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Shri Jairam Ramesh
Honourable Minister of State (Independent Charge)
Ministry of Environment and Forests
Government of India

Public Consultation on Bt Brinjal at Ahmedabad

Dear Honourable Minister Shri. Jairam Ramesh,

We appreciate your concern for the environmental and health hazards of Bt Brinjal and your decision to conduct public consultations on the issue. We as a group of concerned and responsible health professionals would like to share our concerns and put them on record through this letter.

We have reviewed the literature and would like to raise our concerns on the following issues:

A. Adverse Effects of Transgenic Bt foods:

There have been a series of scientific reports indicating side effects of transgenic Bt corn or potatoes on the animals. To quote a few:

1. In July 2008, Austrian researchers found that feeding rats a diet containing the transgenic corn NK603 x MON810 affected the reproduction of mice that was detected in 3rd and 4th generation in the reproductive assessment by continuous breeding (RACB) study design. Some effects on the kidneys were also observed.[1]

2. In November, 2008, Italian researchers concluded that "the consumption of Bt MON810 maize … induced alteration in intestinal and peripheral immune response of weaning and old mice."[2]

3. In December 2009, Joël Spiroux de Vendômois et al., studied the rats with feeds of three main commercialized genetically modified (GM) maize (NK 603, MON 810, MON 863), which are present in food and feed in the world. They observed that it causes hepatorenal toxicity. Other effects were also noticed in the heart, adrenal glands, spleen and haematopoietic system.[3]

4. Mice fed potatoes engineered to produce the Bt toxin developed abnormal and damaged cells, as well as proliferative cell growth in the lower part of their small intestines (ileum).[4]

How can transgenic Bt food be considered "safe" when there are so many studies showing adverse effects of Bt foods? Some studies have shown adverse effects on 3rd generation at the earliest and that too by Reproductive Assessment by Continuous Breeding (RACB) study design. The toxicological studies done by Mahyco do not include studies beyond 90 days of exposure. How can we consider Bt brinjal "safe" without proper, multigeneration studies?

B. Variety of Adverse Effects Due to GM Food in General

Certain studies have shown that the GM food can change the cell structure itself! Two of them:

1. Researchers studied effect of feeding GM soybean on mice and found out that it caused significant modifications in the nuclei (irregularly shaped nuclei) in the hepatocytes of GM fed mice.[5]

2. Scientists studied pancreatic acinar cell nuclei on the mice fed on genetically Modified soybean. The modifications observed in pancreatic acinar cell nuclei of GM-fed mice could be related to the reduction in digestive enzyme synthesis and secretion and can influence the pancreatic metabolism in mouse.[6]

Several animal studies indicate serious health risks associated with GM food consumption including infertility, immune dysregulation, accelerated aging, dysregulation of genes associated with cholesterol synthesis, insulin regulation, cell signalling, and protein formation, and changes in the liver, kidney, spleen and gastrointestinal system. **There is more than a casual association between GM foods and adverse health effects.** Animal studies also show altered structure and function of the liver, including altered lipid and carbohydrate metabolism as well as cellular changes that could lead to accelerated aging and possibly lead to the accumulation of reactive oxygen species (ROS). One study, done by Kroghsbo et al., has shown that rats fed transgenic Bt rice trended to a dose related response for Bt specific IgA. Also, because of the mounting data, it is biologically plausible for Genetically Modified Foods to cause adverse health effects in humans.[23]

C. Increase in Allergic reactions

Allergic reactions occur when the immune system interprets something as foreign, different, and offensive, and reacts accordingly. All GM foods, by definition, have something foreign and different. And several studies show that they provoke reactions. To quote a few:

1. Rats fed Monsanto's GM corn had a significant increase in blood cells related to the immune system.[7]

2. GM potatoes caused the immune system of rats to respond more slowly.[8]

3. GM peas provoked an inflammatory response in mice, suggesting that it might cause deadly allergic reactions in people.[9]

4. Scientists have demonstrated high immunogenicity of Cry1A proteins administered by intragastric route and cautioned the use of transgenic plants for human consumption.[10]
5. There have been reports of allergic reactions to Bt spray. The reaction was severe enough to cause hospitalisation in some of the cases.[11,12,13]

6. Bt toxin might also trigger reactions by skin contact. In 2005, a medical team reported that hundreds of agricultural workers in India are developing allergic symptoms when exposed to Bt cotton, but not when exposed to natural varieties.[14]

Although, there may be many causes, it might be difficult to identify whether GM foods were triggering allergic responses in the population. **Since our country does not conduct regular studies or keep careful records, we need to do allergic studies in great detail before GM food is permitted for human consumption.**

D. GMOs are inherently unpredictable

It has been scientifically proved beyond doubt that genes are not carriers of a single trait. The effect of every gene is determined by the total situation in the cell. Therefore, the transfer of a single gene can not yield intended results and is inevitably unpredictable.

Insertion of transgene can lead to mutation, deletion and alterations of the genomic structure. All this can change RNA, protein, enzymes and other countless natural products in the organism. To cite an example,

The gene of soybean glycinin was transferred into potatoes with the aim to increase their protein content. However, the improvements in protein content or amino acid profile were minimal. In fact, the total protein content of the GM potatoes after the gene transfer became significantly less than that of the control line. Even more unfortunately, the contents of some vitamins were reduced while the amounts of both solanine and chaconine increased in the GM lines. In this light the claimed substantial equivalence of the GM and parent lines was not supported by the published results.[15]

As some of the changes are unpredictable and it is only possible to compare the known properties and constituents of GM and conventional plants. Unknown components are not looked for and in that case how can we analyse them?

Scientists have opined that just chemical analysis of macro/micronutrients and known toxins is at best inadequate and, at worst, dangerous. More sophisticated analytical methods need to be devised, such as mRNA fingerprinting, proteomics, secondary metabolite profiling and other profiling techniques.

Do we have facilities for this kind of studies? Are they mandatory at present? How are we going to label it safe without detailed investigations?

E. Horizontal Gene Transfer

The issue of Horizontal Gene Transfer (HGT) should not be taken lightly.
There is evidence that relatively long fragments of DNA survive for extended periods after ingestion. DNA may be detected in the faeces, the intestinal wall, peripheral white blood cells, liver, spleen and kidney, and the foreign DNA may be found integrated in the recipient genome. When pregnant animals were fed foreign DNA, fragments may be traced to small cell clusters in foetuses and newborns.[16]

In pigs fed GM and non-GM corn, transgene and gene fragments were detected in the lower gastrointestinal tract (rectal and cecal).[17] In chicks fed GM corn, antibiotic resistance marker gene was found in their stomach.[18] The transgene for a Bt corn line(the full length of the coding portion for Cry1AB) was found in-tact in sheep rumen (the first compartment of a ruminant animal's stomach). The authors concluded, "DNA in maize grains persists for a significant time and may, therefore, provide a source of transforming DNA (i.e. Horizontal gene transfer) in the rumen.[19]

The transfer of marker gene can lead to many undesirable consequences not even thought of. There is a possibility of resistance to antibiotic Kanamycin due to HGT. Kanamycin is currently used in many infectious diseases and is a second line treatment for tuberculosis (TB). Drug resistant TB is a major public health problem in India. What will happen if we lose an important second line drug?

F. Studying Effects of GM Food on par with Pharmaceuticals, Monitoring and Regulation Issues

In view of the above unpredictability of GM foods we contend that GM Foods, including Bt Brinjals need to be treated on par with medicines – for approval and regulatory purposes. At a genetic level there is no difference between a genetically modified food and medicine. Therefore the same level of precautions which are taken for pharmaceuticals need to be taken for GM Foods and Bt Brinjal in this instance.

Trials on three mammalian species – the norm for GM foods – need to be done before human trials first to establish safety of the food followed by .Phase 1, 2, 3 and 4 (post-marketing surveillance studies) trials on human beings.

Postmarketing trials – or monitoring for adverse effects – is going to be really difficult, if not impossible. India's record of adverse drug reaction monitoring of drugs is next to nothing. Pharmacovigilance exists in name only. Indeed, that puts in doubt any viability and effectiveness of any regulatory mechanism for Bt Brinjals and GM foods in general, considering also the impossibility of labelling in a diverse market in a country that exists at several levels of poverty and illiteracy at the same time.

With possibility of lateral contamination of Bt genes within and across species, damage across populations and markets is going to be practically irreversible – a fact complicated by absence of gene and seed banks of varieties of non-GM foods. Lateral contamination also effectively destroys choice for the consumer who does not want to consume Bt Brinjal.

Pharmaceuticals are consumed mostly at times of disease by affected sections of populations. It has been difficult to ensure sale only on prescription across the 400,000 retail pharmacy outlets in India leading possibly to all kinds of drug resistance problems and adverse drug reactions. Bt Brinjals and GM vegetables would be consumed by entire populations across the country, especially in the absence of clear choice. Our governance, adverse drug reaction monitoring and regulatory problems in pharma have barely been solved, if at all – how do we expect to solve the same for an item of daily consumption like brinjals across populations, in the event of monitoring adverse effects of Bt Brinjal.

G. Methodological Inadequacies in the Study Design

Several international experts have pointed out serious inadequacies with the methodology and study design in the toxicological study for BT Brinjal conducted by Mahyco.

Experts have observed that "the interpretation of results sponsored by Mahyco is not scientifically acceptable" and hence consumption of BT Brinjal can not be considered safe.[20,21]

The first independent, critical analysis of the data generated by the company had been done by Prof Eric-Gilles Seralini who is the President of the Scientific Council of the Committee for Independent Research and Information on Genetic Engineering (CRIIGEN) and who had been in the French GMO Regulatory Commission. He has concluded, "the two main organs of detoxification, liver and kidney, have been disturbed in this study"[22]

How can we consider Bt Brinjal as "safe for human consumption" when there are serious inadequacies in the study design itself and all the studies claiming safety of the product are either done or sponsored by the same company?

H. On Acceptance of Mahyco Data Submitted by M/s Mahyco

The response of the EC 2 is that this is in line with the "practices for data generation are in line with the national and international norms followed in case of other products such as pharmaceuticals."

These so-called practices in the pharmaceutical sector have been questioned for the last 10 years. The experience of Merck's hiding unfavourable data with respect to Rofecoxib (subsequently withdrawn by the company and/or banned in several countries), the selective publication of data including an entire fake journal by, again, Merck, the almost complete absence of published data on unsuccessful clinical trials, etc.– these and several others have been routinely questioned.

[See for instance: 1) Hopewell S, Loudon K, Clarke MJ, Oxman AD, Dickersin K. Publication bias in clinical trials due to statistical significance or direction of trial results. Cochrane Database of Systematic Reviews 2009, Issue 1. Art. No.: MR000006. DOI: 10.1002/14651858.MR000006.pub3. 2) See for instance: Erick H Turner, Annette M Matthews, Eftihia Linardatos, Robert A Tell, Robert Rosenthal. "Selective Publication of Antidepressant Trials and Its Influence on Apparent Efficacy." *The New England Journal of Medicine*. Boston: Jan 17, 2008. Vol. 358, Iss. 3; pg. 252.]

The GEAC therefore needs to do better than that in terms of blindly relying on company produced data for large scale policy decisions. One may add here that the ethical record of

parent company Monsanto does not inspire confidence in their neutrality. Most of the GLP procedures are not capable of detecting fraud or wilful manipulation or even ensure the absence of the same.

I. Conflict of Interest - at Several Levels

According to the website http://www.indiagminfo.org/ , the following are the new facts emerging on the Expert Committee which recommended Bt Brinjal for clearance (EC2 or Expert Committee II):

- The Chairperson, Prof Arjula Reddy, confesses to coming under pressure from "Agriculture Minister, GEAC and the industry" to approve Bt Brinjal (Attached report has Dr Pushpa Bhargava's statement on a telephonic conversation that Prof Reddy had to this effect with Dr Bhargava, the Supreme Court observer to GEAC, the apex regulatory body in India)
- The Member-Secretary, Review Committee on Genetic Manipulation (RCGM in the DBT), Dr K K Tripathi has a Central Vigilance Commission complaint pending against him for exercising undue discretionary powers to promote interests of companies of his choice (Mahyco, in this instance) and harm others. He sat in the Expert Committee which was considering Mahyco's application, while the CVC complaint was still being examined!
- At least two Bt Brinjal developers in the Expert Committee bring in conflicting interests. One of them is part of the Consortium project that is developing Bt Brinjal in India with American aid!
- At least two members sat in the Expert Committee, reviewing their institutions' own findings on Bt Brinjal biosafety!
- At least two members who were expressly representing the Union Health Ministry sat as observers in the Expert Committee without providing any inputs into the EC2 process.

- Further, the GEAC deviated from the agreed mandate for the Expert Committee, as minuted in its January meeting minutes, to set up a new mandate that allowed the EC2 to recommend Bt Brinjal for cultivation. The Expert Committee was also privy to some data that was never put out in the public domain for independent scrutiny and analysis but which was used for decision-making.

This represents a huge conflict of interest and compromises the recommendations of the report. Also in the interests of transparency, the Government needs to come clean on the data accessed by the Committee and that was not put out in the public domain.

J. Recommendation by American Academy of Environmental Medicine

The American Academy of Environmental Medicine after reviewing the literature, has noted that GM foods have not been properly tested for human consumption, and because there is ample evidence of probable harm, it recommends the public to avoid GM foods when possible and asks the members to provide educational materials concerning GM foods and health risks. It has also asks for a moratorium on GM food and implementation of immediate long term independent safety testing and labelling of GM foods, which is necessary for the health and safety of consumers.[23]

Based on the above facts and issues, we demand that:

1. Long-term, multi generational studies should be done to prove safety of any GM food/ product for human use especially reproductive effects on mothers and teratogenic effects on children.

2. In view of the toxicological effects reported by certain studies, the protocols for bio safety of GM products need to be updated. The safety studies should include not only chemical analysis of macro/micronutrients and known toxins, but more sophisticated analytical methods like mRNA fingerprinting, proteomics, secondary metabolite profiling and other profiling techniques may be required. Detailed Allergic testing also needs to be done. A neutral scientific committee should be formed to frame the protocol.

3. Review of toxicological studies done by Mahyco by an independent expert panel.

4. Immediate moratorium on GM food till the new detailed bio-safety protocols is prepared and facilities are made accessible for all required analytical methods.

5. Ban on all GM crop trials till point no. 4 is achieved.

6. All the Bio safety data of studies done by any agency and regulatory procedures should be kept transparent and made accessible in public domain, even in future.

Sincerely yours,

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S.Srinivasan, Low Cost Standard Therapeutics and All-India Drug Action Network

Renu Khanna, Jan Swasthya Abhiyan, Gujarat; and SAHAJ Society for Health Alternatives

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Dr. Bhagawati Oza, Gynaecologist, Vadodara

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