Editorial

Editorial

Alan Wells

Climate Change: The Final Countdown II

Globally

Following my last-month's plea for action by politicians I am pleased to report (although I do not think that this august journal can take credit for the development) that leading international legislators have reached a new, albeit informal, agreement on tackling climate change. With United Nations climate negotiations in December failing to agree a timetable for mandating new cuts in emissions when the current Kyoto targets expire in 2012, the British-led Globe set up a Washington meeting in the hope of stimulating progress in a less formal setting. The two-day meeting brought together delegates from countries including the G8 nations plus Brazil, China, India, Mexico and South Africa. Delegates recognised that global caps must apply to developing countries as well as industrial nations in attempts to limit greenhouse gas emissions. The meeting also agreed that a global market should be formed to cap and trade carbon dioxide emissions.

The non-binding declaration can be seen as vital in influencing a replacement for the Kyoto Protocol. Delegates said they wanted a successor to the Kyoto Protocol – which expires in 2012 – in place by 2009. US senator Joe Lieberman went so far as to forecast that the US Congress would enact a law on cutting emissions by the end of 2008, possibly in 2007. Dr John Holdren, the head of the American Association for the Advancement of Science, said President George W. Bush needed to appreciate that the US economy would not suffer unnecessarily if emissions were capped.

Although the declaration carries no formal weight, it may indicate a real change in mood.

Canada

The Canadian parliament has moved to force the government to meet its Kyoto Protocol target for reducing emissions. The vote comes after months of fierce debate between the Conservatives and the opposition Liberals over each other's environmental policies. Although Canada remains a signatory to the Protocol the Conservatives have rejected most of the targets since forming a minority government in 2006. The ruling party argues that meeting the target (of reducing emissions by six per cent from 1990 levels by the period 2008–2012) is impossible but Canada's parliament has voted, by 161 votes to 113, in favour of a motion that would force the government to meet its Kyoto targets. The vote gives the government 60 days to formulate a plan for getting back on track. The new law is binding but Canada's Environment Minister, John Baird, has called the vote "a stunt" and has suggested the government might simply ignore it, essentially challenging the opposition to bring down the government and force a spring election. Such a scenario would be unpopular with politicians across the political spectrum.

The Conservatives accuse the Liberals of doing very little to reduce greenhouse gases during the 12 years they were in power. But the Conservative government has been on the defensive over its own record. One environment minister has already lost her job over a series of mistakes, and an embarrassing letter written by the Canadian Prime Minister, Stephen Harper, in 2002 recently surfaced. It derided the Kyoto accord as a socialist scheme designed to suck money out of rich countries.

United Kingdom

In the UK the recent behaviour of Britain's wildlife has raised alarm about the seriousness of climate change as breeding patterns have been thrown into confusion and climate change has once again moved to the political centre-stage. Government, industry and NGO have united in a plea published in a letter to *The Times* from the Environment Secretary, the Trade and Industry Secretary, the Deputy Director-General of the Confederation of British Industry and the Chief Executive, WWF-UK:

> "We call on European industry and governments to work together to secure a sound footing for the EU emissions-trading scheme post-2012. European heads of state are holding crucial dialogues this week on future emissions reduction targets, and discussions are taking place across Europe on the future shape of emissions trading.
>
> Carbon trading in Europe is working. It's not perfect, but we have learnt some valuable lessons from the first years of the scheme. It has already put a price on nearly half the carbon emitted in the UK and EU, and provides flexibility in delivering emissions reductions.
>
> This year is a key one if we are to secure a long-term future for emissions trading as well as moving towards a global deal on climate change post-2012."

The UK Government is imminently to publish its Climate Change Bill. Delays in publication have raised questions about the administration's commitment to tackling climate change, particularly as the UK's carbon emissions have risen in recent years. The Environment Secretary is due to try to restore Britain's place as a world leader in the battle with undertakings to cut carbon output by between 15 and 25 million tonnes by 2020 to get back on track for a long-term target of a 60% reduction on 1990 figures by 2050.

Editorial

This will be partially achieved through targets for public buildings and large non-energy intensive commercial organisations. There will, however, be no legally binding annual targets.

It may be apt in these circumstances to quote George Brimley (*Essays: Wordsworth's Poems*):

> ''There are three classes of politicians – those who under pressure of an existing evil seek for change; ... those who, with conscious and definite aim, plant the great Hereafter in the Now; ... and thirdly, those who with clear eye discern the dependence of the Hereafter upon the Now, and because they shrink from the Hereafter, refuse to take the step which renders it inevitably certain.''

I hope to report next month on results of an EU summit where the Germany, which currently holds the EU presidency, will, reportedly, try to get the Member States to agree on a shared target of cutting 20% off their 1990 carbon emission levels by 2020 (or 30% if there is a new international agreement on climate change). Chancellor Merkel will have a fight on her hands if she is to both persuade EU national goverments to agree on a sharp increase in the use of renewable resources and to cut back on reliance on fossil fuels with 20% of the EU's overall energy consumption to come from solar, wind and hydro-electric power by 2020. Former American Vice-President Al Gore has underlined the importance of the issues at stake during a visit to Brussels, where he argued that the EU had an ''absolutely critical leadership role to play''. We must hope for an ambitious European deal which would help Germany (which also chairs the G8) to apply pressure on other key players at the industrialised nations'' summit in June 2007.

Genetically Modified Potatoes: The Cancer Connection

Avid readers of the biotechnology section in ''Eurobrief'' may have noticed a number of recent Commission authorisations to place on the market food containing, consisting of, or produced from genetically modified (GM) maize lines. There is now evidence that this should concern us (and them). The paper reproduced below is published on the GM Watch website by GM Free Cymru with the intention of increasing public awareness of important research work which has been kept out of the public domain. The report in question has been suppressed for about seven years, and has only recently come to light, thanks to the efforts of Greenpeace Russia.

> ''Commentary on the Report about the Feeding of Rats by Monsanto's GM Russet Burbank Bt Potatoes
> I.V.Ermakova, Agrarian Russia, No 4, 2005, pp. 62–64.''

The Commentary is based upon an analysis of the following document: *Medical-biological investigations of transgenic potatoes, resistant to the Colorado beetle* (under agreement with Monsanto Co.) (Russian Academy of Medical Sciences, Institute of Nutrition: Moscow, 1998). Signed off by V.A.Tutelian, Deputy Director. Physiological, biochemical and morphological investigations in rats. Full Report 275 pp, including raw data.

This translation has been prepared by Ian Panton and Brian John of GM Free Cymru, in consultation with the author.

General Conclusion

The analysis of the relevant part of the Institute of Nutrition Report showed that the studies were not carried out according to the accepted protocols for the biomedical assessment of GM food and feed. Many of the conclusions drawn by the authors do not correspond to the obtained data and therefore they are incorrect.

Two types of Russet Burbank potatoes – the GM potatoes (GM-RB) and potatoes bred by traditional methods (RB) were sent to the Institute of Nutrition by Monsanto for feeding studies. Experiments were conducted only on small groups of animals: 10 rats in each group, which is absolutely inadequate for such vital studies. In the course of the experiments some rats perished, and the data were given only for the surviving groups of eight and sometimes even of six animals. Serious morphological changes in internal organs were observed in rats when they were fed Russet Burbank potatoes (both the GM-RB and RB varieties), which were added to the ration of animals in boiled form. Changes in the liver, kidneys, and large gut; reduction in haemoglobin; strengthening diuresis; and changes in the mass of heart and prostate gland and others were observed. In the course of the first month of feeding, animals showed reduced body mass in comparison with the control group. The strongest changes in the organs were discovered in rats fed by the GM-RB potatoes. Both types of Russet Burbank potatoes (RB and GM-RB) were dangerous for animals. The genetically-modified potatoes GM-RB were especially toxic. However, the Institute of Nutrition concluded that ''the studied types of potatoes can be used in human nourishment for the conduct of further epidemiological studies'', i.e. during the study of the clinical picture of diseases and their distribution among the human population.

Data on pathological changes in the organs and biochemical parameters in the rats fed on Russet Burbank potatoes (RB and GM-RB), in comparison with the rats without potatoes in the control group, are given in the next section.

Editorial

Comments

I. Scheme of experiments
The transgenic potato GM-RB was obtained by the introduction into genomic DNA of the Cry3A gene, isolated from Bacillus thuringiensis subsp-tenebrionis (B.t.t.) and of the gene of neomycin- transferase II (NPTII), isolated from prokaryote transposon Tn-5. Genes Cry3A and NPTII were introduced into the potatoes with the use of the binary plasmid vector Agrobacterium tumefaciens. Both genes expressed themselves in the potatoes in the form of insecticidal activity against the Colorado beetle. The expression of genes occurs in the entire plant, but especially in the leaves.

The feeding experiments were conducted with three groups of Wister rats with an initial weight of 80–100g: one GM experimental and two non-GM control groups. The rats of the first control group (''control'') obtained standard chow during the full course of the experiment. To the rats of the second control group (group RB) normal Russet Burbank potatoes in boiled form (12g per day) were added to the chow. To the rats of the experimental group (group GM-RB) the genetically-modified (or transgenic) potatoes (12g per day) in the boiled form were added to the chow. The duration of the experiments was six months. Some animals were killed after one month and the others six months after the beginning of the experiments.

II Chemical composition of potatoes
It is necessary to focus attention on the chemical composition of Russet Burbank potatoes. In 1998–2000 in the UK it was revealed that GM potatoes strongly differ in their chemical composition from traditionally-bred potatoes and cause damage to the immune system. Both of the American Russet Burbank potatoes differ in chemical composition from the potatoes bred and used in Russia. Differences were discovered in many parameters. Russet Burbank varieties have, in comparison with Russian potatoes, very much lower concentrations of some vitamins measured as mg/100g: for example, B2 – 0,013 (in Russian potatoes – 0,07); B6 – 0,162 (in Russian – 0,3), vitamin E – 0,017 (in Russian – 0,1). As to mineral composition (measured as mg/kg) the Russet Burbank potatoes showed reduced concentrations of iron – 6,4 mg/kg (in Russian – 9,0 mg/kg); sodium -33,4 (in Russian – 50), potassium – 4052 (in Russian – 5680) and especially calcium – 10,4 (in Russian – 100) and many others.

Researchers from the Institute of Nutrition, describing the RussetBurbank potatoes, concluded that ''in all studied parameters the transgenic potatoes do not differ from the potatoes of the same type, bred by traditional methods . . .''. However, the Russet Burbank GM-RB potatoes had two times less fructose glucoses than the traditional potatoes; three times less Beta-carotene; and there was no vitamin E. Thus, the content of some fatty acids in the GM potatoes was increased 1.5-three times and nitrates by two times.

III Toxicology-hygienic studies on the laboratory rats
Two series of the experiments were carried out at one month and six months.

One-month studies
Pathological changes in the rats that ate potatoes were already manifested with the analysis of the body mass of rats in spite of an adequate diet of potatoes, which in the GM-RB group of rats was increased in comparison with the RB group to 1–2.5g, the body mass of rats in the RB group and, especially, in the GM-RB group was statistically significant lower than in the ''control'' group. If prior to the beginning of experiment the body mass of the rats of all groups was practically identical (Control: 73.5 + 1.9g; RB: 72.5 + 2.8g; GM-RB group: 72.7 + 1.6g), then after one month of feeding the RB rats and GM-RB rats showed body mass significantly lower than in the ''control'' group. If in the ''control'' group the body mass was totalled to 231.4 + 9.0g, in the RB group it was 36,4g less (195.0 + 11.0g), and in the GM-RB group it was almost 50g less (181.6 + 8.3g).

In the RB and GM-RB groups, in comparison with the ''control'' group, it was revealed that there were pathological decreases in the absolute mass of almost all the studied organs (data from eight rats): kidneys, liver, spleen, heart, testes, hypophysis, and prostate gland. In this case the most explicit decrease in absolute mass was observed in the GM-RB group, and especially in the absolute mass of the heart and prostate gland.

Obtained data were less clearly expressed with the analysis of relative values. According to the hematological parameters of the peripheral blood in the GM-RB rats (data from six animals) it was observed that there was a statistically significant reduction in hemoglobin concentration in comparison with the ''control'' group but an insignificant decrease (possibly because of the small number of animals) in comparison with the rats of the RB group.

Six-month studies
With the more prolonged feeding of rats by Russet Burbank potatoes the absolute body mass of the animals was statistically lowered in the RB and GM-RB groups in comparison with the ''control'' group. The difference was 40–50g after first eight weeks of feeding (''control'': 264.8 + 8.8g; RB group: 224.9 + 12.5g. and GM-RB group: 220.7 + 9.1g).

After 12 weeks the body mass figures were as follows: 12 weeks (''control'': 309 + 7.6g; RB group: 258.7 + 9.5g; and GM-RB group: 267.9 + 15.9g).

Pathologic changes were revealed with the analysis of the absolute and relative mass ratio of internal

Editorial

organs. The absolute and relative mass ratio of the liver was statistically significantly reduced in the RB and GM-RB groups in comparison with the "control" group. The absolute mass of kidneys was statistically significantly lower in the RB group in comparison with the GM-RB and the "control" groups. The absolute mass of prostate gland was increased in GM-RB group (statistically significant) and the RB group (insignificant) in comparison with the "control" group. The mass ratio of testes was reliably increased in the RB group in comparison with other groups.

The content of total protein in the blood serum of rats was statistically significantly reduced in the GM-RB group in comparison with the RB and "control" groups. Daily diuresis (ml) and relative density in the GM-RB and RB groups were statistically increased, and the content of creatinine was statistically reduced in comparison with the control. Haemoglobin concentration in the GM-RB and RB groups were statistically reduced in comparison with the "control" group. Statistically significant changes were also observed in the leukocyte formula (on the neutrophils and the lymphocytes) in the RB rats in comparison with the "control" rats.

IV Morphological studies at one month and six months
During the experiments four rats died: two rats from the GM-RB group (showing abrupt changes in the large gut and in the liver), and two rats from the "control" group (due to pneumonia). Serious changes in the liver, kidneys and large gut were observed in the rats from the GM-RB group after their killing, in contrast to other groups. The liver in the rats from the GM-RB group had lighter yellow-brown colour, and was easily torn. Cysts in the kidney and in the liver were discovered in three rats out of eight during the six-month study (i.e. ~ 40% of rats). Signs of adipose dystrophy appeared in the cells of the liver (the hepatocytes) in rats from the RB-GM group, which were rarely noted in the RB group. Different sizes of cellular infiltrations were discovered in the large gut in rats from the GM-RB group. Changes in the large gut were not discovered in either the "control" or RB groups.

Conclusions
A number of Russian and foreign researchers have drawn conclusions about the imperfections of the biotechnological methods used for gene introduction into plants, and have drawn attention to the serious dangers presented by GM organisms and their containing products to man, animals and the environment. Plasmids and foreign GM-inserts can fall into the cells of different organs as a result of horizontal displacement, leading to pathologic changes in those who eat GM food.

Both types of Russet Burbank potatoes (fed to the RB and GM-RB groups of rats) lead to changes in the blood and internal organs of laboratory rats (in the liver, the kidneys, the large gut, a change of the dimensions of heart and prostate gland and others) and on the basis of this evidence they *cannot* be used in the nourishment of people.

The genetically modified potatoes were most dangerous. Arpad Pusztai and Stanley Ewen demonstrated pathological changes in different organs (liver, spleen, kidneys, stomach, rectum and others) in rats which were fed on GM potatoes and GM corn (Pusztai, 1998, 2001; Ewen and Pusztai, 1999; see also the journal "Agrarian Russia" No. 1, 2005).

Further studies are necessary on a large number of animals (in each group there must be not less than 20 rats) in order to fully explain the reasons for the negative influence of the Russet Burbank potatoes (both GM and non-GM) and other GM cultures on the organism of animals. In this case it is necessary to compare the apparently damaging influence of GM-potatoes on animals as against traditional Russian varieties. It is possible that a sharp increase recently in Russia in the number of oncological diseases, especially of intestinal tract and prostate gland, and of leukemia (according to data from the Medical Information Agency), is connected with the increasing use of GM-components, including GM-potatoes, in human food products."

We must hope that Member State's governments and the Commission are aware of these findings and take them into account when granting permissions for trials and authorisations of GM products.