

Response by Stanley William Barclay Ewen M.B.Ch.B., Ph.D., F.R.C.Path to Health Committee of Scottish Parliament's Investigation into Health Impact of GM crops.

I have been a consultant histopathologist at Grampian University Hospital Trust for 29 years and I have a special interest in colorectal cancer as I am the lead histopathologist for the Colorectal Cancer screening pilot in Grampian Region. You invite written evidence that addresses 4 questions and my response is specially directed to health matters.

Question 1

Negative Public Health impact and the Precautionary Principle.

It is unfortunate that very few animal trials of GM human food are available in the public domain in scientific literature. It follows that GM foods have not been shown to be without risk and, indeed, the available scientific experimental results demonstrate cause for concern.

Two important papers were published before our paper in The Lancet (co – author Dr Arpad Pusztai). The first concerned “Flavr Savr” GM tomatoes fed to rats. Several of the rats developed erosions (early ulcers) of the lining of the stomach similar to the erosions seen in stomach of older humans on aspirin or similar medication. In humans substantial life threatening haemorrhage may occur from these early ulcers. The second paper concerned the feeding of raw GM potatoes to male mice one month old. The results revealed proliferative growth in the lower small bowel (stomach and upper small bowel were not examined) measured as mean perimeter of each cell (Fares and El-Sayed, 1998, Natural Toxins 6, 219-233).

Pusztai and myself published our results on young rats fed raw GM potatoes in The Lancet (354, 1353 – 1354 October 1999). We measured the part of the small bowel lining that produces new cells and found that the length of the new cell compartment had increased significantly in GM fed rats but not in identical rats fed non GM potatoes. The increased production of cells had to be due to a growth factor effect induced by the genetic modification within the potatoes.

Our paper further revealed that the growth factor effect was not due to the newly expressed transgenic protein, which in our GM potato was snowdrop lectin, but was an effect of the gene construct inserted into the DNA of the potato cell nucleus. I must emphasize the importance of the gene construct that is inserted by manipulation of the potato DNA. The construct includes, not only the new gene, but also marker genes and a powerful promoter.

Major debate surrounds the promoter because it is derived from a part of the cauliflower mosaic virus. It is true that the whole and intact virus appears to be harmless as we have been eating cauliflower type vegetables for millennia but the use of the separate infectious part of the virus has not been tested in animals. Unfortunately, although all plants contain promoters none are as effective or powerful as that obtained from the cauliflower mosaic virus *eg.* Japanese workers who produced “golden” vitamin A containing rice were obliged to use the cauliflower mosaic virus in preference to rice promoters otherwise the foreign vitamin A gene was never expressed.

The use of the infectious part of a virus in food is of great concern to me and DNA (including viral DNA) can only be inactivated by heating for 10 minutes at 95C. It is assumed that normal digestion in the stomach will inactivate the mosaic virus promoter but uncooked GM food regularly passes into the colon where it could be released from GM food residues by bacterial action. Current testing of completeness of digestion relies on artificial recombinant proteins exposed to non human stomach enzymes and hydrochloric acid but this inadequate model does not reflect the range of changes that can occur in human digestion in the elderly population. If uncooked or unprocessed mosaic virus containing GM food were to enter the human food chain then the growth factor effect, established by the two independent research groups mentioned above, might have undesirable consequences such as accelerating colon cancer.

- Three independent groups of scientific investigators have demonstrated changes in gastrointestinal tract after feeding GM products
- Two of the groups have demonstrated a growth factor effect that can persist along the whole length of the gastrointestinal tract
- Could the recorded growth factor effect accelerate gastrointestinal conditions within the population?
- Present GM technology demands the use of the cauliflower mosaic virus promoter which must be present in all GM products
- Must the Scottish Nation be obliged to knowingly eat a fragment of living virus in their food?

Question 2

Risk assessment and Public Health

Unfortunately, human food is not believed suitable for testing in a standard toxicological experiment. In a classical toxicological investigation a single substance, of defined chemical composition, can be administered in identical dose to a

group of laboratory animals. In practice, the effects of feeding even a single foodstuff may be too complex to identify a similar effect that is acceptable as unsafe. For this reason, GM food safety relies on rough similarity of GM product to parent product assessed by chemical analysis (so called substantial equivalence). This concept of substantial equivalence is imprecise and the degree of acceptable variation has never been agreed. Without doubt, adequate nutritional and metabolic GM risk assessment would require laboratory animal testing that would greatly increase the cost of obtaining a product proved to be safe for human consumption.

Further possible undesirable effects have been postulated which cannot be subjected to risk assessment *viz.* alteration of the human liver's response to hepatitis virus as the cauliflower mosaic virus and hepatitis B virus are very closely similar. Furthermore, gene transfer to the micro organisms of the mammalian gut is possible and the chance of this occurrence has been estimated at 1 in 10^{15} and gene transfer to gut lining cells could occur. In addition, the instability of transgenic crops is a major concern because the cauliflower mosaic virus is "promiscuous" permitting unpredictable recombination with the production of a virulent pest.

The feeding of currently available GM products such as maize to animals also carries risks. It is possible that cows milk will contain GM derivatives that can be directly ingested by humans as milk or cheese and even a lightly cooked thick fillet steak could contain active GM material.

- Current risk assessment relies on approximation by substantial equivalence which, by definition, cannot be robust
- Other unquantifiable risks are inherent in present GM technology

Question 3

Prevention of cross contamination

I possess only secondary expertise in this area

Question 4

Monitoring of health around GM farm scale evaluation sites

As a histopathologist in the NHS (37 years), I am presently involved in reporting the histopathological microscopic slides from the Grampian arm of the Colorectal Screening Pilot (commenced March 2000). I believe that those living close to a GM farm scale evaluation site should be strongly recommended to take the opportunity to participate in this Pilot study which does not roll out Nationally until 2007.

(Colorectal cancer in Scotland increases in proportion to increasing latitude the exception being Orkney which has a relatively low incidence).

My reasons for this recommendation can be deduced from the information stated in Question 1 above. In particular, those in the close environment to a farm scale GM trial are likely to have their own private water supply. All water catchment areas will become contaminated with GM material which will not be broken down in the intestinal tract. All verminous rodents will feed on the crop and become food for carnivorous birds of prey. In due course, the left over fragments of carcass will leach into the water table and become detectable in the tap water supply. Boiling of the tap water for some minutes will destroy DNA but most would not find such a measure acceptable in practice. Ingested GM DNA in the water supply is usually broken down in the stomach but some people do not have a normal stomach due to the ravages of *Helicobacter pylori* which infects about half the population by age 50 years. It is possible that GM DNA could affect stomach and colonic lining by causing a growth factor effect with the unproven possibility of hastening cancer formation in those organs. Additionally, GM material will pass from septic tank to river with contamination of aquatic life especially in properties with a septic tank of primitive design.

- Those resident around a farm participating in a GM evaluation should have their health monitored
- Minimum monitoring requirement would be inclusion in the ongoing colorectal screening pilot
- Apart from spread of pollen by hymenoptera, birds of prey will cause contamination due to remnant carcass fragments from rodents feeding on the GM crop

I BELIEVE THE ABOVE STATEMENTS OF OPINION TO BE TRUE ON SOUL AND CONSCIENCE (14th November 2002)

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