

FACTS

against

MYTHS

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INFORMATION BULLETIN

The Nuclear Dietary Regimen: The Myths of Food Irradiation

COMMENT

Food irradiation is the new buzz word in the in the lexicon of food technologists. It involves exposing food to radioactive material so as to preserve them. It is like giving X-rays to food. Such food, it is claimed, is safe to consume and provides a long shelf life to various food products. After all, humans subject themselves to X-rays so there is nothing wrong if our food goes through the same process the proponents claim.

The supporters of this technology are, however, mirror image of those proponents of the current market-driven development paradigm into which nuclearisation has now been incorporated. This mentality, however, is in direct contrast to the increasing disillusionment the world over with this warped perception. In different ways and in different fields, several developments are taking place that clearly indicate an option for a non-consumerist, non-militaristic alternative. Paradoxically, however, the warped "vision" continues to prevail and pursued by those "Orders" interested in its maintenance cloaked

under claims of "breakthroughs". One such "breakthrough" is the investment programme in the food processing industry, viz., the obsession on techniques that preserve and cook food through radiation. Micro-wave ovens have already invaded the market and into individual homes to enable

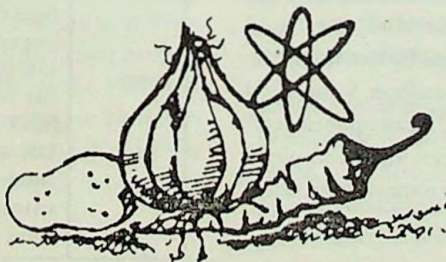
cooking to be completed in a matter of minutes. Those who resist the temptations offered by the micro-wave oven advertisers are not spared irradiated food because the government itself is hooked onto the gimmick with plans to introduce huge "food preservation centres" where items are treated with low-level radiation before being transported to the super-markets like Apna Bazaars or Sahakari Bhandars. Crores worth of public funds are being spent on importing costly equipment that preserves and packages food items using these so-called advanced technologies. Four food irradiators are already in operation in the country with one in Vashi, Navi Mumbai and another five are in fabrication.

Indeed, food irradiation is seen as an integral and important part of India's stride towards the new millennium, the underlying assumption being that our traditional ways of food consumption and distribution need replacement. For according to the supporters of this warped perspective the

rational is that "...with the onset of global integration of the Indian economy in the emerging post-Gatt era, Indian farmers and traders in food materials are on the threshold of an unprecedented opportunity to reach out to the international markets...the Centre

Q – What is wrong with getting a fresh "potato", rather than one bombarded with nuclear waste?

A – So it can sit on a shelf and "appear" fresh?



was likely to clear eight more food products, including fruits, wheat and rice for irradiation..."¹ But are these new technologies really the answer to our all-round development needs? Is it all that certain they represent the wave of the future?

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The reference to 'Indian farmers' in the above quote is clearly not about poor farmers – like those that committed suicide in Andhra Pradesh, Karnataka and Maharashtra. The reference is rather to those profit-maximisation, big agri-business farmers integrated into the globalised market. The long shelf-life that irradiation produces in food will, in the not-too-distant future, ensure that traditional farming and preservation methods etc. will become redundant.

Since its introduction, however, concerned citizens around the world and in India too are now alert to the dangers that irradiated food bring with it giving rise to a number of movements opposing it whilst simultaneously exposing it on health and environmental grounds.

MYTH: *Food irradiation emerged with the need to help agricultural farmers, groceries and consumers overcome their perennial problem of maintaining freshness in food crops, e.g. vegetables, fruits, etc., and the advantage of a long shelf-life.*

FACT: The impetus for food irradiation has not come from farmers, retail grocers or even consumers. On the contrary! Its strongest advocate has been the nuclear industry!

However, the idea of irradiating food is not new. (See Chronology³) Little progress was made until 1953 when the US President, Eisenhower, announced the so-called Atoms For Peace programme. (See also FAM #6/97) Public attention was to be diverted away from the nuclear weapons project by promoting nuclear power and other uses of nuclear technology so that the academic and industrial infrastructure could be developed behind which the project would continue. It also saw it as an opportunity to get rid of nuclear waste. The main push was made by the International Atomic Energy Agency (IAEA) and the Atomic Energy Commission. The Dept. of Energy (DOE), keen to get rid of the radioactive waste Cesium 137, paid companies to take this waste. These companies then lobbied US Congress so they could irradiate food. Cobalt 60 is currently the radioactive source for food irradiation, but the DOE hopes that with the proposed expansion of food irradiation, Cobalt 60, which is in limited supply will run out, and Cesium 137 will again be used.

There are also some of the large meat processors (three MNCs control 80% of the market) which instead of cleaning up their production system, would rather irradiate, as it is cheaper. The irradiation companies lobby the processors, the processors lobby Congress and the FDA (which has on its board former and future executive employees of the food processing and nuclear industries) also lobbies the Congress. In addition, with all of the news about *E. coli* and *salmonella*, the uninformed American Congressmen think they are "protecting" the food supply. Furthermore, the food processing MNCs stand to make billions by extending the shelf-life of some foods as also the million \$ the food processors would save by not having to "clean up their acts" and the government on its part keen on "dumping" radioactive waste in the South. Thus, the issue of food safety is basically a guise.

CHRONOLOGY	
1916	Sweden experiments with irradiation of strawberries.
1921	Patents taken out in USA.
1930	Patents taken out in France
1953	Food irradiation to be one of the atoms for peace technologies. US Army begins research.
1957	Irradiation used on spices in West Germany.
1958	Food irradiation banned in West Germany.
1960	Canada permits irradiation of potatoes.
1963	USA permits irradiation of wheat, potatoes and bacon
1968	USFDA withdraws permit for bacon. US Army studies found to indicate adverse effects and to have been poorly conducted.
1970s	Research programme taken over by IBT Ltd IAEA organises 'expert seminars' and publishes reports on food irradiation.
1976	IECFI relaxes requirement for testing of irradiated foods so that radiolytic products do not have to pass tests normally required for food additives. Further permits for foods given by various countries.
1981	IECFI gives general clearance up to 10 kGy (average dose) and removes requirement for control of maximum and minimum doses. UN Codex Alimentary Process initiated. Permits extended by various countries.
1982	UK Government Advisory Committee (ACINF) set up to review evidence on safety and wholesomeness.
1983	IBT directors convicted of doing fraudulent research for government and industry. US loses £ 4 million and 6 years worth of research data.
1986	Scandal over abuse of irradiation by British food companies using Dutch and Belgian irradiators to conceal bacterial contamination on illegal imports to UK and Sweden. US approves clearance of irradiation for fruit and vegetables up to 1 kGy (and 30 kGy for spices) UK ACINF report published – recommends there are no special safety problems from irradiation of food up to 10 kGy.

Given this rationale, there followed a decade of intensive research into food irradiation funded and supervised by the US Department of Defence

Thus, in the early 70s the IAEA held seminars on food irradiation and established a joint committee of experts from the IAEA, WHO and FAO. This group, the Joint Expert Committee on Food Irradiation (JECFI) decided in 1976 that the new chemicals called *radiohytic* products which reproduced in irradiated foods do not need to pass tests of toxicity as do other food additives. They declared irradiation a process – not an additive – although free radicals (highly reactive molecules) and new chemicals are produced in the food. Some of these *radiohytic* products are the same as those produced in cooking or thermal process e.g. hydrogen peroxide and formaldehyde, but they occur in large proportions in irradiated foods. Others are unique to the irradiation process.

However, the rhetoric of classification of food irradiation as a process or an additive is not trivial. Food additives must be tested for toxicity. Food processes do not require such testing.³

MYTH : *Food irradiation is like giving X-rays to food. After all, humans subject themselves to x-rays regularly. So there is nothing wrong if food is irradiated.*

FACT : *Not so!*

In an x-ray, the dose of radiation is low, in the region of 0.01 rad. Still, there is evidence that such low radiation can damage body cells (cf. FAM #6, 97) as it will become clear below. In food irradiation the dose is much higher – 5000 to 1m. rads for fruits, vegetables and non-vegetables; up to 3 m. rads for spices. That is like giving upto 3 m. x-rays!

MYTH : *Irradiation helps in destroying the deadly bacteria in food. It sterilizes the food and this prevents spoilage. Hence, there is no nutritional loss if food is irradiated.*

FACT : Irradiation does not kill all of the deadly bacteria in our food! It still leaves some of it in our meals, making people still sick. Moreover, studies have shown that irradiating microorganisms, like *E. coli* and *salmonella* may give rise to even more dangerous, radiation-resistant strains of bacteria. Irradiation of chicken could kill not only the *salmonella* bacteria but also the yeasts and moulds that are the natural competitors of *botulinum*, the *bacterium* that causes *botulism* food poisoning. It will also kill the organisms that cause the putrid odour. Yet, at the doses proposed, the *botulinum* will not be killed. Under the right conditions the *botulinum* could multiply and become a health hazard without the consumer having any warning smell. Radiation-resistant strains of bacteria have been developed under laboratory conditions and scientists found that one particular bacteria can survive a radiation dose five times what the FDA will allow for beef. Scientists exposed this bacteria to 10 and 15 kilograms of radiation for several hours, enough radiation to kill a person several thousand times over; the bacteria survived.

Of greater concern, however, is that though irradiation can kill bacteria on the food, it will not remove the toxins that have been created by the bacteria at an earlier stage.

Increased production of *afatoxins* following irradiation was first found in 1973 and confirmed in 1976 and 1978. *Afatoxins* are powerful agents for causing liver cancer.² Its production was found to be stimulated by irradiation at doses approved by the WHO/IAEA/FAO expert committee

Afatoxins occur in damp environments on fungus spores on grains or vegetables. Control of humidity in storage becomes even more important in the case of irradiated than non-irradiated foods.

MYTH : *Food irradiation is also an alternative to chemical additives used for preservation, flavoring and coloring.*

FACT : Concerns about food adulteration and the like are indeed very well founded. However, far from eliminating additive use, the process of irradiation will itself require use of number of additives in order to control some of the undesirable effects of irradiation.

The use of such additives is not to be restricted to the high dose application where the obnoxious radiation flavors become pronounced but are also proposed for low dose uses to prevent discoloration and other undesirable effects such as bleeding and breakdown of fats in meat.

On the contrary, it has been seen that irradiation has some disagreeable side-effects. Milk and milk products, fatty and oily products, certain fish and meats, develop unpalatable flavors and odors. Onions and garlic shows signs of internal browning. To counter side-effects like these, chemical additives have to and will be added anyway.

Some foods just cannot be irradiated – they are irreversibly damaged by the risk of over-radiation – and the benefits of low doses are minimal in increasing shelf life. A single rotten potato or onion in a batch that is irradiated will result in the spoilage of the entire batch. If all the means currently used for food preservation have to be used even after irradiation, not only does irradiation seem superfluous, it is hardly likely that the process would be cost-effective.

Irradiation thus fails to eliminate health hazards arising out of pesticide residues and other chemicals. The claim that it is an alternative to these chemicals is false. Pre-harvest pesticides will still be used, and their chemical interaction with irradiation is unknown.

MYTH : *Extensive and rigorous tests, etc., in the West and elsewhere in the world, over the years, has deemed food irradiation safe and wholesome. Nor does it make our food radioactive.*

FACT : Food irradiation has a long history of over 40 years of scientific research and testing of food technology before "approval". Research included wholesomeness, toxicological and microbiological evaluation. In 1955, the Army Medical Department of the US began to assess the safety of types of

foods commonly irradiated in the diet. Petition to the Food & Drug Administration (FDA) – the agency of the US Dept. of Health and Human Services (est.1906) that oversees the safety of foods, drugs, cosmetics, and medical services – for approval of specific foods for irradiation soon followed.

Later, in the early 70s, the National Aeronautics and Space Administration (NASA) adopted the process to sterilise meats for astronauts to consume in space, and this practise continues today. The first products approved by the FDA were wheat and white potatoes in the 1960s. During the 80s, FDA approved petitions for irradiation of spices and seasonings, pork, fresh fruits and dry or dehydrated substances. However, the research that was used to obtain the clearance for can-packed bacon in 1963 – clearance that was subsequently withdrawn in 1986 when the FDA found the data seriously flawed.

Indeed, there have been over 2000 research papers on food irradiation since, of which around 400 had been selected by the FDA in the US for review.¹ They chose 6 as "considered by the Agency to reviewers to be properly conducted, fully adequate by 1980 toxicological standards, and able to stand alone in support of safety". Two of the studies were in English, three in French and one in German. On investigation on one of the English language papers, published in 1964, the authors state that there were differences between the control rats and the rats fed irradiated wheat, with a statistically significant rise in stillbirth rate among those fed irradiated wheat. Other findings failed to reach significance because of the small number of animals. This hardly constitutes strong proof of the safety of food irradiation.

The second English language paper reported unexplained deaths and abnormalities in animals given irradiated food, not reaching statistical significance because of the small

number of animals in the study. One of the studies indicated negative effects in older animals, but the finding was not pursued. The food used in the English language studies had been irradiated at 20 kilorad (0.2 kilogram) well below the proposed level of irradiation of human food – 1,000 kilorads (10 kilogray).

In two of the three French studies, the dose to food was less than 50 kilorad (0.5 kilogray). No adverse effects were reported;

In the German study animals fed irradiated food weighed significantly less than controls and had reproductive abnormalities. Both these effects were mitigated with vitamins;

Thus, the 'scientific' evidence in support of food irradiation consists of studies with low irradiation dose, small number of animals, short follow-up times, and negative results. No scientist worth his salt would accept these studies as establishing the safety of irradiated foods.¹

Subsequent American research was turned over to the Industrial Bio-Test limited (IBT) in the US a firm convicted in 1983 of conducting fraudulent research for government and industry. Consequently, the government lost about US \$4 million and six years of animal feeding study data on food irradiation. Some of this discredited work is still used as part of the "scientific" basis for assurances of the safety of food irradiation¹;

Further investigations, again, showed that such studies – cited 'ad infinitum' by its proponents – were highly flawed. The US government considers irradiation a food additive in testing food additives for toxicity; laboratory animals are fed high levels (in comparison to a human diet) of potential toxins. The results must then be applied to humans with theoretical models. It is questionable whether the studies the FDA used to approve food irradiation followed this process. In fact, the FDA claimed only five of the 441 were "properly conducted, fully adequate by 1980 toxicological standards, and able to stand alone in support of safety". With the shaky assurance of just five studies, the FDA approved irradiation for the public food supply;

- The Department of Preventive Medicine and Community Health of the New Jersey Medical School found that two of the (five) studies were methodologically flawed. In a third study, animals eating a diet of irradiated food experienced weight loss and miscarriage, almost certainly due to irradiation-induced Vitamin E dietary deficiency. The remaining two studies investigated the effects of diets of food irradiated at doses below the FDA-approved general level of 100,000 rads. Thus, they cannot be used to justify food irradiation at the levels approved by the FDA¹;
- In 1986 a big British food company, The Imperial Group, admitted that when its prawns imported from Malaysia failed quality tests, it sent them to Holland to be irradiated, and then sold the prawns to caterers under the Admiral label.

Daily Mail, Monday, March 3, 1986

We broke law with gamma ray prawns says food firm

By STEPHEN LEATHER, Consumer Affairs Correspondent

ONE of Britain's biggest food groups has sold radiation-treated prawns in contravention of health regulations.

The Imperial Group admits it broke the law last year after a consignment of prawns from Malaysia failed

to pass tests. The firm bought two containers of Malaysian prawns. They were imported through Southampton. When they were tested by the health authorities they found they were not safe to eat.

In February we took them out. We didn't have to test them again but we did. We tested 48 batches. Twenty passed but 26 did not – our standards for these tests are very high.

Source : Webb²

- Other studies indicate serious health problems associated with eating irradiated food. A compilation of 12 studies carried out by Raltech Scientific Services, Inc., under contract with the US government examined the effect of feeding irradiated chicken to several animal species. The studies indicated the possibility of *chromosome* damage, immunotoxicity, greater incidence of kidney disease, *cardiac thrombus*, and *fibroplasia*.
- One landmark study in India found four out of five children fed irradiated wheat developing *polyploidy*, a chromosomal abnormality that is a good indication of future development.

Reinforcing this stand against food irradiation, G.L. Tritsch, a cancer research scientist at Rosewell Park Memorial Institute, USA, raised the point on the expression "extensive testing" which he showed to be rather ambiguous. For instance, to test irradiated mangoes it is necessary to take an amount required for consumption in one's lifetime, extract the amount, and do an Ames Test on it. But merely to take a mango and squeeze a few drops of its juice on an Ames Test plate – to examine if its carcinogenic – is meaningless. It certainly would not be considered adequate testing.¹

Another problem with expressions is "Wholesomeness" of Irradiated Food.² The expression in English is one that combines the ideas of nourishing and healthful. There is no similar word in other languages. This is unfortunate. At international foras, such as those of the UN, etc., the expression has been debased so that it now only covers the concept of *safety* and safety only narrowly defined as the *absence of*

- a) harmful toxic chemicals
- b) harmful microbiological effects
- c) significant impacts on nutrition
- d) induced radioactivity in the food

The use of the term "wholesome" for foods that are to be sold as fresh but, in fact may have been significantly denatured in the process of irradiation, is wrong. There is a big difference between stating 'safe for human consumption' and 'wholesome'. This is a distinction the public can and do make and which they must be allowed to continue to make as a fundamental right.

Finally, the related myth that food irradiation does not make food radioactive begs the question as to why food irradiation is then *not* safe?

MYTH: *Radiation intensity used in irradiating foods is so low that it does not produce any adverse impact on food substance vis-a-vis consumers' health.*

FACT: As shown elsewhere in this issue, pathogenic micro-organisms (bacteria and viruses) are highly resilient, and it takes a lot to overpower them. Consequently, if the so-called low levels of radiation used are sufficient to kill these harmful

The AMES Test⁴

This is the most commonly used test for mutagenic substances – substances that cause mutation in the genes. It is well established that *mutagenesis* – mutation of the chromosomes within the cell – leads to cancer. The Test was developed at the University of California at Berkeley by Prof. Ames and involves growing human or bacterial cells in a medium. The material in question is added – in this case, an extract of the irradiated food – to the culture medium. Of course, if too much (irradiated material) is added, then the cells are destroyed. If very little is added, then nothing will be observed. So, just enough of the material must be added that will not destroy the cell and yet, at the same time, allow the possibility to clearly observe what mutagenic effects emerge. It is of paramount importance that this test is conducted correctly and also to explore a broad range of concentrations, and in the microgram (one millionth of a gram) range. Then, as a control, the same amount of unirradiated foods needs to be analysed as well.

microbes, they could certainly destroy the essential vitamins and *enzymes* too, thus lowering the nutritive value of foods. As we showed in the previous issue of this publication, that with lower doses, cells are damaged and cause havoc to the body in later years. (Cf. FAM #6/97)

It needs to be reiterated that there is no such phenomena as "safe limit" of radiation tolerance. As Tony Webb states, "A little bit of radiation does not give you just a little bit of cancer. Any dose, however small, can be the one that does the damage". Some years ago a British documentary film, *Deadly Experiments*, telecast on Channel Four TV, revealed how the British Government's Medical Research Council (MRC) devised and secretly conducted experiments in the late 60s and 70s on Punjabi women to ascertain why Asian women in particular suffered from widespread iron deficiency – without seeking their consent. The MRC suspected problems with the Asian diets and so decided secretly to track the iron content in '*chapatis*' by mixing radio-active iron salts with the '*atta*'. After being fed the '*chapattis*' they were told that the special diet would cure them. Subsequently, at least one family member of one of the women, who is now dead, has alleged that her mother died prematurely due to radiation.

MYTH: *Food irradiation is an imperative need today, a solution to global hunger and starvation.*

FACT: However, the patrons and proponents of this irrelevant technology "have not produced any projection of

the actual economic, or other, benefits of longer shelflife, especially in the rich North despite over-abundance of food".

The claim of providing irradiated food to the starving millions in the South begs the question, "Do we give the starving person to eat irradiated food and risk getting cancer in 10 or 20 years, or do we let that person starve"? This is indeed a very hard choice! However, the cold, hard truth is that this food will actually not reach the people who are dying of hunger and starvation. There is food that is being thrown away! It is not being sent to the starving millions in Kosovo, Albania, North Korea, or Rwanda, etc. Hunger and starvation is primarily an economic and political issue. It has nothing to do with food irradiation!

MYTH : *To guarantee the safety of irradiated food a regulatory body of the UN was launched, called the Codex General Standard for irradiated food which allows food irradiation as a quality control measure.*

FACT : This UN-initiated yardstick for quality control has been exploited by vested interests, the multi-business food industry to conveniently use it to a) mask bad quality b) improve spoiled foods c) suppress spoilage indicators like odour and taste and d) relax GMP regulations.

But this safety measure is anyway not helpful. Irradiation does not reverse spoiling processes. It can delay microbiological spoilage but, at doses applied in food irradiation, will have almost no influence on the enzymatic processes. Investigations with the Howard-mould test show the same findings before and after irradiation.

Neither will the process remove nor modify any substance from the product. When the product is bad, while GMP is not applied, it will be just as bad after the irradiation process. So quality control in food irradiation is not different from quality control in other food treatments.

Quality control starts at the receipt of the product, when the condition of product and packing is judged, and the details of importance are noted on the accompanying papers. Sometimes a product in bad condition is refused or when damaged during transport photographs are taken and in consultation with the owner return or repacking is arranged. Depending on the product, temperature measurement is done and samples are taken for microbiological control. The quality assurance manager may even delay the time of treatment until the laboratory report has been received.

Irradiated Food is Against Nature – Dr. N. Bengali

Our universe is permeated with electromagnetic energies of various frequencies vibrating in harmony with one another. Life is essentially a biomagnetic phenomenon. Every cell (plant, animal and human) has its characteristic biomagnetic (or bio-energy) field, with a discrete vibratory rate. Ancient Indian philosophical texts describe this vital life force as '*prana*'. The Chinese describe it as '*qi*'. The bioenergy field of cellular tissue originates in the cellular nuclei (that contain the chromosomes). The unique genetic patterns distinguish each living form from others. Human and all other life forms (including plants and animals) live in (bio-magnetic) harmony. There is constant interaction between ecological, bio-electromagnetic fields and the bio-magnetic fields of cellular tissue. Ionising radiations like x-rays and gamma rays interact with the cellular nuclei of foods, disturbing their natural vibratory rates (and bioenergy states). Foods do more than meet the bio-chemical needs of our tissue cells. They also supply our tissue with bio-energy. The bio-energy of natural foods is in tune with our cellular bio-energy fields and are hence biochemically and pranically nourishing. Irradiated foods, on the other hand, alter (abnormal) bioenergy states and hence likely to disturb the natural frequencies of our cells.

The bio-energy field is linked with and determines the genetic makeup of cells. In irradiated foods the genetic sequence is disturbed. Consuming such foods could alter the bio-energy condition of our cells, leading to possible chromosomal anomalies. This explains the finding of the National Institute of Nutrition (NIN), Hyderabad. Unlike chemical changes in cellular tissue, genetic aberrations are irreversible. Genetic anomalies disturb physiological functioning and are responsible for certain types of cancer, cataract and various congenital disorders.

MYTH : *Food irradiation plants are also safe and reliable and workers are not in any danger of suffering any harmful exposure.*

FACT : This is the same argument that nuclearcrats offer for justifying the need for nuclear power plants!

However, workers in irradiation plants like those at nuclear power plants also risk exposure to large doses of radiation due to equipment failure, leaks and the production, transportation, storage, installation and replacement of radiation sources.³ For instance,

- *The U.S. Nuclear Regulatory Commission (NRC) has recorded 54 accidents at 132 irradiation facilities worldwide since 1974. But this number is probably low since the NRC has no information about irradiation facilities in approx. 30 "agreement*

states" which have the authority to monitor facilities on their own;

- New Jersey, U.S.A., is home of the highest concentration of irradiation facilities, and virtually every New Jersey plant has a record of environmental contamination, worker over-exposure, or regulatory failures;
- In 1991, a worker at a Maryland plant in Pennsylvania, U.S.A. suffered critical injuries when exposed to ionising radiation from an electron-beam accelerator. The victim developed sores and blisters on his feet, face and scalp, and lost fingers on both hands;
- In 1988, Radiation Sterilizers, Inc., (RSI) in Decatur, Georgia, reported a leak of Cesium 137 capsules into the water storage pool, endangering workers and contaminating the facility. Workers then carried the radioactivity into their homes and cars. Cleanup costs exceeded \$30 million and taxpayers footed the bill; In 1986, the NRC revoked the license of a Radiation Technology, Inc., (RTI), facility in New Jersey for 32 worker-safety violations, including throwing radiative garbage out with the trash and bypassing a key safety device. As a result of this negligence, one worker received a near-lethal dose of radiation;
- In 1982, an accident at the International Nutronics in Dover, N.J. contaminated the plant and forced its closure. Radiation baths were used to purify gums, chemicals, food and medical supplies;
- In 1974, an Isomedix facility in New Jersey flushed radio-active water down toilets and contaminated pipes leading to sewers. In the same year, a worker received a dose of radiation considered lethal for 70 percent of the population. Prompt hospital treatment saved his life. In short, the question of plant safety involves of security, (the nuclear waste is very lethal), waste disposal, engineering safety, transport of radio-active material, production of new isotopes and handling, in some case by poorly trained personnel.

MYTH: Though it is safe some minor effects can occur in food in the testing of chemical products of irradiation but these are nutritionally insignificant and seldom occur. So, there is no need to worry! Such minor effects are no more serious than what occurs during normal storage, or, during cooking or heating. And, anyway, its enormous benefits outweigh its harmful effects.

FACT: The way these effects are dismissed nonchalantly is disturbing as also the changes to the rules of testing the hazards and for limiting the maximum doses to the food. Obviously, powerful vested interests that want to believe food irradiation is safe and who are more concerned to convince the public than objectively report the problems and

uncertainties. In Britain, for instance, a large number of potentially harmful additives are still approved for use in food. "Any testing system that is less stringent than the one that has allowed these additives to slip through the safety net hardly inspires confidence".²

The argument on storage, is incorrect. Vitamin B1, for example, is not only very sensitive to radiation damage but the further losses during storage are greater than expected during normal storage of un-irradiated foods. Vitamin E is not only virtually destroyed in some irradiation processes, but is destroyed even if it is added as a supplement after irradiation.

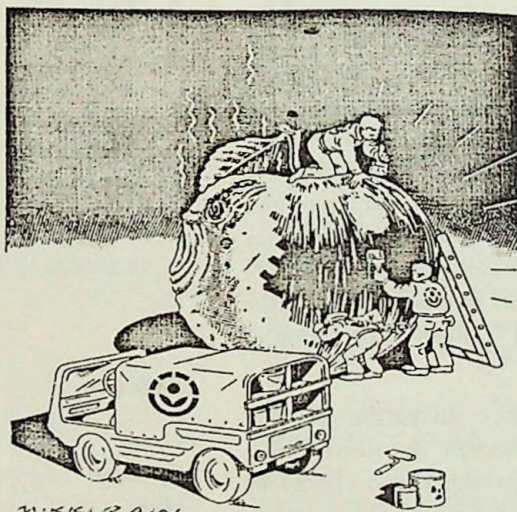
The argument on cooking too is mis-leading. It is true that vitamin losses, particularly of vitamin C, do occur but it is the grains, meats and some vegetables that are usually cooked whereas a large portion of vitamin C is obtained from fresh fruits and uncooked vegetables. Depending on the vitamin, the type of food and the dose of radiation, losses commonly

range from 20% to 80%. Fruit juices lose more vitamins than fruits, which lose more than vegetables, and grains which, in turn lose more than meat. (Yin foods lose more vitamins than yang foods)⁵. Vitamin E, in particular, is so seriously damaged that even if it is replaced as an additive later on, it will still get destroyed. This will affect grains and beans that contain natural poly-unsaturated oils. Vitamin E protects these oils. Without Vitamin E, the oils easily turn rancid – and toxic. The loss of also

Vitamin B1 during cooking is again greater when the food has been irradiated.

At another level, it must also be noted that a family in the North with a normal healthy diet – even, for that matter, the tiny well-off minority in the South – will not seriously suffer from major nutritional deficiencies owing to irradiated food. But what of the majority in the South whose diet is already deficient? This is far more common than usually appreciated. Poor eating habits are often forced upon people by poverty, or by the pattern of family working that leaves them over-dependent on processed 'convenience' or even junk or funky foods.

Finally, the argument of the advantages of food irradiation out-weighting its disadvantages is also spurious. It emanates from the FDA which has a Cost-Benefit Analysis/Risk Assessment which says, for example, that if only one person in 1000,000 gets cancer and only one person in one million dies from the chemical in a particular food, then the benefits of the particular chemical may outweigh the "low" loss of



Irradiation - Whitewashing Food Problems?

life and illness. If this is true then why do they do that? The answer is short and simple! It all boils down to \$\$\$\$. The pesticides manufacturers are incredibly rich and powerful. In addition, the one person per million death rate is a highly politicized risk calculation method. This "risk assessment" has been called a "process, the goal of which is to obtain permission to kill people".

Finally, whatever the supposed benefits, is this a risk worth taking? Are there any assurances about safeguards taken against the occurrence of such accidents?

MYTH: *The so-called 1975 NIN study of Hyderabad has since proved to be faulty and its data contradictory. Thus, this oft-quoted study negating the relevance of food irradiation is invalid.*

FACT: The study by Drs. C.Bhaskaran and G.Sadasivan of the National Institute of Nutrition, Hyderabad, on the five children fed freshly irradiated wheat (75 kilorads or 0.75 kilograys) showed that four of the five children developed a chromosomal abnormality called *polyploidy*. *Polyploidy* is a good indication of possible future cancer¹. That is, 80%. However, after the feeding was stopped, the *polyploidy* disappeared. The same results were obtained in monkeys. The result led to the then Prime Minister, Indira Gandhi, to overrule the DAE's strong advocacy of food irradiation. However, the FDA of the US rejected this study based on a review. But it was later discovered that this rejection was based on the findings of the "the committee of scientists", Sukhatme and Kesavan, who had refused to examine the NIN animal studies as it was "outside their frame of reference".

The study was also rejected on the claim that the tests were carried out on malnourished children. But that is rather because they were young.⁴ Young children do not have fully developed DNA repair systems, and for this they are more susceptible to *mutagenesis* than adults on whom such experiments are commonly conducted. But unless you look

at *chromosomes*, any abnormality will surely be missed. The children had gained weight. Their haemoglobin was fine. Clinically, they responded well to this irradiated food. On looking at them the children appear perfectly alright. But on closer examination of their chromosomes a clear indication of *mutagenesis* is observed. Years later, the children might develop cancer if the *polyploidy* continued.

At any rate, whatever the mechanisms involved in the chain of events from cell damage to cancer and/or genetic damage there are few in the medical and biological sciences who would regard an increase in *polyploid* cells as a trivial matter. That this chromosome defect has been found in children and animals fed irradiated diets is clearly cause for concern though not of itself proof of a causal link between consumption of such foods and these very serious long term effects.²

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GLOSSARY

Radiation :	Is the process where food are treated by regulated doses, with radio-active material that are salvaged from nuclear waste.
Gy Gray :	Unit of received those of radiation.
kGy :	KiloGray
Rad :	Old unit of received dose of radiation.
Rem :	Old unit of dose measuring biological damage.

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