, such as cortisone and epinephrine. In addition, insulin can act on the hypothalamus and thus stimulate the sympathetic nervous system. Metabolic pathways (NAD) and are in many ways associated with related primary molecules, such as nicotinic acid, nicotinamide, niacin and components of B vitamins. It is not unusual to find these molecules as essential micronutrients to be consumed in the diet or as supplements for the needy.

A summary of the roles played by insulin and the resulting insulin resistance may be insightful (Table 1). However major gaps remain in our understanding of the complex, multi-faceted regulatory mechanisms of metabolism.

Table 1. Summary of the role and effects of insulin and insulin resistance

	Molecular Effects	**Effects**	**Other Effects**
Insulin↑	Lipoprotein lipase↑, fat storage	Leptin↑ & Leptin resistance (inflammatory prostaglandins↑) ; Apidonectin↓	Fat burning inhibited but TG stored in fat cells - obesity
	Na retention	Fluid retention	BP↑
	Cortisol↑ (serotonin↓)	Sleep disruption, stress (depresion, anxiety)	Obesity
	Cortisol↑ (insulin↑)	Abdominal obesity	Muscle breakdown (”burning”)
	amylin↑ co-secreted	Regulation of glucose spikes	satiety
	glucagon↓, GH↓	Moderating response of insulin	Fab “burning” reduced
	PPAR-γ↓	Insulin resistance	
Insulin resis-tance	Ca↓	Loss of Ca	Osteoporosis
	Mg↓	Loss of Mg	BP↑
	glucagon↓↑, GH↓↑ adiponectin↓	Impaired responses; low release of FFA from stored TG	Fat release down, increase ectopic fat; obesity
	PPAR-γ↓, LDL↑, TG↑	Small dense LDL↑	CHD
		inflammation	Ageing & chronic diseases
		Cellular proliferation	Breast & colon cancers?
	Leptin↑ Sirtuin↓↑	Increase TG storage	Obesity; Alzheimers?

↓= decrease; ↑= increase; ↓↑= unregulated; BP = blood pressure; Ca = calcium; FFA = free fatty acids; GH = growth hormone; LDL = low density lipoprotein; Mg = magnesium; PPAR = peroxisome proliferator-activated receptor; TG = triglycerides

Fats, Sugars and Obesity

T2D is often associated with obesity, although there is probably no causal relationship. However, recent findings indicate possible genetic links [Shungin *et al,* 2015; Locke *et al,* 2015]. The common link is in insulin and insulin resistance, and this idea arose from a re-evaluation of the dietary contributions towards obesity and insulin resistance. As noted above, it has been the success of agriculture that has influenced the carbohydrate-centric food pyramid and later the My Plate guidelines [USDA, 2011; USDA, 2015]. The low price and ready availability of sugars, especially fructose, have added much to promote sweet desserts and bottled drinks, which in excess, are now recognised to cause problems in insulin regulation. Whereas dietary fats had once been considered the cause of obesity, attention has correctly turned to sugars, which can readily be metabolised to storage fats. Incidentally, the incidence of obesity and T2D has increased concurrently in countries with high-carbohydrate diets for almost 5 decades, although during this period there was also an increased consumption of *n*-6 oils and margarine (soyabean, corn, canola and sunflower). Dietary guidelines are not being shifted to recommend lower levels of carbohydrates and sugars, but low-fat products have been ingrained in consumer thinking and are still widespread in supermarkets. This prevalence is not helping in the diabesity epidemic. However, the neew USDA guidelines (USDA, 2015) have recognised the flawed notion that saturated fat and cholesterol are unhealthy. Restrictions on dietary fat, saturated fat and animal protein (which also supply other nutrients and vitamins), are likely unwise, as their replacement by refined carbohydrates and processed polyunsaturated fats (especially containing *trans* fats from partial hydrogenation) can lead to more obesity and chronic diseases.

Researchers can now monitor blood insulin using an ultra-sensitive radioimmunoassay technique discovered at the time of the T2D discovery; laboratory assays for insulin currently use immunological methods. Early experiments found that T2D patients had surprisingly high insulin levels, but there was a lack of sensitivity (insulin resistance) of the bodily tissues to metabolize sugars. It is reasonable to conclude that a high-carbohydrate and low-fat diet (with caloric energy mainly from processed grains and sugars) may give rise to sustained high insulin levels (and later lead to insulin resistance). Insulin resistance affects liver cells, first making them unable to metabolism blood glucose to storage glycogen; then, muscle cells become affected, followed by fat cells. Insulin and sugar-protein conjugates (glycation products) cause inflammation and can also cause vascular damage, which can lead to cardiovascular diseases. Insulin resistance is associated with metabolic syndromes with characteristic poor lipid profiles, which are risk factors for cardiovascular diseases.

Among the dietary oil and fats, saturated fats have long been singled out at undesirable in the diet, even without solid scientific evidence. Being mainly solid and the most calorie-dense constituent of fat is meats, saturated fats may seem, by simplistic perception, to become body fat. The main problem is that saturated fatty acids have not been properly understood, as they are of different types in terms of chain length, being short (in dairy fats), medium (in coconut and palm kernel) and long (in most vegetable oils and animal fats). Furthermore, they are consumed as various structural forms of triglycerides depending on the source [Goh, 1999; Ong and Goh, 2002], and their absorption, metabolism and nutritional effects differ widely. In relative terms, some of the medium and long-chain saturated fatty acids cause slightly elevated levels of total blood cholesterol (HDL-c), unlike polyunsaturated oils. It is now recognised that the total cholesterol/HDL-c ratio provides a better indicator, and thus saturated fat can be superior compared to polyunsaturated oils. In fact, the relative saturated palm oil and palm olein (40-50% saturated) are known to be resistant to oxidation and do not give rise to the more atherogenic small dense LDL (sdLDL) [Basiron, 2015; DiNicolantonic, 2014; Ong *et al,* 2014] which is considered to be the most damaging LDL particles to the endothelium. Altheroma (plaque deposits) in arteries is through to arise from free radical-induced oxidation of polyunsaturated fats and cholesterol accumulation that is followed by calcium deposits.

Furthermore, contrary to mistaken perceptions, most body fat originates not from the intake of dietary fat but from the body's biosynthesis from dietary carbohydrates, with the dietary fat (if not in excess) being mostly metabolised to energy. Endogenous fat synthesised by the body form a high-carbohydrate diet is saturated, and a high fat diet could additionally contribute to body fat, especially in individuals with T2D or metabolic syndromes. The obesity epidemic in the US coincided with the early recommendations of the USDA and other institutional bodies for a low-fat diet; low-fat diets require the acquisition of calorific energy from carbohydrates. However, Sweden, with only about a 14% obesity problem, had rightly reported that a low-fat diet is not the answer to obesity problems and that a reduction of calorie intake is needed; an update of the low-carbohydrate-high-fat diet may thus be needed [SBU, 2013]. However, such an update demands a dramatic change from the enternched dogma against dietary fats.

One of the tragedies of bad science has been Ancel key's notorious "mistaken" correlation of fat intake with cardiovascular mortality [Hoenselaar, 2012; Gunnars, 2012]. The phenomenon has contributed to the fallacies of low-fat and low-saturated fat diets. By focusing on 7 countries, a positive correlation was made from the data of Japan, Italy, England & Wales, Australia, Canada and the US, with paradoxes coming from France

(high intake of saturated fat) and israel (high intake of polyunsaturated oils). However, taking the date of Israel, Austria, Switzerland, Germany, the Netherlands and Norway would have produced a negative correlation [Gillespie, 2013]. Date from approxinately 40 European countries on CHD mortality vs. saturated fat intake showed a low negative (not positive) correlation (R^2 linear = 0.34). Finally, Chowdhury [Chowdhury *et al,* 2014] performed a large meta-analysis, covering almost all studies, and found that "total saturated fatty acid, whether measured in the diet or in plasma as a biomarker, was not associated with coronary disease risk", thus dismissing any doubt about this correlation.

In the late 1950s, the American Heart Association (AHA) favoured the consumption of polyunsaturated fat over saturated animal fats, especially margarine, not considering that partial hydrogenation of polyunsaturated oils is needed. It is only since the early years of the 21st century that the use of *trans* fats has been limited or banned, when statistics on heart disease showed no improvement despite the emphasis on low levels of blood cholesterol and the use of "polyunsaturated oils". Cholesterol has also been badly understood, partly because statin drugs have been a big business. The CHD risk actually does not show any correlation with increasing levels of blood cholesterol (R^2 linear = 0.016). All-cause mortality vs. cholesterol is a U-shaped curve, showing, surprisingly, that a moderately high cholesterol level (approximately 220 ml/dL) is at the minimum of the curve, while cardiovascular mortality has a minimum at approximately 205 mg/dL [WHO, 2011]. The current medical guide may apparently be considered slightly off at 180 mg/dL. The analysis of studies on dietary fat and cholesterol leads to a notion that "undermines the role of serum cholesterol levels as an intermediary to the development of CHD and contravenes the theory that reducing dietary fat generally and saturated fat particularly potentiates a reduction in CHD" [Taube, 2007; Harcombe *et al,* 2015].

Insulin Resistance and Diabetes

The modern sedentary lifestyle and diet have likely been the cause of many health problems, chronic diseases and even ageing. It is the abundance of processed carbohydrates in the food that has stretched the proper functioning of insulin. Continually high glucose intake must have caused slow and increasing insulin resistance, perhaps initially to a pre-diabetic stage. Increasing insulin secretion (hyperinsulinemia) provides no further benefit, as there is insulin resistance, until the T2D stage is reached (elevated glucose levels in fasting blood). High levels of insulin and glucose glycation products cause inflammation, followed by endothelial damage with cellular proliferation, and then a further chain of events, including vessel constriction, platelet adhesion, clotting, and plaque formation. There is an associated increased excretion of Mg (which is needed for muscle relaxation) and Ca (causing bone loss). Together the the onset of T2D, other serious health problems

develop, such as obesity, high blood-pressure and cardiovascular diseases. Diabetes and heart disease are intertwined by a similar cause of insulin resistance.

There are related metabolic disorders (metabolic syndromes of diseases) that involve sugars as well as fats. Metabolic disorders can manifest in poor blood parameters - high LDL-c, Low HDL-c, and high TG, CRP, insulin and glucose - and ca lead to T2D. T2D is clearly a complex development, involving multi-faceted, dysfunctional metabolic pathways. It is the dominant form of diabetes, accounting for ~95% of cases, with T1D accounting ~5%, while another uncommon form (gestational diabetes) appears in up to 10% of pregnant women.

T1D can be considered genetic, unless the pancreas becomes damaged by some disorder, such as an autoimmune disease. Ancient traditional Chinese medicinal reports were quite correct in trying to medicinal diabetic patients with animal pancreatic parts but without knowing that the hormone insulin can poorly survive the digestive tract. It is now well known that diabetic management can be achieved with commercially available insulin injections. The interesting stories of the discovery of pancreatic insulin, as well as the structure, synthesis and commercial production of insulin, are marvels of modern science [Patlak, 2002].

T2D occurs ovea a lifetime, manifesting as an inability of the body to regulate insulin production and usage, leading to elevated blood glucose levels. It may not necessary result from the absence of insulin but rather from the phenomenon of insulin resistance, involving first the liver and then the muscle tissues and later the fat cells. There are complex biochemical processes involved in metabolism, and the initial disorder is generally considered to be a metabolic syndrome. As T2D is commonly associated with obesity, adipocytes (fat cells) are also involved at a leter stage in becoming insulin-resistant.

T2D development has been recognised as a complex process, involving both genetic and acquired factors (poor diet, weight gain and inactivity). The traditional *Ayurvedic* medicine correctly looked for a holistic treatment. In addition to high glucose levels in the blood, poor blood lipid profiles, present in metabolic syndrome cases, can provide important indications. Tpically, high levels of free fatty acids become a manifestation of insulin resistance of fat cells, where lipolsys (storage of fat or release of fatty acids for metabolism to energy) is impaired. Constant high levels of free fatty acids have the deleterious effects of impairing insulin secretion by the pancreas and causing insulin resistance in the liver and muscle.

T2D is a complicated mix of dysfunctional metabolic pathways, involving metabolic hormones and co-factors, other hormones and enzymes, and the storage, digestion and

absorption of fat and sugar (Table 1). Treatments with traditional and modern medicines may therefore act to target some of the multiple pathways involved in causing chronic elevated glucose levels. Some treatment options depend on supplementary vitamins and dietary factors.

Diet and Lifestyle

The dietary approach in central in curing insulin resistance, pre-diabetic conditions and (in part) diabetes. It is over-nutrition and sedentary lifestyles that lead to insulin resistance of impairment of insulin secretion, followed by T2D. Caloric restriction is thus expected to be benefical and has been clearly shown to prolong longevity in animal studies. Taking this direction, with the use of nutrient-dense foods, should lead to optimal nutrition. Nutritional recommendations that are supported by a large body of scientific evidence include the following.

- Fibre, especially from natural and unprocessed dietary sources, such as vegetable and fruits, is generally recommended.
- Fish or marine proteins (without excessive murcury or radioactivity) and long-chain omega-3-rich fish oil sources are recommended.
- Most nuts (for example, walnuts and almonds) are useful for diet.
- Among oils and fats, those with relatively high oleic acid levels are favoured, including olive oil and increasingly, palm olein. Fat is still chosen to be the major energy source.
- Consumption of *n*-6 polyunsaturated fats must be limited, and essential needs are to be balanced with *n*-3 oils. Partially hydrogenated oils and *trans* fats should be avoided or eliminated totally. Saturated fats, especially with medium-chain fatty acids (coconut and palm kernel), are beneficial and there is the satiety factor. It is still unclear whether excessive short-chain fatty acids from daily may have any undesirable effects.
- Increasing evidence suggests that there is no association between the consumption of saturated fat and cardiovascular-related mortality.
- Exogenous cholesterol from dietary sources contributes to the total blood cholesterol, but these levels are minor in many instances compared with the endogenous cholesterol biosynthesized in the liver. Eggs, once considered to be potentially harmful due to their high cholesterol content, are now regarded as wholesome - particularly when coming from free-range hens that are fed to enhance the content of minerans and *n*-3 fatty acids.

- Micronutrients and minerals need to come from dietary sources - animal or vegetable; the former can be a good contributor.
- Grains and carbohydrates, unlike in the conventional food pyramid (USDA etc.), should be less emphasised in the diet. Carbohydrates and sugars (socrose, glucose and fructose) are used to provide a secondary energy source, unless one needs them because of vigorous physical activity.
- Heavy meals should be followed by physical activity, and the last meal of the day is to be the lightest; a dietary pattern to suit individual needs.
- It is assumed that sufficient fresh water is available.
- Obviosously, general beneficial diets are for healthy individuals, free from undue stress.

The discussions of dietary needs point to suitable diets consisting largely of fish, seafood and animal proteins and nutrients derived from them, eggs, high-fibre fruits and vegetables, a balanced mix of oils and fats (with sufficient *n*-3 oils), nuts, whole-grain carbohydrates (low-GI), minerals and essential micronutrients. These should be at the base of the food pyramid. It is noted that organ meats are not excluded despite the fear of cholesterol previously, as they contain minerals and essential micronutrients. High-GI (glycaemic index) carbohydrates from processed grains, sugars and *n*-6 polyunsaturated oils should be minimuzed and positioned at the top of the food pyramid. For reasons that are not particularly established, red meat consumption should also be limited. The dietary notes provided are close to the paleo (hunter-gatherer) diet and similar to the high-protein and fat diet of Atkins (except for an emphasis on fresh fruits, vegetables, nuts and unprocessed seeds and grains). Perhaps mankind had not evolved sufficiently to handle modern-day processed foods from agriculture, such as abundant grains and dairy products. The Mediterranean diet is considered to be favourable if it remains high in fish and seafood, fresh fruits (and nuts) and vegetable and high-oleic oils (e.g., olive or palm olein/superolein [One *et al,* 2014]); it should also have balanced *n*-3/*n*-6 polyunsaturated oils, limited amounts of carbohydrates and sugars and low levels of high-GI carbohydrates. Diets types will remain controversial, because they need to be individualized, much like personalized medicine [Gardner, 2007]. The Swedish diet recognizes that refined carbohydrates and sugar, rather than fats, contribute to obesity, but other Nordic diets are still entrenched in the fat dogma. The standard American diet may just be oversized and too high in *n*-6 polyunsaturated fats (inclusive of *trans* fats) and sugars.

The choice of diets above may seem restrictive in comparison with the mass-produced and well-processed foods available. If other alternative diets and food intakes are not

presented in excess, it is still possible that the average individual and his/her gut microflora should be able to manage reasonable well. A word of caution may be added, that modern production methods for protein may be using too much chemicals, antibiotics and growth hormones. However, choices are available for produce to have less or these harmful substances and to ensure how well the animals, fish and eggs are produced. Finally, diets, as with adjunct medical treatments, are now considered to be personalized, especially in terms of developing possible chronic ailments. Much of the variations in this regard, of course may be due to differences in individual DNAs, epigeneties and even in the gut microbiota.

Choice of Herbs and Spices in Food

Much of the discussion above on chronic diseases, especially diabetes, depicts some undesirable consequences of modern available diets and lifestyles. As is known, chronic diseases have been around since the beginning of civilization, and some wisdom may be gathered from ancient quotes, e.g., “Let your food be your medicine, and your medicine be your food” - *Hippocrates;* “When diet is wrong, medicines is of no use. When diet is correct, medicine is of no need” - *Ayurverdic* proverb; and “He who takes medicine and neglects diet wastes the skills of the physician” - Chinese proverb. Yet there should be a healthy and happy balance in food choices, e.g., “Man is what he eats” - *Lucretius;* and again “What is food to one, is to others bitter poison” - *Lucretius;* and “Human beings don’t eat nutrients, they eat food.” - *Many Catherine Bateson;* and further “The secret of success in life is to eat what you like and let the food fight it out inside.” - *Mark Twain*. There are paradoxes and contradictions, but fortunately, in the diversity of culinary practices around the world, there are good tasting and healthy choices in nutritious foods. Beneficial herbs and spices are much used in many sophisticated cuisines.

Natural Products with Anti-Diabesity Action

Natural products are highly varied in structural types and work over many biochemical pathways. Much like the limited understanding of diabetes, the functions of the wide varieties of chemical types of natural products have yet to be fully evaluated. Only some progress has been made, as specific chemical structural types are now known to act on certain biological pathways, enzymes of genes. Towards fighting diabesity, many natural products are reported to act generally, such as hypoglycaemic agents, α-glycosidase inhibitors, sirtuin regulators, and PPAR activators, or even broadly as anti-oxidants. It is therefore common to find products from natural sources in various combinations, with actions on various receptors involved in metabolism and with some relieving the disease sysmptoms but without providing a complete cure.

Guanidine is a natural product from *Galage officinalis* (French lilac, Goat's rue) that is used to treat diabetes. This chemical blocks the breakdown of glucose-1-phosphate (from stored glycogen). The modern drug metformin (dimethylbiguanidine) is a less toxic direvative of the original natural product. The natural alkaloid berberine has several anti-diabetic properties and is sometimes considered to be better than metformin. A large number of flavonoids, anothocyanins, xanthones and other phenolics (catechins and theaflavins) are generally considered to be anti-oxidants (and/or with other functionalities) and are useful in moderating many pathdays to or in diabesity conditions [Chuah *et al,* 2006]. One of the better-known antioxidant polyphenolic flavonoids, (-)-epigallocatechin gallate and theaflavin-3, come from tea, whereas tocotrienols are from palm and rice-bran oils. Curcumin, from common curry-spice mixes, has many useful properties apart from being a powerful antioxidant. Nutural B-vitamins are useful natural supplements for prevention and "reversal" of diabesity. Many saponins can act in different ways, including the inhibition of α-glucosidase, which blocks the breakdown of carbohydrates of glucose for absorption. Some natural products act on related metabolic pathways, e.g., sterols in inhibiting cholesterol absorption. Various structural types, including terpenoid glycosides, are active as glucosidase inhibitors.

Spices and Herbs

The common problems of unsuitable modern diets have been noted to be mainly in consumption of excess processed foods, salt and sugar. The use of herbs and spices in cuisines helps to reduce the dependence on these excesses in the food. Among the useful foods for consumption are spicy malay salads consisting of combinations of *Cosmos caudates* (*Ulam raja,* rocket), *Centella asiatica* (*Pegaga,* pennywort), *Ocimum basilicum* (*selasih,* basil), *Carica papaya* (*Betik,* papaya), *Allium cepa* (*Bawang,* onion), *Allium sativum* (*Bawang putih,* garlic), *Capsicum annum* (*Cabai,* chilli), *Psophocarpus tetragonolobus* (*Kacang botol,* winged bean), *Parkia speciosa* (*Petai*), *Piper nigrum* (*Lada,* peppercorn), *Piper sarmentosum* (*Daun kaduk*), *Curcuma longa* (*Kunyit,* turmeric), *Zingiber officinate* (*Halia,* ginger), *Cinnamomum* spicies (*Kulit cinnamom,* cinnamon, etc. Additionally, one may include the lyrical "parsley, sage, rosemary, and thyme".

Fresh Vegetables and Fruits

Asian cuisines frequently utilise herbs and spices, which are useful for long-term adjunct treatment of diabetes, hypertension, obesity, and cardiovscular problems. Fresh fruits are vegetables (if not overly sweet or full of digestible carbohydrates) are useful for providing fibre, minerals, vitamins and natural products [Chuah *et al,* 2006]. Some of the more prominent plants are summarised below.

Parkia speciosa (Petai) provides edible seeds from beans of the legume tree, which are widely used for food preparations in S. E. Asia; in Malaysia, they are usually cooked with *Sambal* (a mixture of chilli-prawn paste and ingredients such as garlic, ginger, shallot, sugar, lime juice and fish sauce). Various medicinal properties are attributed to this plant, including relief of diabetes and lowering of blood-pressure and cholesterol levels. There are anti-inflammatory and antioxidant components, and the seeds are high in nutrients, including minerals, B-vitamins and others.

Mormordica charantia (bitter melon) is widely used in many countries for diabetes treatment. The fruits, especially for the smaller varient, are used for food in various forms, e.g., fried chisp or stir-fried with meat or salted eggs. The medicinal component of the plant for diabetes treatment has been verified as a protein from the fruit which was shown to bind to the insulin receptor [Lo *et al,* (2014)]. Curcubitane triterpenoids from the fruit also show hypoglycaemic effects [Harinantenaina *et al,* (2006)].

Garcinia mangostana (*Manggis,* mangosteem) and G. camboja are well-known tropical trees whose the fruits are well-commercialized for multiple ethnomedicinal uses, including obesity treatment. Prenylated xanthones, abundant in the fruits, have antioxidant and anti-inflammatory properties, whereas hydroxycitrate has been suggested for ues in appetite and weight control.

Abelmoschus exculentus (*Kacang bendi*, okra, ladies finger) provides important vegetable seed pods worldwide. These are popular as antidiabetic and antihyperlipidemic agents.

Gymena sylvestra (cowplant) has antidiabetic and hypolipidemic activities. The Indian herb is easily grown in the tropics and seems to exert antidiabetic effects through a number of mechanisms. Glucose absorption is inhibited by triterpenold glycoside saponins.

Mangifera indica (mango) is a common fruit that has antidiabetic properties, among others, possibly from polyphenols.

Diospyrus kaki (persimmon) has antidiabetic effects, possibly from flavonoids.

Punica granatum (pomegranate) has antidiabetic and hypolipidemic effects due to its high content of antioxidant phytochemicals.

Supplements

It is currently recognized that a gradual need for nutrient and vitamin supplements may develop due to inadequate or improper diets, especially after the mid-lile years. On an individual basis, there are different needs for nutrients (long-chain *n*-3 acids such as DHA, carotenoids, antioxidants, tocotrienols [Vitamin E] and several minerals) and vitamins (D and B's) and for choices of food sources to acquire them.

Conclusions

Overeating and over-nutrition in an environment of mostly low physical activity have been the cause of the rapidly increasing obesity and diabetes (or diabesity) in the world. In trying to determine dietary reasons for this, it has become evident that the modern agricultural success has provided an abundance of grains (wheat, corn, etc) and dietary fats (dairy, soybean, palm, canola, etc). Only recently have dietary guidelines reversed the mistaken dogma promoting low dietary fats and opposing saturated fats, which had been largely due to the influence of big business interests. Processed grain carbohydrates and corn fructose had dominated choices in food preparations, while *n*-6 polyunsaturated oils from soybean and canola had unfairly displaced the relatively more saturated fats from dairy, meats and other sources. It has taken decades to unravel flawed scientific data, with the accumulating evidences against the excessive consumption of processed *n*-6 polyunsaturated oils (trans fats, hydrogenation, etc) and carbohydrates and sugars; but the diabesity "epidemic" has become very obvious, and the overall mortality and CHD have not declined. The cholesterol factor has also been overemphasised due to vested interests as well as the persistent dogma against saturated fats while many beneficial effects (e.g. medium-chain fatty acids, satiety, provision of good HDL and less formation of the harmful small dense sdLDL), and several other health benefits have been missed.

Attention should now be focused on complex metabolic processes, particularly on insulin regulation. These are long-term effects, as are the development of chronic diseases, such as diabesity and CVD, and a re-evaluation of the dietary guidelines in necessary for diverse personal needs. Even though this topic is controversial, as individual needs are so varied, much can be gained from the available body of knowledge. Basis diets need to contain protein (fish or seafood, meats and some legume vegetables), oils and fats (preferable oleic and saturates) with limited *n*-6 polyunsaturates (balanced with *n*-3 oils), nuts, fresh fruits and vegetables and other minerals and micronutrients (vitamins, antioxidants, etc). Carbohydrates (especially processed carbohydrates) and sugars are to be limited, unless a vigorous lifestyle (e.g., labour-intensive work) demands them. Interestingly, micronutrients - such as vitamins Bs and D, tocotrienols and several natural products of animal and plant origins, including spices - have become recognised as nutritionally important.

Abbreviations : AHA = American Heart Association; BP = blood pressure; Ca = calcium; CHD = coronary heart disease; CRP = C-reactive protein; CVD = cardiovascular disease; DHA = docosahexaenoic acid; FFA = free (unesterified) fatty acids; GH = growth hormone; GI = glycemic index; HDL = high density lipoprotein; LDL = low density lipoproteins; Mg = magnesium; mg/dL = milligram/decilitri; NAD = nicotinamide adenine dinucleotide;

n-3 = omega 3; *n*-6 = ω6; PPAR = peroxisome proliferator-activated receptor; R^2 = R-squared, square of correlation coefficient; sdLDL = small dense low density lipoprotein; T1D = Type-1 diabetes; T2D = Type-2 diabetes; TG = triglyceride; USDA = US Department of Agriculture

Disclaimer

Humans are purveyors of knowledge and information provided is for general interest and healthy living. Individuals with medical conditions need guidance and treatment from qualified medical specialists to receive appropriate medical treatments for their specific and personalised needs.

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Are we Eating Food or Poison?

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Perhaps the best lesson in nutrition science is “Balanced diet”, which proposes that we need a minimum quantum of each nutrient daily. If we go below the value (RDA) different deficiency diseases will precipitate. What we don’t know is the upper limit of these nutrients. It is exceedingly important to quantify the food or nutrition in order to provide right advice even to non technical beneficiary. In recent time court order has restricted the sale of unsafe food by street vendors to school children. Particularly restriction is imposed on HFSS foods (High fat, Sugar & Salt). It has not stated how high is ‘high’. It should be quantified, as fat sugar salt are all nutritionally needed. Ketogenic diets (with 80% fat calorie) has been used for almost 100 years to treat epilepsy.

But the fallacy is that we know the LD_{50} values of most of the nutrients. Hence our nutrients are our poison. With regard to drug, Dr Paul Elrich, known as Father of Pharmacology has appropriately stated that “Every drug is poison, only dosage will define whether drug or poison.” The fact seems to be true in case of food, LD_{50} value of Vitamin A is 500 times RDA.

It is also known that almost each food has pronutritional factors as well as antinutritional factors of varied proportions. Even our staple rice has anti-thiamin activity, though at a low level. This was worked out by a professor of Biochemistry of Calcutta University three decades back. There are many examples. Lathyrus sativas or kesaridal contains BOAA (β oxalyl-amino-alanine) which was discovered by the scientists of National Institute of Nutrition. The above chemical causes lathyrism when taken in larger quantities. Kesari dal is banned in India and cannot be sold for use as an ingredient in the preparation of any article of food intended for sale. This is the mandate in FSSAI-2006 (Food Safety & Standards Act of India). Yet it is being sold and mixed with Bengalgram dal flour as “Besan”, because it is a low cost ingredient.

Soybean has trypsin inhibitor. Tapioca is having cyanogenic glycosides, Phytates in cereals interfare Fe and Zn absorption. Zn deficiency in Iran & Egypt is due to phytates in grains. Oxalates in many vegetables interfare Ca absorption and promotes Uninary stone formation. Goitrogen in cabbage & cauliflower causes goitre.

Our food has also mutagens & antimutagens in varied amounts. Mutagenic compounds are mainly-flavanoids, furans & alkaloids while antimutagenic compounds are polyphenols, isothiocyanates & plant steroids.

The second best lesson in nutrition science is perhaps cited by renowned nutritionist, Dr Arnold Bender “Eat a little bit of Everything, too much of nothing. A good diet is a mixed diet”.

This gives us two lessons -

Firstly the interdependence of nutrients & secondly the individual antinutrients are minimised. But the effect of such minimisation is not well understood, though grossly the effect can be seen. For example the Kesari Dal can be tolerated in smaller quantities alongwith other foods, but larger quantity will cause lathyrism.

This is one side of the coin. These anti-nutrients are inherently present in our food. But we may have to face greater danger from synthetic chemicals externally provided. These are food additives. These additives could be intentional or unintentional. About 4000 chemicals are in the list of intentional additive which are permitted by the food laws or different countries. These could be acidifying, agents, acidity regulators, antioxidants, preservatives, colours, flavours, flavour enhancer, thickening agent, firming agent, anti-caking agent, emulsifiers and related chemicals. But unintentional additives such as pesticide residues, heavy metals residue and mycotoxins are known chemicals. Dehydration is an important technology in food processing which must be learnt properly in order to avoid mycotoxicosis. Several decades back people in the advanced countries were suffering from “Chernophobia”. They are able to mitigate the problem to certain extent by favouring ‘organic’ foods.

Still a greater danger is awaiting us. That is adulteration. When we are hungry we are prone to eat anything. This is how adulteration has crept in our food habits. We have no time to prepare our food in this modern age. That is how service sector is growing.

Not only permissible limits of chemicals are exceeded but unpermitted dyes, chemicals, preservatives are getting into our food. Formaldehyde is being used to preserve fish. Metanyl Yellow is being used in all kinds of our daily diet.

We are dying of diseases and accept it as our own fault. But we don’t accept that we are being killed by our people. WHO has declared India as Second capital of the world after China, where Cancer is spreading like wild fire. They have also predicted that by 2020 every Indian family will have one cancer patient at least on an average. It must be worked out how much of it is due to unsafe food.

Food is our primary requirement. Its safety and quality must be ensured.

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A REVIEW

*The book entitled **"A treatise on Analysis of Food, Fats and Oils"** is an example of unique competence and contribution of the authors, S. K. Roy, N. K. Pramanik and A. R. Sen.*

The book is the first of its kind in India. It covers the traditional and modern analytical methods for the characterization and quality of fats, oils as well as other food items.

The authors are well reputed and qualified and they have applied their collective wisdom and expertise in including and presenting more appropriately and meticulously the analytical methods.

The book can also be viewed as a rarer type as it deals with the statutory and industrial aspects of fats, oils and their products, and pollution control in vegetable oil industry.

In fact these aspects are of extreme use and importance to those concerned with these issues.

The book is already well received by the readers and users in the academic and industiral circles throughout India because of the highly relevent and benefficial methodologies and basic-cum technological information. The book will be recognised in due course of time as one of the top quality analytical books in the area of food, fats and oils.

Prof. D. K. Bhattacharyya
21-6-2003

Regarding availability/price enquiries may be made to :
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BOOK REVIEW

A book entitled “Perfumery Materials, Production and Applications” has been authored by an very eminent Professor (Dr) D. K. Bhattacharyya, Emeritus Fellow (AICTE), Adjunct Professor Bengal Engineering and Science University, former President, O.T.A.I and a Scientist of National and International repute.

The book speaks for itself about his mastery and competence in the discipline of “Perfumery Materials”.

“The book demonstrates the scopes of certain specific reactions and raw materials in producing new synthetics. The enormous scopes of biotechnology involving bio-conversion processes’, with isolated enzymes and by fermentation biotechnology involving selective microorganisms has been indicated in making synthetics. The applications of natural aromatic oils in aromatherapy, food, cosmetics/toiletries, imitation perfumery and allied sector have been included.

Standardisation and evaluation of natural aromatic (essential oils and incidence of their adulteration have been elaborated in order to ascetain their quality and authenticity for sustaining the business in the industry” says Prof (Dr) R.N. Mukherjee, Former, Professor and Head, Deptt of Chemical Engg, University of Jadavpur. The book will fulfill a long felt want in the discipline of Essential Oils and will cater to the various categories of Scholars, Scientists and Technologists. The book has already been well appreciated in India and abroad, though published by the Stadium Press L.L.C., USA.

Those interested to procure a copy of this Valued book on Essential Oils may contact Professor D. K. Bhattacharyya at Phone No (033) 2461 9662.

(S. K. Roy)
Editor

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