Why I cannot remain silent

Interview with Dr. Arpad Pusztai

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On why GM is not safe, predictable or precise

GM-FREE: The rats in your experiment who ate potatoes genetically engineered to produce GNA lectin suffered reduced organ weights and immune damage. Why do you think this was?

Dr. Pusztai: I think the reason is not the GNA lectin itself, but the technique. Probably the CaMV (Cauliflower Mosaic Virus, a promoter used to switch on the introduced gene) had a part in it. It's a problematic thing.

The other problem is the positioning of the inserted gene. Our experiment showed up how imprecise the technique is, because we had two GM potatoes, both contained GNA lectin, and both came from the same pot. They were both grown in greenhouses or in fields in tunnels under identical conditions and at the same time. Yet they came out different. The only explanation is that the incorporation of the transgene [inserted gene] into the host genome happened at two different places. And the effect on the genome was different.

These positioning effects are not simple to predict. Think of William Tell shooting an arrow at a target. Now put a blindfold on the man doing the shooting and that's the reality of the genetic engineer when he's doing a gene insertion. He has no idea where the transgene will land in the recipient genome.

Meanwhile, while we are all arguing in Britain, scientists in other countries are getting on with the job. There are two new papers by Japanese scientists, on GM rice and GM soya. They say that the positioning effect has to be taken into consideration because we don't know which genes in the host organism the inserted genes will make silent or reactivate. It is clear from their evidence that some of the changes cannot be predicted on the basis of the gene insertion.

On substantial equivalence

Dr. Pusztai: The idea of "substantial equivalence" is that there is no need for biological safety tests because the plants must be of similar composition as the parent line. This is the basis on which GM crops are being released. However, they cannot be substantially equivalent to the parent because you've introduced new genes. That's why I don't give tuppence for substantial equivalence.

We had two transgenic lines of potato produced from the same gene insertion and the same growing conditions; we grew them together along with the parent plant. With our two lines of potato, which should have been substantially equivalent to each other, we found that one of the lines contained 20% less protein than the other. So the two lines were not substantially equivalent to each other. But we also found that these two lines were not substantially equivalent to their parent. This could not be predicted. It

demonstrates that the unpredictability is inherent in the GM process on a case by case basis and also at the level of every single GM plant created.

Our project should have ended right there, in my opinion, but we had to develop new testing techniques useful for all GM plants.

In genetic engineering, a lot of GM plants never see the daylight, because for one reason or another they don't grow or they have an unpleasant color like the GM salmon which turned green. Where unpredictable effects show up, you throw them out. But from the point of view of science, these are important, because if GM is such a predictable, precise science, then you should be able to produce the same thing again and again. But you can't.

Regarding our potatoes, even after many lines were thrown out, the ones which we retained were still all different from each other. Even though they all came from the same pot, using the same genetic construct, and were grown in identical conditions. So this is my challenge: if it is so predictable, so precise, they should not be any different. They must not be different. Causative logic says that they ought to be the same. That is for me the most worrying aspect.

On the allergy threat

GM-FREE: This lack of predictability is worrying for people with food allergies. These people can only live their lives on the basis that they know which foods to avoid. Biotech companies claim they test for "known allergens" like peanuts. But there are thousands of other foods that can cause serious allergies but which are not classed as known allergens. On top of this, there may be new toxins or allergens in GM foods that are not spotted because they are not looked for.

But what you are saying means that even if you test three potatoes and find that they do not cause an allergic reaction, a fourth potato of the same kind, produced by the same technique, could cause a toxic or allergic reaction.

Dr. Pusztai: You are quite right. The only thing you could do is find a stable GM organism, which has been put through tens of generations and still comes out the same, and which is not crossed with any other potato. You keep the purity of the line.

GM-FREE: In the real world, this is impossible.

Dr. Pusztai: I totally agree. We are storing up problems for the future.

On the "sound science" behind the GM push

Dr. Pusztai: GM foods have been introduced on the back of just one published paper - just one, in fifteen years of GM. It was written by a Monsanto scientist and published in 1996. The study was a feeding trial of Roundup Ready soya on rats, catfish, chicken and cows. I don't want to say anything about it because it's a published paper, but I could take it apart in 10 seconds.

GM-FREE: Ah, go on.

Dr. Pusztai: Well, the main problem is that the researchers appear to have done their utmost to find no problem. They were using mature animals which are not forming body tissues and organs. Adults only

need a small amount of protein because their bodies are in equilibrium, in homeostasis. But a young growing animal needs a great deal more protein because it's laying down muscle and tissues, and forming its organs.

With a nutritional study on mature animals, you would never see any difference in organ weights even if the food turned out to be anti-nutritional. The animals would have to be emaciated or poisoned to show anything. In this study, they gave the rats a commercial feed that contained 20% protein, of which only one-tenth was replaced by GM soya protein. Most of this high overall dietary protein was used by the rats for energy, thus masking any possible effect of the GM soya protein. You need to stress the animals if you want to see the effects of a feeding trial in a short enough time. This is my field, so you can take it for granted that if I had had the chance of refereeing that paper, it would never have passed.

Another problem was the way they did the post-mortem. They never weighed the organs; they just looked at them - what they call "eyeballing". I must have done thousands of post-mortems so I know that even if there is a difference in organ weights of as much as 25%, you wouldn't see it. In my lectures I used to put up two identical computer-drawn rats side by side and put two different sized organs in them, and I asked the audience which rat was bigger, and they always got it wrong. You have to weigh them.

On the British Medical Association's call for a GM moratorium

Dr. Pusztai: It stands to reason that they would take a strong line. If there is any problem, the doctors will have to deal with it. It's easy for a gene-basher to say, "I've got some fantastic product," because he doesn't have to see the consequences. He can only see that this or that insect is killed and as far as he is concerned that's the end of the story.

But this is a very unfair and unscientific attitude. It is close to being irresponsible, because we are playing God. You can call it God, evolution, natural selection, natural law, whatever - but this is what it is.

On the scientific and political establishment's tactics

GM-FREE: In May this year, four major reports, all trumpeting the safety of GM foods and all condemning your work, were released within two days of each other. They were the Donaldson/May report; the House of Commons Science and Technology Committee report; the Royal Society review; and the Nuffield Council on Bioethics' report. What's your view on the timing of these reports?

Dr. Pusztai: Can you believe that four major reports could come out, all condemning me, within two days? That is stretching belief.

It's clear that there was a concerted effort to discredit me. The only body that invited me for discussions, the Environmental Toxicology Committee, gave me just eleven days' notice. I explained that on that day I would be on a plane, so could they please suggest an alternative day. They obviously were not interested, because they did not come back to me. The Royal Society, despite the fact that I offered my full cooperation, refused it; they just wanted to have pieces of paper which they could shred to bits to condemn me.

In 1956, when I was living in Hungary, I got a Ford Foundation Scholarship and they said I could go wherever I wanted. I chose England because I thought the British were fair, and that they would tolerate even an oddball like me. But then I found out about these machinations and duplicity.

On the Royal Society review of his research

Dr. Pusztai: The Royal Society report was totally negative and unhelpful, and obviously made to cut me down, to give the political masters the backing they required from an august body.

You see, if you submit a paper to a journal, in 7 out of 10 instances, the reviewers are helpful. For example, they say, "I don't think you have done this well; could it not have been done this way instead?" Then there is a dialogue. The point is not to steam-hammer some poor soul, but, as I said in a letter to the Royal Society, to arrive together at the truth. But in this case, there has been no attempt whatever to discover the truth.

The Royal Society, instead of going back to last August and all that history, should be concentrating on how to make the experiments better. There is not a single word in their review that addresses this, apart from saying it should be better designed. My PhD students would have laughed at me if I said anything like that. Sanctimonious phrases are not enough - if you criticize an experiment, you have to say how you would go about doing it better.

I have published everything in my life. I make a solemn promise that I shall try my best to publish my research. If I fail, I shall put it on the internet. I owe it to the people who have been supporting me that they should know all the facts. No matter how the Royal Society or whoever else machinates against me, I will do it.

On his decision to go public with his findings before peer review and publication

Dr. Pusztai: The British tax payer has spent 1.6m [pounds] for this Rowett-based research. You have paid for it. Yet if I had not spoken out, the information would have stopped at the Rowett.

Other scientists often ask me why I went against the code of practice and spoke out before publication in a peer reviewed journal. I made my 150-second testimony on TV's World in Action because I had facts that indicated to me there were serious problems with transgenic food. It can take two to three years to get science papers published and these foods were already on the shelves without rigorous biological testing similar to that of our GM potato work. I did indicate my concern and it cost me my job but I would do it again. If I had not done it, we would now be eating these potatoes and not discussing the safety of GM food.

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