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Dr Arpad Pusztai Talks on Food for the 21st Century

Organized by The British Hungarian Fellowship
Held at the Polish Hearth Club
South Kensington
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Please note.

I have written this report in the first person in order to preserve the authenticity of what the speaker said. The speaker has agreed that this is a true account of what he said.

In the last fifty years there has been an increase in the number of pesticides we use and we now have to use more and more. There is a need for biotechnology to overcome this and the costs to the environment and the farmer. There are four main reasons why this has been on the cards since the discovery of DNA. There has been an increase in pest resistance to pesticides and almost all genetically modified plants are in this category for this does give an advantage. There is a need to improve yield, cultivation time and growth characteristics and to improve nutritional value, although no products of this category are yet on the market, they will be part of the second generation of GM crops.

GM crops are now common place, we have got this technology and practically everything has been genetically modified now, although in the UK only three products are on our supermarket shelves. These are GM Soya which is tolerant to Monsanto's roundup herbicide. Maize engineered with the Bt toxin gene made by Novartis and Zeneca's Flavor Savor, antisense, puree which ripens very slowly and is convenient for the farmer.

To make a GM plant you have to breakdown the resistance of the plant in order to get it to accept the genes you want to put into it. Genetic engineers have to use tricks to do this, you need a switch -- a promoter to get your gene turned on and off and you have to make the whole thing work so as you can pick out the cells that have taken up your gene. We use reporter genes for this, we grow the cells up so that all that have been successfully transformed can be identified. We use antibiotic resistance genes to do this. So we don't just put one gene in, you need an array. We use plasmids to get it in or we shoot it in with a high pressured gun. The technique is quite complicated and contains many elements other than the transgenes themselves. Other things may happen and the technique is essentially unpredictable. The transgene also go into an environment where 10's of 1000's of other genes from the plant are being expressed.

Now in our studies we only took two lines to study where both transformations were done at exactly the same time. The two lines however became different and this suggests that the transgene got into different positions in the plant genome. These position effects are not simple to predict. In order to understand this think of William Tell, the shooting of an arrow at a target, now put a blind fold on the man doing the shooting and that's the reality of the genetic engineer when he's doing a transformation. He has no idea where the transgene will land in the recipient genome.

We made the transformation and had 10-20% success rate which then reduced to 5% which were promising. Then we regenerated these and selected again. You have to select all the time. We first grew the transgenic potatoes in isolation in the lab and then later in open land in Rotterdam.

I must say at this point that we would be eating these potatoes if it wasn't for me kicking up such a fuss. This investigation is not about Dr Pusztai verses James. The British tax payer has spent £1.6m for this knowledge. You have paid for it. We took all the best scientific advise. In our case the information would have stopped at the Rowett but I raised hell.

The regulators were a panel of twelve people, who I care to call scientific administrators for they have no research opportunity and have no results. We got the results and even though it has been said that we shouldn't have disclosed the findings I still believe it unfair to use people as guinpigs. I knew what the regulators were getting from industry. We are told it has been rigorously tested yet only one paper has been published to do with the safety of eating it. There should be at least a dozen in my opinion. The facts and reassurances can turn out to be fake and when the British public's health is at stake, skepticism is very important.

In 1995 our group at Durham and the Rowett Scottish group put a bid into the Scottish office for testing these GM potatoes. These potatoes were destined for the Scottish and UK market and even though potatoes are a side dish they still needed to be tested. We won the bid against twenty seven other groups. Now you have to remember that such bids are peer

reviewed, this is part of the bidding process. Obviously if we were better, then we must have been reasonably good. We had an objective, to identify genes that are encoding anti-nutritional factors.

Which genes are bad for insects but OK for mammals? In the case of potatoes, the insect pests are aphids which eat the leaves and nematodes which eat the roots. So we tested some of the gene products and then made an artificial diet for the insects and checked to see if reproduction was normal and if they were happy or became sick.

The gene must not do anything bad to us. We used rats because they are mammalian and we used young rats because they show up any ill effects much more clearly as they are relatively small and vulnerable. There is sufficient overlap between rat and human to draw on. My institute was mainly an animal husbandry / animal nutritional institute, that is the main profile of the Rowett and it has a relevance to human nutrition. I have recently written a paper on biological testing for the European Union (it's interesting, they have sacked me but they still want me to write science papers for them). We have been testing for 30 years and have over 50 papers published. This was the first objective and we spent seven years just to select the appropriate genes to put into the potatoes. So later on there was a huge contrast, we had a main body of research that gave us a solid base and we knew the gene product was safe for us to eat.

We had two transgenic lines of potato, 71 & 74 from the same transformation, we grew them together along with the parent plant. It is very important to grow the plants together under identical conditions The comparisons are very important when one is to consider the two lines as substantially equivalent. Regarding substantial equivalence, there is actually no need for biological tests, the plants must be of similar composition and this is how GM crops are being released. They however cannot be substantially equivalent to the parent because you've introduced new genes, sometimes several. We looked at protein, starch and sugar content and other things that may be anti-nutritional, glycoalcholides.

One of the lines contained 20% less protein than the other and we looked at other things as well and established that these two lines were not substantially equivalent to their parent. This could not be predicted and it demonstrates that the unpredictability is not just inherent in the GM process on a case by case basis but also at the level of every single transformation created. Our project should have ended right there in my opinion but we had to develop new testing techniques useful for all GM plants.

We proceeded and conducted feeding experiments. We fed the rats with the parent potato, the parent potato plus the protein product of the transgene and the GM potatoe from both transgenic lines. All experiments were done under the same conditions, all rats coming from the same line (not clones but almost as they were highly interbred), all getting the same amount to eat and all kept in the same environment.

The question was, do they grow normally? And if they are not growing normally, what is happening to the tissue? One would expect the rats to grow from 100g to 120g over ten days. Also, did the tissues grow proportionally? The liver should grow 1g to 1.2g. If the liver wasn't growing properly that would suggest toxic effects. The brain size/function was also significant. We weighed all these tissues and others, wet and dry weight, and found that

many of the tissues were growing dis-proportionately. What is the mechanisms? We looked at the immune system, the regulation. You can often see things there that you don't see elsewhere there. We did meticulous experiments. We were leading scientists not bumbling amateurs. I felt concern because these things had never been tested before and as the experiments went on the worries started to multiply. There were abnormal effects to the lymphocyte responsiveness as well. These are genuine effects effecting the immune system and are not normal.

I made my 150 sec testimony on World in Action because I had facts the indicated to me there were serious problems with transgenic food. It can sometimes take 2-3 years to get science papers published and these foods were already on the shelves. I did indicate my concern and it cost me my job but I would do it again. Other scientists often ask me why I went against the code of practice and spoke out before publication in a peer reviewed journal? My reply is to say we would be eating these potatoes now and not be discussing the safety of GM food if I would not have done it.

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