

CONTACTS WITH THE SCIENCE MEDIA CENTRE SINCE 1 JANUARY 2014

SMC email to Defra and others – 28 July

Subject: Fwd: GM report

FYI

Sent from my iPad

Begin forwarded message:

Internal SMC email attached - 27 July

Subject: GM report

Your GM contacts may have already seen this -- a new report on GM crop challenges in Africa released this month by think tank Chatham House.

http://www.chathamhouse.org/sites/files/chathamhouse/field/field_document/20140721BiotechAfrica.pdf

This was flagged up in Mark Kinver's BBC News article Friday, "Africa 'missing out on biotech green revolution'". <http://www.bbc.co.uk/news/science-environment-28419484>

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SMC email to Defra and others – 22 July

Subject: SMC Coverage Report- Crop breeding technologies briefing

New crop breeding technologies: genome engineering and beyond

Monday 21st July 2014

Invitation

Science Media Centre and BBSRC background briefing

What? New crop breeding technologies: genome engineering and beyond

When? 10:30am Monday 21st July

Where? 5th floor, Wellcome Collection, 183 Euston Road, London

NW1 2BE

Plant agriculture is poised at a technological turning point. Recent advances in genome engineering make it possible to precisely alter DNA sequences in living cells, providing unprecedented control over a plant's genetic material. The new technologies are already being widely adopted in academic and industrial research and it is expected that crops developed using these new technologies will be produced world-wide over the coming years.

These emerging crop breeding technologies offer a range of opportunities but also face regulatory challenges and may require new risk assessment approaches.

The Biotechnology and Biological Sciences Research Council (BBSRC) is working with experts from a variety of backgrounds to develop a position statement on developments in new genetic technologies, their application in crop breeding and implications for risk assessment and regulation. The position statement is expected later this summer.

In advance of this statement, this briefing offers an opportunity to find out about molecular genetic techniques for genome editing (site-directed mutagenesis, such as CRISPR, TALENs, ZFN technologies, oligo-directed gene targeting) and tools for epigenetic modification (such as RNA-dependent DNA methylation for gene silencing). There is an opportunity to ask about the science behind these technologies, the regulatory challenges and critically for some – are they or are they not GM?!

Speakers will include:

- Professor Sophien Kamoun, Head of The Sainsbury Laboratory, John Innes Centre, Norwich Research Park
- Dr Sebastian Schornack. Research Group Leader, University of Cambridge, Sainsbury Laboratory
- Professor Huw Jones, Rothamsted Research; member of EFSA GMO panel
- Professor Ottoline Leyser, Director, Sainsbury Laboratory, University of Cambridge

For further information please call Fiona Fox on 020 7611 8365

Attendees

Ben Spencer Daily Mail

Penny Sarchet Research Fortnight

John Parker Economist

Tom Heap Countryfile

Fiona Harvey Guardian

Steve Connor Independent

Recording sent to Tom Feilden (Today) & Ben Webster (Times)

Briefing coverage

Independent

<http://www.independent.co.uk/news/science/scientists-renew-call-for-lighttouch-legislation-on-secondgeneration-gm-crops-9619769.html>

Guardian

<http://www.theguardian.com/environment/2014/jul/21/genome-editing-crops-restricted-eu-rules-scientists-warn>

Clips

Independent

<http://www.independent.co.uk/news/science/scientists-renew-call-for-lighttouch-legislation-on-secondgeneration-gm-crops-9619769.html>

Scientists renew call for light-touch legislation on second-generation GM crops

Steve Connor

Science Editor

Monday 21 July 2014

Senior scientists have called for a revamp of European legislation covering genetically modified crops in the light of radical advances in genome editing that has enabled crop researchers to make the smallest changes to a plant's DNA with pinpoint accuracy.

Europe's regulations governing the introduction of new GM crops is based on the actual DNA process used to generate the genetic modifications, rather than the end product of the process, which is why it now needs reforming the researchers said.

They believe that current legislation on GM crops is inconsistent, given that it is possible to produce mutations in plants that are identical to those made by conventional plant breeders, but with greater accuracy and speed.

Professor Ottoline Leyser, director of the Sainsbury Laboratory at Cambridge University, said that gross genetic changes brought about by conventional crop breeding involving the random generation of mutations is not subjected to the tough regulatory process, whereas those produced through GM have to conform to the rules.

"I'm not arguing for less legislation, I'm arguing for more legislation. I would like a sensible, proportionate, evidence-based system for everything," Professor Leyser said.

There is now even some doubt as to whether genetic mutations in crops by the genome-editing technique called Crispr [pronounced "crisper"] would even be defined as GM crops under the existing European legislation, she said.

"There is no way that legislation based on processes is ever going to keep up with the introduction of new ways of doing things. You need a more robust regulatory system that is immune to the way that you do the changes," she added.

Professor Huw Jones, a crop scientist at Rothamsted Research in Hertfordshire, said that the DNA changes made by Crispr can be identical to mutations produced by conventional crop breeding, but that it is not clear whether crops generated by Crispr will be subject to European Commission rules governing GM crops.

"We need a regulation that is fit for purpose. It would cover the risks inherent in the technology but it should also be consistent," Professor Jones said.

"If a herbicide-tolerant crop has an environmental impact – and I'm not saying it does – it doesn't matter how you make it. That impact should be analysed and risk-assessed as the characteristic per se, and not because of the technology," he said.

Crispr is the latest and most powerful of the genome-editing technologies. It is based on a bacterial enzyme that can recognise and cut the DNA of a plant at any given point in the genome, whereas "conventional" GM involved the transfer of entire genes from one organism to another at random.

"In these days of genome sequencing you can sequence the entire genome and demonstrate the only changes you have made [from Crispr] are no different to anything that could be obtained from conventional breeding," said Professor Sophien

Kamoun, president of the International Society for Molecular Plant Microbe Interactions.

“Mutations are occurring all the time in conventional breeding so that the only thing you are doing here is having a much more precise and rapid way of doing that,” Professor Kamoun said.

“You can generate limitless variations within the crop but the fundamental differences to conventional GM is that you are not actually moving genes from one organism to another,” he said.

Guardian

<http://www.theguardian.com/environment/2014/jul/21/genome-editing-crops-restricted-eu-rules-scientists-warn>

Genome editing of crops may be restricted by EU rules, warn scientists

New technology designed to fight disease and improve yield, but different from GM, speeds up natural process of gene adaptation

- Fiona Harvey, environment correspondent
- theguardian.com, Monday 21 July 2014 17.21 BST

A fledgling technology to manipulate the genes of crops in order to make them less susceptible to disease and more productive is at risk of falling foul of the European Union’s genetic modification rules, scientists warned on Monday.

Genome editing is different to genetic modification, because it does not usually involve transplanting genes from one plant or species to another, but on pinpointing the genetic mutations that would occur naturally through selective breeding. This means that, in most cases, it mimics natural actions and does not require the wholesale transformation of genes with which GM is often associated.

Genome editing typically involves finding the part of a plant genome that could be changed to render it less vulnerable to disease, or resistant to certain herbicides, or increase yields or other desirable traits. Researchers use “molecular scissors” to break apart the genome and repair it, which is a process that occurs naturally when plants are under attack from diseases and can throw up new mutations that enable the plant to survive future attacks. This evolutionary process can effectively be speeded up now that it is possible to examine plant genomes in detail in laboratories, and create mechanisms through which the relevant genes can be altered very precisely, without the need to import DNA from other organisms, one of the key criticisms of GM foods.

“Using these methods to introduce new variations, our ability to create new genes is nearly limitless,” said Sophien Kamoun, of the Sainsbury Laboratory at the John Innes Research Centre in Norwich. “We can be much more precise [than with conventional plant breeding].”

As the processes mimic those of nature, but speeded up, the end result is the same as if the sort of selection routinely practised by farmers for centuries had been used, scientists said. Huw Jones, of Rothamsted Research, said: “These plants are indistinguishable from those that would occur through selective breeding.” Ottoline Leyser, director of the Sainsbury Laboratory at the University of Cambridge, said gene editing could offer an alternative to GM that could be much more palatable to consumers.

But green campaigners are far from convinced. The European parliament’s Green party told the Guardian: “While the biotech sector has sought to trumpet the benefits and precision of gene editing, compared to existing GM technology, there are many uncertainties as regards the impact of gene-edited organisms on the environment and health.”

The technology is very new, as the first commercial application of it in a plant for human consumption was approved this spring, when the US-based Cibus announced an edited version of canola. Scientists believe there is huge potential for the technology because it avoids the slower, scattergun approach of selective breeding.

It has only become possible to edit plant genes in the past few years following decades of work on mapping genomes and inventing ways in which they can be precisely altered.

Under EU laws, however, it is unclear whether gene editing should be treated in the same way as genetic modification. GM crops are effectively banned in Europe, and licences to experiment in GM are rare and very expensive. In some other parts of the world, most importantly the US, the regulations are much lighter and GM food faces few barriers to animal and human consumption.

The European commission is expected to offer guidance on the technology soon, perhaps next year, but it is not clear whether that could involve a ruling on whether and how the current regulations should apply, or a commitment to further study with the possibility of new regulations. The commission did not respond to requests from the Guardian for comment.

Jones said the lack of clarity on the legal status of gene editing techniques was hampering research and potential investment, particularly in Europe. “Clearly lawyers need to look at it,” he said.

Leyser said the EU should base its regulations on the properties of crops that have been altered or selectively bred, rather than focusing on the process by which this is

achieved, as happens at present. “There is no way legislation based on processes is going to keep up with new ways of doing things,” she warned. Assessments of crops that have been modified should be sufficient to avoid harm, rather than arguing over whether genome editing should be treated as GM, she said.

The scientists said the promise of the new technologies, in improving crops and helping to feed the world’s growing population, should not be underestimated.

The Green party/European Free Alliance group in the European parliament said: “Gene editing raises similar concerns as [genetic modification] as regards intellectual property rights and the impact on traditional and organic farming models. As such, it would make sense for gene editing to be covered by the same regulatory regime as existing GMOs. However, the current EU legislation on GMOs is clearly in need of a major overhaul, notably to significantly improve the risk assessment process and ensure its independence, as well as to take account of the socio-economic impact of GMOs.”

Natalie Bennett, the UK’s Green party leader, said: “The Green party believes that with these new technologies, with their often unknown side effects and impacts, it is important to maintain the precautionary principle. These are genetic modifications using new techniques; they should be treated accordingly.

“It was only last week that researchers writing in the prestigious journal Science expressed grave concerns about one particular use of gene editing technology, the gene drive, while the European Food Safety Authority concluded in 2012 that cisgenesis [another technology for altering plants] should be treated in terms of regulation and oversight as a GM technology, at least initially.

“With new techniques and possibilities being developed every year, now is not the time to allow a wild west of release of organisms without full safety oversight and consumer information.”

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Email to Defra from SMC - 27 June

Subject: my latest blog on scientific consensus versus the media

<http://www.sciencemediacentre.org/the-science-side-of-the-story/>

My blog: on science and the media

The Science Media Centre is an independent venture working to promote the voices, stories and views from the scientific community to the news media when science is in the headlines. Over 80 supporters including scientific institutions, media groups, charities, universities, corporate organisations and individuals fund the Centre, with donations capped at 5% of the running costs to preserve its independence.

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Email from Defra to SMC - 22 July

Subject: RE: SMC Coverage Report- Crop breeding technologies briefing

Thanks -----!

Email from SMC to Defra and BIS - 22 July

Subject: FW: SMC Coverage Report- Crop breeding technologies briefing

Nice coverage from our backgrounder yesterday....

(same doc attached as above - new crop breeding technologies background briefing)

SMC email to Defra and others – 24 June

Subject: FW: SMC Roundup Ver 5: Republication of Séralini study on Roundup-tolerant GM maize [IMMEDIATE RELEASE]

Hi all,

Here's everything the SMC has sent out on the Seralini republication, including comments gathered by SMCs in Canada, Australia and New Zealand.

Best wishes,

SMC email attached - 24 June

Subject: SMC Roundup Ver 5: Republication of Séralini study on Roundup-tolerant GM maize [IMMEDIATE RELEASE]

Hi all,

I know the embargo has lifted so this may be too late to be useful, but one more quote and comments from other SMCs.

Cheers

Science Media Centre Round-up VERSION 5

IMMEDIATE RELEASE

Expert reaction to republication of Séralini study on Roundup-tolerant GM maize, as published in Environmental Sciences Europe*

NEW COMMENT: Prof Bruce Chassy, Professor Emeritus of Food Safety/Nutritional Sciences, University of Illinois, said:

“The original Seralini paper was rejected for many reasons. Perhaps the most important of these was that the design of the study and the described methods for data collection were fatally flawed in a number of ways. No amount of rewriting or excuses for faults can make the data whole again. When the data are faulty, the experiment must be repeated with proper design and methods.

“Food and Chemical Toxicology and Elsevier have acted poorly throughout this affair. It is difficult for experts to understand why Food and Chemical Toxicology published the paper since it is exceedingly challenging to find an expert peer-reviewer who cannot find numerous flaws in the paper. The journal then consumed more than a year to retract the paper.

“Among the several reasons for retraction that Food and Chemical Toxicology failed to cite was the unethical use of animals in experiments which the Committee on Publication Ethics states in a reason for retraction.

“Seralini now states that the research was not a cancer study. If that is true, then there was no reason not to euthanize animals when tumors were first detectable. There was nothing to gain or learn. This is unethical treatment of animals.”

Prof Tom Sanders, Professor of Nutrition & Dietetics, King's College London, said:

“Republishing data that was faulty in the first place in study design and analysis does not provide redemption. Furthermore, it is now possible to publish almost anything in Open Access journals!.

“Seralini did not follow conventional methods for assessing animal toxicity and made most of the measurements at the end of life. When a very large number of measurements are made statistically significant differences will occur by chance.

“The figures of an animal with a large tumour serve no scientific purpose. There are numerous omissions of probabilities which could lead the less critical reader to infer differences that are not statistically significant.”

Prof David Spiegelhalter, Winton Professor of the Public Understanding of Risk, University of Cambridge, said:

"The article still does not appear to have had proper statistical refereeing, and the methods and reporting are obscure. The claimed effects show no dose-response, and so the conclusions rest entirely on a comparison with ten control rats of each sex. This is inadequate."

"The study needs replicating by a truly independent laboratory using appropriate sample sizes. I agree with the authors that this whole area would benefit from greater transparency of data and improved experimental and statistical methods"

Professor Joe N. Perry, Visiting Professor of Biometry, University of Greenwich, said:

“This paper appears to be based on the same data as Seralini’s previous 2012 paper, with no real new information and only minor rephrasing and a few new references. Therefore, I doubt whether my conclusions would differ from those of the vast majority of independent members of the scientific community, who concluded in 2012 that there was insufficient evidence to justify the claims of CRIIGEN and Giles-Eric Seralini. However, I do welcome Seralini’s promise to publish his raw data and my hope is that all organisations involved in GM risk assessment will, wherever possible in the future, publish in full their raw data in the spirit of full transparency and openness.”

Declared interests

None declared

Comments from the Australian Science Media Centre

Dr Ian Musgrave is a Senior Lecturer in the Faculty of Medicine, School of Medicine Sciences, within the Discipline of Pharmacology at the University of Adelaide:

“A French research study that claimed that rats fed a diet which contained a Roundup-tolerant genetically modified maize died more frequently and earlier over the two year study than control groups was retracted last year after widespread criticism of its methodology and interpretation. It has now been republished. However, the major flaws in this study still remain.

1) the wrong controls were used - there should have been a non-GMO control for each level of GMO corn (i.e. there should have been an 11 per cent control for the 11 per cent GMO corn, a 22 per cent control for the 22 per cent GMO corn and 33 per cent standard corn for the 33 per cent GMO corn. As energy content, carbohydrate load and other components of the corn may affect tumour formation, this is a fundamental flaw which invalidates any conclusions.

2) there is no dose response. For a substance to be an attributable cause of cancer, being exposed to more of the substance should result in more cases of cancer this just does not happen in this study.

3) furthermore, there is no consistent response to any of the measured outcomes that would even hint at a real adverse effect. The GMO corn had no effect on the number of tumours - Roundup even decreased the number of tumours in male rats, as did the combination of roundup and GMO corn in male rats (there was no consistent effect in female rats). High levels of GMO corn and high levels of roundup both reduced spontaneous mortality and pushed back the onset of death in male rats.

“This shows that all we are seeing in these results is due to random variation in a poorly controlled experiment. It does not show that GMO corn, or roundup, even at concentrations that no human would ever be exposed to through diet, have no effect on cancer or mortality.”

Professor Andrew Bartholomaeus is Adjunct Professor at the Pharmacy School of Canberra University and the Therapeutic Research Unit of the School of Medicine at the University of Queensland:

“This paper is largely a re-publication of the original article published and subsequently retracted by Food & Chemical Toxicology due to concerns around the

scientific quality of the study and its interpretation, with some amendments that qualitatively address some of the criticisms of the original.

“The science of the original publication was carefully assessed by food regulatory agencies, including the European Food Safety Agency (EFSA) and Food Standards Australia NZ (FSANZ). EFSA concluded that the design, analysis and reporting is of insufficient scientific quality to be relevant in the safety assessment process. The damning criticisms of the European Society of Toxicologic Pathology (ESTP), the peak body for experts in the diagnosis and interpretation of animal pathology findings, remain most relevant. ESTP concluded that the interpretation of findings included such basic errors that they would "be considered as a disqualifying mistake at an examination for pathologists" and stated they were "shocked by the whole body photographs of animals bearing very large tumors... which should have been euthanised....much earlier.....as the authors only illustrate that Sprague Dawley rats develop mammary tumors..(which are) common background lesions" in this strain of animal.

“From a toxicological or food safety perspective the conclusions of FSANZ and international food regulatory agencies and peak scientific bodies suggest that the paper has insufficient scientific merit even to be considered controversial or provocative and it will likely be essentially irrelevant to the mainstream scientific community.

“None of the changes alter these fundamental criticisms. In short, the paper is likely to raise little more than a yawn amongst the mainstream toxicology and food regulatory communities. As an exercise in media management however the republication and associated commentary and media management such as the embargoes and limited access, reflects a masterful flair for publicity generation. Unfortunately such studies, and the associated publicity, may lead to more serious public health consequences than those purported to be found in the studies themselves, as illustrated by the vandalism of field trials of Golden rice in the Philippines, a crop being developed to alleviate the chronic disease and premature death of some of the world's most desperate and disadvantaged children, suffering chronic vitamin A deficiency.”

Declaration of interests for Andrew Bartholomaeus:

I have no direct financial interest in commercial biotechnology activities, either currently or at any time in the past. Before retiring I was the Branch head for the Risk assessment Branch of FSANZ, and prior to that the chief toxicologist for the prescription medicines branch of the TGA. I currently consult, primarily to Government, on science policy and practice in regulation and perform human health risk assessments for various areas of government. I have also collaborated with ILSI

(free of charge) to deliver workshops on biotechnology risk assessment for regulators around the world and to publish papers on this topic.

Comments from the New Zealand Science Media Centre:

Associate Professor Peter Dearden, Director of Genetics Otago, Laboratory for Evolution and Development, University of Otago comments:

"The republication of the Séralini study raises a number of important issues to do with the scientific process. It must be noted that the paper being published is identical to the first one, which was initially attacked on methodological bases.

"The paper is being republished because the authors feel it was unfairly retracted from Food and Chemical Toxicology. I think that the problem here is the controversial nature of the original paper.

"This was a publication that gave some interesting results, but that needed to be replicated with larger numbers of rats in the experiment and, perhaps, a more statistically robust analysis. The paper was, in my mind, inconclusive, but pointed a direction in which future research could go.

"After much public discussion the paper was withdrawn by the journal against the wishes of the authors. This is unusual. Even more unusual is the notice of retraction that states that the study was inconclusive, but there was no flaw or fraud in the original paper. Inconclusive data is no reason to retract a peer-reviewed and published paper.

"The republication of this paper, and the rebuttals presented, have not changed my opinion. I am not convinced that the original paper indicates any danger of genetically modified food. I do think, however, that this research needs to be continued.

"I am also convinced that retracting the original paper in this unusual way has not served the scientific process well. All good science is a debate, and one that should be held publically in published journals. Only through open publication, replication and exchange of scientific data can we use science effectively.

"Controversial studies should not be buried because of public argument. They should be investigated, repeated, and new data published to either disprove or support the original findings. Only then do we get a clear and robust argument."

Prof Thomas Lumley, Department of Statistics, University of Auckland, comments:

"I do not think the republication of the Séralini paper and the responses to critics answer any of the statistical concerns I had with the original paper. The main point of the response over sample size is to argue that some standard toxicological studies also use small sample sizes, which may be true but would not be relevant.

"Although I do not find it convincing, I am pleased that the study is being republished. While I think it would have been reasonable to reject the paper initially, I was uncomfortable with a retraction that was not based on any new information or any accusation of wrongdoing, and said so at the time.

"Since the responses to critics claim that much of the opposition is a smear campaign by people funded by Monsanto and the GM crop industry, I think it is appropriate to point out that I have never received funding from Monsanto or any company involved in GM crop technology."

Comments from the Science Media Centre of Canada:

Cami Ryan, Professional Affiliate with the Department of Bioresource Policy, Business and Economics, College of Agriculture and Bioresources, University of Saskatchewan:

"First, and most importantly, this is the same poorly designed scientific study that has been widely discredited by health and food safety agencies all over the world when it was published in 2012 (and subsequently retracted in 2013) by Food and Chemical Toxicology. Sample sizes and controls are still a problem (there are well-articulated OECD guidelines on this: and there are several holes in terms of interpretation of data (see this, lots of links to other 'takes' on this).

"If Seralini's goal here was the pursuit of good, quality science, he would have accepted the original retraction, paid mind to the broader criticisms that he received from subject-matter scientific experts and organizations and executed a new study (using an appropriate methodology) before attempting to publish again. Quality science is published in quality journals. If Seralini was really onto something here, it most certainly would have been taken up by more reputable academic journals such as Nature or Science."

Disclosure statement from Cami Ryan:

My current work is funded through various entities including not-for-profit grower groups and organizations as well as Genome Canada's Genome Prairie/GELS program. No conflict.

Alan McHughen, Plant Biotechnologist and Geneticist at College of Natural and Agricultural Sciences, UC Riverside, USA:

“The number of rats used was too small to detect a meaningful difference in treatments. In this ‘new’ study, the number of rats remains the same, too small to yield meaningful results. To illustrate for those not familiar, it’s as if Seralini tossed a coin two times, and the coin came up ‘heads’ both times. With this result, Seralini is trying to convince us that he has a magic coin that only comes up ‘heads’.

“The strain of rats used (Sprague-Dawley) was inappropriate for this type of two-year long study, as these rats have a natural predisposition to form tumors, regardless of the treatment. Seralini has not and can not justify this fatal error in experimental design

Seralini now asserts that he follows all European ethical guidelines for animal care. But he still shows rats with massive tumors, and the European ethical standards requires rats be euthanized when tumors reach 4mm diameter. Clearly the rats in the photos have tumors larger than 4mm, about the size of a small pea.

“There’s no dose response. In toxicity or carcinogenicity studies, increasing the dose of an actual toxin or carcinogen leads to greater effect. But Seralini’s data do not show such dose effects, and Seralini still does not properly explain why.

“In short, the ‘new’ paper will have the same impact as the original, retracted paper, because the original data were useless, and there is no new data. The methodology was faulty then, and, as there is no new methodology, it remains faulty now.”

Disclosure statement for Alan McHughen:

I am happy to advise that I am a public sector academic scientist serving the public interest, and as such, my research program is funded entirely from public sources; I do not accept private funds. As a result, I have no research connection to either Mr Seralini (or his coauthors), or CRIIGEN, or Monsanto.

Robert Wager, Technician and faculty member in the Biology Department at Vancouver Island University. M.Sc in Biochemistry and Molecular biology (UBC 1993):

“There are two main issues with the data I think need explanation by Seralini. First, the basic rule of toxicology is the dose makes the poison. Everything can be toxic if the dose is high enough. Therefore all proper toxicology studies show dose response curves (the higher the dose, the greater the effect). None of the data in the Seralini paper show dose response curves.

“The second point and probably more important point is the use of inappropriate strain of rats. Sprague-Dawley is a strain of rat that spontaneously generates tumors.

For this reason they are extensively used in cancer research. One of the main criticisms of the original 2012 paper was the omission of the control rat data and photos. The re-release again does not show the control rats.

“It is very clear that review of the science literature show the conclusions of Seralini et al. are not supported by the vast majority of publications in this area.”

Disclosure statement for Robert Wager

“I have no financial connection with any biotech company. I have never received any personal pay from any biotech company, nor does my institute receive/administer and grants from biotech companies. I have serious difference of opinion on GMO's with Seralini et al. but have no connection to him or his institute. I am an academic who hates the impact pseudo-science is having on public policy and that is my only motivation.”

Marcel Kuntz, biologist, director of research at Centre National de la Recherche Scientifique (CNRS, France) and professor at University of Grenoble-Alpes, said:

“The authors reach essentially the same conclusions that were already refuted and they don't take into account the fundamental criticisms addressed to them.

“Looking specifically at the tumors: The breed of rats used is subject to spontaneous tumor development. To identify a statistically reliable increase in tumors in a group of rats requires a large number of individuals. This re-publication is still deficient on this point.

“These tumors were the most spectacular element of the media operation conducted by the authors. It should be noted that they showed photographs of three rats: a rat who used the GMO NK603, another who drank Roundup and a third absorbed both. Unlike the most basic scientific approach, no control rats (which didn't eat GMO or drink herbicide) were shown. These control rats are still not shown in the re-publication.”

Disclosure statement for Marcel Kuntz:

My only income comes from my employers mentioned above (and marginally the copyright of my books). I have no current contract with a private company, or as an individual, nor to my laboratory. My current scientific work is basic research, unrelated to the marketing of a variety of plant (GM or not). I don't hold any patents, nor collect, nor received income as an inventor of a patent held by others. I do not identify any change in this situation in the foreseeable future.

Below are comments that were sent out in reaction to the original publication of the same study in Food & Chemical Toxicology**, which was later retracted by the journal:

Prof Maurice Moloney, Institute Director and Chief Executive , Rothamsted Research, said:

“Although this paper has been published in a peer-reviewed journal with an IF of about 3, there are anomalies throughout the paper that normally should have been corrected or resolved through the peer-review process. For a paper with such potentially important findings, it would have been more satisfying to have seen something with a more conventional statistical analysis. A comparison of each measured parameter, which took into account the variance throughout the experiment, which would have been revealed using a multiple range test, would have provided better evidence for the concluding remarks and the abstract. Figure 1 does not provide any data from the controls and their variance is unreported here. Table 2 reports different numbers of individuals used for the controls than the treatments. In all cases the controls have used less individuals than used in the treatments. The data in Table 2 do not show confidence intervals or provide evidence of significant differences between all the treatments and the controls. The lack of a dose response effect is argued by the authors to be indicative of a “threshold” effect. This is an extrapolation of their findings and could only be determined by intermediate dosing. The photographs are very graphic, but do not include a control. Sprague-Dawley rats frequently develop mammary tumours in well-fed controls. Are we to conclude from this that no controls developed tumours? Numerically, we cannot tell, because they are absent also from Figure 2. We are performing a more detailed analysis of the statistics in relation to the conclusions, but for the present it is fair to point out that normally a referee would insist on showing the control data and its variance in such a study.”

Prof David Spiegelhalter, Winton Professor of the Public Understanding Of Risk, University of Cambridge, said:

“In my opinion, the methods, stats and reporting of results are all well below the standard I would expect in a rigorous study – to be honest I am surprised it was accepted for publication.

“All the comparisons are made with the ‘untreated’ control group, which only comprised 10 rats of each sex, the majority of which also developed tumours. Superficially they appear to have performed better than most of the treated groups (although the highest dose GMO and Roundup male groups also fared well), but there is no proper statistical analysis, and the numbers are so low they do not amount to substantial evidence. I would be unwilling to accept these results unless they were replicated properly.”

Dr Wendy Harwood, senior scientist, John Innes Centre, said:

“The full data set has not been made available, but the findings do not contradict previous findings that genetic modification itself is a neutral technology, with no inherent health or environmental risks.

“We have to ask whether a diet with this level of maize is normal for rats. Another control with an alternative diet should have been included.

“Ten rats per group is a small number. For example, is the death of three out of ten controls compared to five out of ten males in the treated group statistically significant?

“The data from the control group fed non-GM maize is not included in the main figures making it very difficult to interpret the results.

“Without access to the full data, we can only say that these results cannot be interpreted as showing that GM technology itself is dangerous. However they do indicate possible concerns over long-term exposure to Roundup that require further study.”

Further comments from other scientists:

“Other issues that have come up:

- ‘All data cannot be shown in one report and the most relevant are described here’ – this is a quote from the paper.
- Small sample size
- Maize was minimum 11% of the diet – not balanced
- No non-maize control?
- No results given for non-gm maize
- For nearly 20 years, billions of animals in the EU have been fed soy products produced from genetically modified soybean, mainly from Latin America. No problems have been reported by the hundreds of thousands of farmers, officials, vets and so on.
- The same journal publishes a paper showing no adverse health effects in rats of consuming gm maize (though this is a shorter 90-day study)
- Statistical significance vs relative frequencies.

- We also have to ask why the rats were kept alive for so long – for humane reasons this study would not have been given approval in the UK.
- In Fig.2, I assume the bars with a zero is for the non-maize control. Those bars don't look significantly different from the bars indicating 11, 22, and 33% of GM maize in the diet? Have the authors done stats on their data?
- Dawley (SD) rats are rarely kept over 6 months of age. Mortality on this strain of rats is ~55% of mice still alive after 2yr. If indeed there is a known high incidence of tumours in ageing SD rats, it would seem hard – with such small numbers of rats as in this new study – to draw the conclusions that the authors do...
- Also to note, these type of studies with resulting tumours as those depicted in this paper would never have gotten HO approval to keep the animals alive this long. There are strict rules for how long animals can be kept with tumours and how large these are allowed to develop before an animal has to be humanely sacrificed."

Prof Ottoline Leyser, Associate Director of the Sainsbury Laboratory, University of Cambridge, said:

"Like most of the GM debate, this work has very little to do with GM. The authors of the paper do not suggest that the effects are caused by genetic modification. They describe effects of the roundup herbicide itself and effects that they attribute to the activity of the enzyme introduced into the roundup resistant maize. There is good evidence that introducing genes in to crops using GM techniques results in fewer changes to the crops than introducing them using conventional breeding.

"This is unfortunately rather a subtle point and is somewhat tangential to the immediate issue."

Prof Anthony Trewavas, Professor of Cell Biology, University of Edinburgh, said:

"The control group is inadequate to make any deduction. Only 10 rodents so far as I can see and some of these develop tumours. Until you know the degree of variation in 90 or 180 (divided into groups of ten) control rodents these results are of no value.

"These figures for normal appearance of tumours in these rodent lines are surely available and using a line which is very susceptible to tumours can easily bias any result. To be frank it looks like random variation to me in a rodent line likely to develop tumours anyway."

Prof Tom Sanders, Head of the Nutritional Sciences Research Division, King's College London, said:

"Most toxicology studies are terminated at normal lifespan i.e. 2 years immortality is not an alternative.

"No food intake data is provided or growth data. This strain of rat is very prone to mammary tumours particularly when food intake is not restricted.

"There is a lack of information on the composition of the diet. One concern is whether there were mycotoxins in the maize meal because of improper storage. Zearalanone is a well known phytoestrogen produced by filamentous fungi that grow on maize.

"The statistical methods are unconventional, there is no clearly defined data analysis plan and probabilities are not adjusted for multiple comparisons."

Prof Mark Tester, Research Professor, Australian Centre for Plant Functional Genomics, University of Adelaide, said:

"The first thing that leaps to my mind is why has nothing emerged from epidemiological studies in the countries where so much GM has been in the food chain for so long? If the effects are as big as purported, and if the work really is relevant to humans, why aren't the "North Americans dropping like flies?! GM has been in the food chain for over a decade over there – and longevity continues to increase inexorably!

"And if the effects are as big as claimed, why have none of the previous 100+ plus studies by reputable scientists, in refereed journals, noticed anything at all?

"Finally, of course, this was a study of one event with one gene. To then extrapolate to all genetically modified crops is absurd. Even if it eventuates that there is an issue with this one event, or even this one gene, there is no reason at all for other genes introduced using GM to carry the same burden of risk. GM is an adaptation of a natural process that occurs all the time all over the planet – it is "only" a technology, a technique. It is how it is used that is more important. Generalisations about the risk of the technology per se are absurd."

Prof Alan Boobis, Professor of Biochemical Pharmacology, Imperial College London, said:

"Some of the effects are presented in a way that makes it difficult to evaluate their significance. For example, there does not appear to be a statistical analysis of the mammary tumours. These occur quite often in untreated animals. One would

usually also take into account the historical controls in the testing lab, in reaching a conclusion. The pesticide itself has been subject to long term studies in rodents by others.”

When originally published in Food & Chemical Toxicology the SMC sent the below Before the Headlines analysis, which has been amended to reflect changes in the republished study:

Before The Headlines

COMMENTARY

Title, Date of Publication & Journal

‘Republished study: long-term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize’ by Gilles-Eric Séralini et al, published by SpringerOpen, 24 June 2014.

[Originally publication: ‘Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize’, Food and Chemical Toxicology, 19 September 2012]

Claim supported by evidence?

The conclusions of the new study are written in different language to that of the original publication. Nonetheless the clear language regarding rats fed on a diet containing NK603 Roundup tolerant GM maize dying earlier and having more tumours than rats fed on a standard diet is not supported by statistical significance.

(Note: biochemical analysis has not been reviewed by a Before the Headlines statistician)

[Original publication: The paper does not prove the claim that rats fed on a diet containing NK603 Roundup tolerant GM maize died earlier than rats fed on a standard diet.]

Summary

Looking at the graphs of mortality for females (Fig 6), death might appear to be earlier with a GM diet than a standard diet; however this has not been proven statistically. Mortality is broadly similar for males with a GM diet and a standard diet. Similar comments apply to pathological findings.

It is evident that some treated groups have lower death rates / tumour rates than the comparable controls. This is not reported in the abstract.

There is no consistent dose-trend – if there were an effect, we would expect to see increases (e.g. in deaths) from 0 to 11 to 22 to 33. In contrast – in males, 33 (and C) have the lowest numbers of deaths.

[Same as original publication]

Strengths/Limitations

“In females, all treatment groups showed a two- to threefold increase in mortality, and deaths were earlier. This difference was also evident in three male groups fed with GM maize” * - this statement has not been subjected to standard methods of statistical analysis for survival time. The phrase “two- to threefold increase in mortality” is based on exceptionally small numbers.

The authors suggest a threshold – this rarely occurs in practice. We would expect greatest mortality/ toxicity at the highest dose in a well-designed study. With small numbers as in this study we would expect to see a general trend of mortality increasing with dose.

It seems likely that the numbers in each group are too small for standard methods of statistical analysis to find significant effects on mortality or pathological findings.

There are virtually no p-values presented. The group sizes are small. This should be interpreted with extreme caution.

It is notable that the figures do not present deaths in the control group in a similar manner (no step graph for controls). This makes it more difficult to compare the other groups with the controls.

There are many treated groups, and a number of parameters. There is obvious potential for selected reporting, selection of methods etc. In such small groups, with so many parameters this is a big issue. This issue is amplified in the abstract and further in the press release. Strong statements are issued without sufficient backing / explanation.

Deaths are compared to the control mean (for males and females). Due to the distribution of deaths (most deaths occur in old age), this is almost bound to exclude the large majority of deaths in the control groups. The 2 or 3 deaths in the control group is determined by their methods, but is inappropriately presented as a true observation.

*[In the original publication this quote was worded differently “In females, all treated groups died 2–3 times more than controls, and more rapidly. This difference was visible in 3 male groups fed GMOs.” Otherwise same as original publication.]

Before The Headlines is a service provided to the SMC by volunteer statisticians: members of the Royal Statistical Society (RSS), Statisticians in the Pharmaceutical Industry (PSI) and experienced statisticians in academia and research. A list of contributors, including affiliations, is available at <http://www.sciencemediacentre.org/working-with-us/for-journalists/headlines-for-journalists/>

* 'Republished study: long-term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize' by Gilles-Eric Séralini et al. will be published in Environmental Sciences Europe at 10:00 UK time on Tuesday 24th June 2014, which is also when the embargo will lift.

** 'Long term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize' by Seralini et al., published in Food and Chemical Toxicology on Wednesday 19th September 2012.

All our previous output on this subject can be seen at this weblink: <http://www.sciencemediacentre.org/tag/seralini/>

Note to editors

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The Science Media Centre can also help you find an expert on a topical area of science, we have over 2000 media friendly scientists and engineers on our database and you can call us on 020 7611 8300 if you need an expert to interview.

The SMC has asked the experts in the above Roundup to declare any interests which may be regarded by a reasonable and objective third party as giving rise to a conflict, and their responses are included above.

For more details see our website www.sciencemediacentre.org, please e-mail the Science Media Centre with your comments on our service at smc@sciencemediacentre.org

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Any material from media outlets contained within this email is sent for the sole purpose of criticism, review and reporting of recent publications in pursuit of the charitable objectives of the Science Media Centre. Recipients should not forward any such material.

To unsubscribe from this group and stop receiving emails from it, send an email to 2-gm+unsubscribe@sciencemediacentre.org

SMC email to Defra and others – 20 June

Dear all

Some of you will remember a study in 2012 by Seralini et al which claimed to show roundup-treated GM maize caused rats to develop tumours. The paper's design, methodology and use of statistical tools attracted a great deal of criticism from the scientific and the paper was eventually retracted by Elsevier.

The same group have now reanalysed the results and come to essentially the same conclusions. They will be republishing in a different, open access journal, and launching their results to the media in Paris on Tuesday. The name of the journal is being kept secret but I believe it is Environmental Toxicology and Pharmacology (tbc).

Just as before, it is critical that this work is scrutinised by 3rd party experts in advance. This maize is widely consumed and if this research really does represent a public health time bomb, that must be communicated clearly and robustly in the press. Similarly, if the work is of poor quality, journalists need to know that in advance.

I need as wide a selection of quotes as possible, so if you have the expertise to comment on the stats, the study design, the toxicology, or any other element of this work, please read the attached material and let me have your quote by Monday.

Below is the original email from the promoters of this work. Attached are the paper, press release, and associated documents. It's in zipped form so if you can't open it please tell me.

Please note that this material is under embargo until 11am on Tuesday 24 June and so it is not for publication or distribution before that time.

Any questions please don't hesitate to call me on ----- today or over the weekend.

Many thanks for your help everyone - reporting of their previous study was hugely enhanced by the fact journalists had access to your responses in advance and this time will be no different.

Attached email from CRIIGEN – 18 June

Subject: Roundup, GMO, republication of the Séralini study : invitation and press kit (EMBARGO June 24th)

Dear all,

After two years of controversies and pressures that led in November 2013 to the censorship of the study on chronic toxicity of Roundup and a Roundup tolerant GMO published by Food and Chemical Toxicology (2012), the Professor Séralini's team is proud to announce the republication of his study.

They confirm their main findings :

- * The main pesticide of the world, Roundup, provokes severe hepatorenal deficiencies and sex-dependent hormonal effects such as mammary tumors from very low environmental levels
- * Comparable results have been obtained during chronic consumption of an equilibrated diet containing a Roundup-tolerant GMO (maize).
- * The research team of Professor Séralini has chosen to republish in an open access journal with a professional peer-review committee .
- * The team will also provide the raw data of its study

The republication will come jointly with the publication in the same journal of a new article regarding the impacts of « Conflicts of interests, confidentiality and censorship in health risk assessment .The example of a herbicide and a GMO ». You will find the full article in the press kit.

A press conference will be held in Paris on June 24, 2014 at 11:00 am at Paris, Salle du bureau d'information du Parlement européen, 288 bvd St Germain (métro 12, Assemblée nationale) to reveal the name of the journal and answer your questions. A press release will be sent with additional informations at 11:00 am.

Please find a full press kit (study, articles, figures and comments) joined to this mail.
We can also provide you some international scientists' contacts for public comments.

We would like to ask you to respect an embargo for public release till the press conference, June 24th at 11:00 am.

The Pr. Séralini's team will be available for further information for the next days, and will welcome you on June 24th to answer your questions.

Best regards,

CRIIGEN

(6 ATTACHMENTS IN ZIPPED FILE)

:

Defra email to SMC - 13 March

Subject: RE: GM Report briefing- Invite & Attendees

Thanks ----- – really great (and well-attended) event I thought, looking forward to seeing the coverage tomorrow.

SMC email to Defra – 13 March

Subject: FW: GM Report briefing- Invite & Attendees

This went really well...fingers crossed for coverage

Internal SMC email attached - 13 March

Subject: GM Report briefing- Invite & Attendees

Science Media Centre news briefing

UNDER EMBARGO UNTIL 00.01hrs Friday 14th

What? New report on GM

When? 10.00am Thursday 13th March

Where? The Wellcome Trust, 215 Euston Road], NW1 2BE

The Council for Science and Technology, the body that advises the Prime Minister on science policy issues, last year asked a group of independent scientists to look into the developments in the science of GM crops since the Royal Society report published in 2009

The result is a new 50 page report which records the progress of the first generation of crops, the potential applications coming through the pipeline and the regulatory challenges. The report makes a series of recommendations that would allow a safe and sustainable agriculture to use GM varieties for the benefit of the farmer, consumer and the environment

Speakers will include:

Professor Jonathan Jones, Sainsbury Laboratory

Professor Jim Dunwell, University of Reading

Professor Sir Mark Walport, Chief Scientific Adviser

For further information please call Fiona Fox on 020 7611 8365

Notes to editors:

The authors of the report are

Professor Sir David Baulcombe, University of Cambridge

Professor Jonathan Jones, Sainsbury Laboratory

Professor Jim Dunwell, University of Reading

Professor John Pickett, Rothamsted research

Professor Pere Puigdomenech, University of Cambridge/Barcelona

Attendees

James Morgan BBC

Angela Saini Science AAAS

Christina Earle Sun

Kate Kelland Reuters

Steve Connor Independent

David Shukman BBC

Hannah Devlin Times

Tom Feilden BBC Today

Damian Carrington Guardian

Sarah Knapton Telegraph

Clive Cookson Financial Times

Charlotte Smith BBC Farming Today

Ben Spencer Mail

Andy Coghlan New Scientist

Catherine Brahic New Scientist

Helen Lock Research Fortnight

David Wilcock PA

Michael le Page New Scientist

Thomas Moore Sky News

SMC email to Defra – 14 February

Subject: FW: SMC Roundup V3: Blight-resistant GM potatoes [UNDER EMBARGO UNTIL 00:01 UK TIME MON 17 FEB]

Have sent a final version out – remember not to share as this is under embargo

Hopefully it will get some pick up though with the floods hard to know

Cheers

Internal SMC email attached - 14 February

Subject: SMC Roundup V3: Blight-resistant GM potatoes [UNDER EMBARGO UNTIL 00:01 UK TIME MON 17 FEB]

Science Media Centre Round-up- Version 3

EMBARGOED UNTIL 00:01 UK TIME on MONDAY 17/02/14

Expert reaction to blight-resistant GM potatoes as published in Philosophical Transactions of the Royal Society B*

NEW COMMENT Prof Ian Crute, Agriculture and Horticulture Development Board, said:

“It was here in Britain, over 170 years ago, that the science of plant pathology was born when this dreadful affliction of potatoes led to the discovery that severe crop loss could result from infectious disease. The fight against blight has been waging ever since. Now finally, we have the knowledge and technology to stack the odds in our favour. Surely, we must ensure that this scientific advance is exploited swiftly and not left on the shelf unexploited. Our global requirement for resilient and sustainable crop production systems is just too important to let this happen”

NEW COMMENT Prof Melanie Welham, Science Director, BBSRC, said:

“Potatoes are important agricultural products and their susceptibility to blight highlights the challenge of producing food in a sustainable way, while minimising effects on the environment. If we are to explore alternatives to chemicals, we need scientific research on a variety of approaches and technologies that could help us. This BBSRC-funded research provides important evidence to help inform future decisions on how best to meet the food requirements of a growing population.”

NEW COMMENT Prof Denis Murphy, Head of Genomics and Computational Biology Research Group, University of South Wales, said:

“This report of enhanced resistance to potato blight shows the very real potential of GM technology to address a serious and persistent disease in one of our major staple crops. The main significance of the report is that in this case at least (and possibly others) the transfer of just one or two genes from one type of potato to another can significantly increase resistance to the blight disease.

This will not always be the case. For example, there are many crop traits that are regulated by many genes which makes the GM approach less useful in such cases. However, where important traits like disease resistance are regulated by a few

genes the GM approach offers some real advantages over conventional breeding from wild relatives.

In my family we have a personal interest in potato blight thanks to our great grandfather (born 1843) who was a pastoral farmer in County Cork in Ireland. He recalled his horror when as a young boy he saw crowds of starving and destitute people fleeing from their ruined potato crops in the late 1840s. Over a million Irish people died during those awful years and the same pathogen, *Phytophthora infestans*, continues to attack our potato crops to this day.

Nowadays we are privileged to live in happier times and it is vitally important that scientific advances, such as that reported by the Sainsbury Laboratory group, are allowed to help with the never ending quest to protect our essential food crops from this and other serious diseases.”

NEW COMMENT Prof Huw Jones, Head of Cereal Transformation Lab, Rothamsted Research, said:

“Potato breeding is exquisitely difficult and moving disease-resistance from a wild relative to a commercial line by GM is a great way of overcoming these obstacles. Obviously a risk assessment is needed before these can be marketed but this is a great example of publically-funded plant science with a real benefit to UK farming. “

NEW COMMENT Prof Maurice Moloney, Chief Executive of Rothamsted Research, said:

“It is exciting to see real data confirming a hypothesis with respect to resistance delivered by GM better than any other approach so far by alternative possibilities. Just is a step forward that is applicable widely to other crops. If only this approach had been available in 2012, when there were no pesticide free –potatoes.

Let's put it together and help the Industry and consumer at the same time.”

Prof Chris Pollock, Aberystwyth University, said:

“This is an excellent example of the way in which biotechnology can add to the plant breeder's armoury. With increasing demands for food globally, managing losses from pests and diseases becomes increasingly important and developing resistant varieties is an important part of integrated pest and disease management. Late blight of potatoes is a difficult disease to control, and using genes from distant

relatives is a valuable tool. Biotechnology gives breeders the opportunity to do this quickly and precisely.

Unfortunately, the problems in the current European regulatory process, which is expensive and extremely slow, means that this advance by UK scientists is far more likely to help farmers in other countries.”

Prof Joe Perry, University of Greenwich said:

“I welcome this example of a third-generation GM plant, one which has potential benefit for the consumer, the farmer and, by reducing pesticide use, for the environment. If proper risk assessment were to demonstrate that this potato was as safe for human health and the environment as conventional varieties, it would be difficult to see any objection to its cultivation in the UK.”

Prof Bruce Whitelaw, Professor of Animal Biotechnology, Roslin Institute, University of Edinburgh, said:

“This is an exciting development which demonstrates the ability of GM technology to provide enhanced genetic traits. Engineering disease resistance in important agricultural products will help provide the much needed increased productivity that is required to provide food security for the many nations of our world.”

Prof Sir David Baulcombe, Professor of Botany, University of Cambridge, said:

“This work illustrates the elegance of GM. You wish to improve a crop variety? Then take a suitable gene from a wild relative and transfer it into the crop. One new gene and one new trait. All of the qualities of the old variety are preserved but with added value. Conventional breeding is good but it’s not as simple – all of the genes of one parent are combined with all of the genes of the other and it takes time to sort out the best gene combination in the progeny. GM does not need this extra time.”

Prof Mark Tester, Professor of Bioscience, KAUST, said:

"These people have put a wild potato gene into commercial potatoes, accelerating breeding. They have delivered benefits for all – reducing pesticide use and increasing food security. I cannot see how those against GM can rationally object to this.”

This is yet another example of how genetic modification can be used to introduce new variation into crops which goes beyond that found naturally within the gene pool

and where this knowledge can be applied for significant benefit to both the environment and global food security.

* 'Elevating crop disease resistance with cloned genes" by Jones et al. will be published in Philosophical Transactions of the Royal Society B at 00:01 UK time on Monday 17th February, which is also when the embargo will lift.

All our previous output on GM crops can be seen at this weblink:
<http://www.sciencemediacentre.org/tag/gm-crops/>

Note to editors

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SMC email to Defra and others – 14 February

Subject: Fwd: SMC Roundup: Blight-resistant GM potatoes [UNDER EMBARGO UNTIL 00:01 UK TIME MON 17 FEB]

fyi...under embargo until Monday so please do not share..just for your info

----- Forwarded message -----

SMC email attached – 14 February

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Science Media Centre Round-up

EMBARGOED UNTIL 00:01 UK TIME on MONDAY 17/02/14

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My blog: on science and the media

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SMC email to Defra and others – 13 February

Subject: Strictly Embargoed

Hi folks,

I am keen to gather a few 'third party' reactions from scientists to the new study on GM potatoes being published on Monday (and under strict embargo until then!!) to send to the journalists who we hope will cover the story. I don't need you to explain the science which ----- does beautifully in this embargoed press release, but more to comment on the scientific significance or otherwise of this research. We send these 'Round Up' press releases on new research to science journalists every week and we know they are very useful to guide journalists as to how significant a story is and whether it is a well-designed strong study or a more preliminary step.

I am keen to get these comments to the science journalists by lunch time tomorrow ..so sorry for the late notice – I have been drowning in floods!

Cheers

Strictly embargoed to 0001 hours, Monday 17 February

GM spuds beat blight

In a three-year GM research trial, scientists boosted resistance of potatoes to late blight, the biggest threat to their survival, without deploying fungicides.

The findings, funded by the Biotechnology and Biological Sciences Research Council and The Gatsby Foundation, will be published in 'Philosophical Transactions of the Royal Society B' on 17 February.

In 2012, the third year of the trial, the potatoes experienced ideal conditions for late blight. The scientists did not inoculate any plants but waited for races circulating in the UK to blow in.

Non-transgenic Desiree plants were 100% infected by early August while all GM plants remained fully resistant to the end of the experiment. There was also a difference in yield, with tubers from each block of 16 plants weighing 6-13 kg while the non-GM tubers weighed 1.6-5 kg per block.

The trial was conducted with Desiree potatoes to address the challenge of building resistance to blight in potato varieties with popular consumer and processing characteristics.

The introduced gene, from a South American wild relative of potato, triggers the plant's natural defence mechanisms by enabling it to recognise the pathogen. Cultivated potatoes possess around 750 resistance genes but in most varieties, late blight is able to elude them.

"Breeding from wild relatives is laborious and slow and by the time a gene is successfully introduced into a cultivated variety, the late blight pathogen may already have evolved the ability to overcome it," said Professor Jonathan Jones from The Sainsbury Laboratory.

"With new insights into both the pathogen and its potato host, we can use GM technology to tip the evolutionary balance in favour of potatoes and against late blight."

In northern Europe, farmers typically spray a potato crop 10-15 times, or up to 25 times in a bad year. Scientists hope to replace chemical control with genetic control, though farmers might be advised to spray even resistant varieties at the end of a season, depending on conditions.

The Sainsbury Laboratory is continuing to identify multiple blight resistance genes that will be difficult for blight to simultaneously overcome. Their research will also allow resistance genes to be prioritized that will be more difficult for the pathogen to evade.

In a new BBSRC-funded industrial partnership award with American company Simplot, the researchers will identify and experiment with multiple resistance genes. Combined with their understanding of the pathogen, they hope to develop Desiree and Maris Piper varieties that can completely thwart attacks from late blight.

<ends>

Notes to editors

The full reference: Elevating crop disease resistance with cloned genes. Phil. Trans. R. Soc. B 368: 20130087. <http://dx.doi.org/10.1098/rstb.2013.0087>

It is part of a special issue of the journal on the subject of: 'Achieving food and environmental security: new approaches to close the gap'.

Funding: Findings in the current paper were largely funded through the £750,648 BBSRC grant BB/G02197X/1, 'A pipeline of resistance genes to *Phytophthora infestans* from wild *Solanum* species and their accelerated isolation using Illumina sequencing methods'. They include insights into the pathogen, resistance in *Solanum* species and the 3-year field trial.

Security for the field trial was funded via a £46,039 supplement from the BBSRC.

The subsequent grant BB/H019820/1 'An enduring pipeline to identify and utilize durable late blight disease resistance in potato' was awarded at £712,792 jointly between The Sainsbury Laboratory, the University of Dundee and Scottish Crop Research Institute. This project, which contributed to some findings in the current paper, is ongoing until April 2015.

The industrial partnership award is for £1.2million with around £450,000 awarded to The Sainsbury Laboratory.

More on late blight

The total economic cost to farmers (losses and control measures) is currently up to £500 per hectare, or up to half the total cost of potato production in a bad year. UK farmers spend an average of £60 million a year controlling blight. It causes worldwide losses of about £3.5 billion.

As well being an economic cost, recurrent chemical sprays cause soil compaction from tractor journeys and CO2 emissions from diesel fuel.

Why improve Desiree and Maris Piper when a conventionally-bred variety is already available?

In the UK we produce and consume about 6 million tonnes of potatoes each year. The most popular are Maris Piper with around 15% of the market and Desiree with approximately 2%.

See <http://www.potato.org.uk/sites/default/files/%5Bcurrent-page%3Aarg%3A%3F%5D/GB%20Potatoes%20Market%20Intelligence%202013-14.pdf>

Production is from the traditional earlies, for example crops grown in the South West, through to the more widespread maincrop potatoes produced e.g. from Lincolnshire and up into Scotland. A range of different varieties are needed for this extended window of cropping from the first earlies planted in February to the later maincrops being harvested up until October for production and for the broad geographic spread on different soil types.

Overlaying these production needs with the consumer's requirements for fresh market potatoes or ones that need to be processed for crisps or french fries - all of which have different cooking characteristics – means that no one variety meets our national needs. In fact around 200 different varieties are grown in GB to meet the needs of our market place.

Longer Q&A

<http://www.tsl.ac.uk/lateblightqa.html>

Fiona Fox

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My blog: on science and the media

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SMC email to Defra and others – 24 January

Subject: FW: SMC Coverage Report (briefing)- GM plants for omega-3

Hi folks

The media coverage for this is really lovely..very balanced and measured for a GM story and even the mail piece is ok (and they didn't pull out their anti GM logo)...I really think times are changing on this and it's a really nice mixture of great researchers happy to be proactive (----- was amazing!!!), very supportive and proactive press offices in places like Rothamsted and the BBSRC and great science reporters who do not have an axe to grind on this issue as some of the political hacks and consumer reporters who covered this in the early days

Also look out for a piece on another GM story on the BBC 10 news tonight featuring the John Innes GM purple tomatoes

Cheers

SMC email attached - 24 January

Subject: SMC Coverage Report (briefing)- GM plants for omega-3

GM plants for omega-3 – announcement of new field trial

Friday 24th January 2014

Invitation

Science Media Centre and Rothamsted Research news briefing

UNDER EMBARGO UNTIL 00.01 UK time on Friday 24 January

What? GM plants for omega-3 – announcement of new field trial

When? 10.30am Thursday 23 January 2014

Where? The Wellcome Trust, 215 Euston Road, London NW1 2BE

Rothamsted Research has applied to Defra to conduct a field trial of GM plants that produce omega-3 oils and may provide health, environmental and economic benefits.

Consumption of omega-3 oils from oily fish (e.g. salmon and mackerel) has been linked with improved health. Fish do not produce these oils themselves but rather accumulate them through their diet.

Scientists at Rothamsted Research have developed Camelina plants that accumulate omega-3 long chain polyunsaturated fatty acids (LC-PUFAs) in their seeds and therefore can provide a novel method of making these essential oils with existing farming practice and machinery.

Scientists have already demonstrated that plants growing in glasshouses produce the right profile of fatty acids in significant quantities. The purpose of the proposed trial is to evaluate the performance of this trait in the field.

The proposed experiment is publicly funded by the Biotechnology and Biological Sciences Research Council (BBSRC). An open public consultation on this work has now begun.

Speakers will include:

Professor Johnathan Napier, Rothamsted Research

Dr Olga Sayanova, Rothamsted Research

For further information please call Tom Sheldon on 020 7611 8366 or Darren Hughes / Matina Tsalavouta at Rothamsted on 01582 763133 x2673 / x2525

Attendees

Ben Jackson Sun

Damian Carrington Guardian

Victoria Wade Sky News
Michael Le Page New Scientist
Hannah Devlin Times
John von Radowitz PA
Sarah Spickernell Financial Times
Olivia Midgely Farmer's Guardian
Steve Connor Independent
Tom Feilden BBC Today
Kate Kelland Reuters
Ben Spencer Daily Mail

Recording: <https://db.tt/7mLhrctf>

Media Enquiries

Victoria Wade (Sky News) filmed interview with Johnathan Napier

Briefing coverage

BBC News

<http://www.bbc.co.uk/news/uk-25873931>

Times

<http://www.thetimes.co.uk/tto/science/article3984303.ece>

Daily Mail

http://www.dailymail.co.uk/news/article-2545076/Now-gene-experts-create-fish-oil-without-fish-GM-crops-grown-spring.html?ITO=1490&ns_mchannel=rss&ns_campaign=1490

Guardian

<http://www.theguardian.com/environment/2014/jan/24/fish-oil-from-gm-crop>

Telegraph

<http://www.telegraph.co.uk/earth/agriculture/geneticmodification/10593892/GM-crops-containing-fish-oil-nutrients-could-be-grown-in-UK-within-months.html>

ITV News

<http://www.itv.com/news/update/2014-01-24/scientists-bid-to-begin-field-trials-into-fish-oil-gm-crop/>

Independent

<http://www.independent.co.uk/news/science/first-nutrientenriched-gm-crops-could-be-grown-in-the-uk-within-months-9081305.html>

Financial Times

<http://www.ft.com/cms/s/0/b784b742-8451-11e3-b72e-00144feab7de.html#axzz2rJ93bE00>

BBC Today (Johnathan Napier interviewed)

<http://www.bbc.co.uk/programmes/b03qflzn/live>

PA (via Yahoo News)

<http://uk.news.yahoo.com/fish-oil-gm-crop-bid-submitted-000127717.html>

Independent (Voices)

<http://www.independent.co.uk/voices/editorials/gm-crops-could-help-to-solve-the-problem-of-overfishing-9081021.html>

Farmers Guardian

<http://www.farmersguardian.com/home/arable/rothamsted-trialling-gm-omega-3-plants/61696.article>

Reuters

<http://www.reuters.com/article/2014/01/24/us-science-britain-gm-idUSBREA0N0M720140124>

Clips

BBC News

<http://www.bbc.co.uk/news/uk-25873931>

24 January 2014 Last updated at 05:07

'Fish oil' GM plant trial application submitted

An application to conduct field trials of a genetically modified crop containing Omega-3 fatty acids normally found in oily fish has been submitted.

If approved by the government, the trials could begin at Rothamsted Research agricultural institute in Harpenden, Hertfordshire, this year.

The initial aim of the crop is to benefit the fish farming industry, the researchers said.

But in a decade it could end up in food products, such as margarine.

The scientists at Rothamsted Research - who have been working on the project for 15 years - modified seeds from *Camelina sativa* (false flax) plants using genes from marine algae - the primary organisms that produce the fatty acids.

By substituting synthetic versions of up to seven genes from marine algae, the researchers have engineered *Camelina* plants to produce two key Omega-3 fatty acids normally obtained from oily fish, EPA and DHA.

Both are said to have important health benefits, including protection against heart disease.

Fish oils

Lead researcher Prof Johnathan Napier said: "The next really exciting challenge for us is to say, 'We know it works in the glasshouse. Does it work in the real world?'

"We have applied to Defra for permission to carry out a field trial."

If the regulatory hurdles are crossed, the first crop could be sown in about three months.

Plants such as flax and linseed contain Omega-3 fatty acids, but they are not the same as the long-chain compounds in fish oil.

Oily fish such as tuna, mackerel, and sardines do not produce long-chain Omega-3 fatty acids naturally either.

They only obtain them by consuming certain types of marine algae and the molecules then move up the food chain.

Currently, farmed fish are given fish oil, rather than feeding on the algae, in order to get their Omega-3.

About 80% of available supplies of fish oils are taken by the industry as a result.

The Rothamsted Research scientists believe genetically modified plants like Camelina have the potential to make fish farming more sustainable and ease the pressure on wild fish populations.

Prof Napier said he doubted Omega-3 supplements would be a "natural market" for fish oil nutrients produced from GM plants.

But he said he could imagine the fatty acids being incorporated into food products such as margarine.

"By the end of this decade, there's a possibility that people will be able to obtain a GM plant-based source of fish oils," Prof Napier said.

Times

<http://www.thetimes.co.uk/tto/science/article3984303.ece>

British trials for GM crop could 'grow' fish oil

Hannah Devlin Science Editor

Last updated at 12:01AM, January 24 2014

A genetically modified crop designed to produce fish oil could be grown in field trials in Britain later this year.

Scientists hope that the plant could become the world's first sustainable source of omega-3 fatty acids, which help to prevent heart disease and could delay the onset of dementia.

Professor Johnathan Napier, from Rothamsted Research agricultural institute in Hertfordshire, said that the substance was critical for human health but was in increasingly short supply.

"In 20 years, it's difficult to imagine how everyone will be able to have fair and equal access to these fatty acids," he said.

Despite oily fish such as mackerel and sardines being the traditional source of omega-3, they do not produce the long-chain fatty acids themselves, but absorb it from their marine environment, where it is produced by algae and marine plankton.

The crop, *Camelina sativa* or "false flax", was engineered by "cutting and pasting" up to seven genes derived from marine algae. In preliminary trials the modified flax seeds were shown to contain similar concentrations of omega-3 to that found in cod liver oil.

Although the scientists have not sampled the oil, they said that it would not taste "fishy".

The Rothamsted team has now submitted an application to the Department for Environment, Food and Rural Affairs seeking permission to begin a field trial and, if successful, the crops could be sown within three months.

It is likely that the initial market for a GM omega-3 product would be fish farms, which currently consume about 80 per cent of the fish oil that comes out of the ocean. Without enhancing the diet of farmed fish with omega-3, the fish suffer ill-health and go blind. Ultimately it could be used to enhance products in which Camelina oil is already used, such as margarine.

A hectare of GM Camelina would be expected to generate just under a tonne of vegetable oil — about 80 per cent of the yield level of oil seed rape. In total about a million tonnes of fish oil are extracted from the ocean each year.

Camelina sativa is widely cultivated in the rest of Europe and North America as a source of vegetable oil, animal feed and biofuel.

The scientists said they thought that there was increasing public acceptance of GM crops. “There isn’t a big health controversy over the safety of GM,” said Professor Napier. “I think that one’s been laid to rest.”

Although omega-3 can be obtained from some nuts, seeds and vegetables, it is only in the marine environment, in algae and fish, where the long-chain forms of omega-3 are found — docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA), which we need in our diet. False flax plants naturally produce the short versions of omega-3, but the genetic modification means they also produce the long-chain versions of the acids.

Camelina was chosen because it is easy to manipulate genetically and it does not cross-pollinate with any other crops that are grown commercially in the UK, side-stepping environmental concerns.

Owen Paterson, the Environment Minister, has criticised the “medieval” attitude of some European countries towards GM technology, which he has said the rest of the world was benefitting from while Europe was being left behind.

At least six GM crops have been ruled as safe by the European regulator during the past decade but have been blocked at the political level, where countries including Austria, France, Hungary and Poland have refused to grant final approval for cultivation.

This week pro-GM activists launched a campaign to get EU approval for genetically engineered crops, staging a protest outside the Brussels office of Greenpeace yesterday. The protesters held up banners describing the environmental group’s position against GM crops as a “crime against humanity”, for opposing GM crops such as Golden Rice, a vitamin A-enriched form of the dietary staple that could

prevent millions of deaths as well as blindness from malnutrition in the developing world.

Daily Mail

http://www.dailymail.co.uk/news/article-2545076/Now-gene-experts-create-fish-oil-without-fish-GM-crops-grown-spring.html?ITO=1490&ns_mchannel=rss&ns_campaign=1490

Now gene experts will create fish oil without fish: GM crops could be grown this spring

- Researchers apply to conduct first GM field test in Britain for three years
- If approved this could lead to synthetic cod liver oil being sold by 2020
- Opponents concerned about hidden health risks of the untested product

By Ben Spencer

PUBLISHED: 01:59, 24 January 2014 | UPDATED: 02:00, 24 January 2014

Synthetic cod liver oil capsules could be sold on shop shelves by 2020 scientists have revealed

A designer crop genetically modified to produce fish oils could be grown in our fields this spring, scientists announced yesterday.

Researchers have applied to conduct the first GM field test in Britain for three years, which if approved could lead to a synthetic form of cod liver oil being sold on shop shelves by 2020.

The field test would only be the fifth to be conducted in Britain in the last decade.

The prospect of 'Frankenstein foods' has long been viewed with concern.

Opponents yesterday said the application was a worrying development and raised concerns about potential hidden health risks of the crop, which have not yet been tested.

The scientists say a modified form of the Camelina plant - a spindly brassica usually grown as a biofuel or animal feed - can produce the same amount of healthy omega-3 fatty acids as fish oils.

Professor Johnathan [correct] Napier, lead scientist at the taxpayer-funded Rothamsted research project, said the technology would take pressure off dwindling fish stocks.

His team has developed the engineered plant by 'cutting and pasting' genes from algae.

He said: 'We are interested in producing fish oils in plants because fish oils, and the long-chained omega 3 fatty acids, are known to be very important for human health and nutrition.'

'Global fish stocks are in decline so there is a problem of the availability of fish for these fatty acids.'

Laboratory experiments have shown that by inserting up to seven genes from algae into Camelina, the plant can produce two key omega-3 fatty acids that are normally obtained from oily fish, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA).

The acids are linked to health benefits for the heart, brain and nervous system and are thought to provide greater protection against diseases such as Alzheimer's.

Rothamsted said its initial hopes for the new crop is as a feed in fish farms, which consume 80 per cent of fish oil supplies.

But Professor Napier said that by the end of the decade, the GM-produced oil could be sold for human consumption as an omega-3 supplement or as an addition to food products such as margarine.

Innovation: If the regulatory hurdles are crossed, the first trial crop will be sown at research facility in April. This could lead to fishless fish-oils by the end of the decade

An application to conduct the trials at Rothamsted's agricultural institute in Hertfordshire was this week submitted to the Department for Environment, Food and Rural Affairs.

If the regulatory hurdles are crossed, the first trial crop will be sown at research facility in April.

Professor Napier said: 'By the end of this decade, there's a possibility that people will be able to obtain a GM plant-based source of fish oils.' But he admitted none of the oil had so far been consumed by humans and it would need to pass rigorous health checks before it could enter the food chain.

Dr Ricarda Steinbrecher, a geneticist at EcoNexus, a non-profit research organisation in Oxford, said genetic engineering risked introducing unintended DNA mutations.

She said: 'There are more risks than are immediately obvious.'

'Risks arise not only from the new trait and the interference caused by the new genes but also from the many DNA mutations that occur during the engineering processes.'

'Will the plant still produce all its original nutrients? Will it produce toxins? Will it still be safe to consume?' Peter Melchett, policy director of organic campaign group the Soil Association, said shoppers would never accept the idea of GM food supplements: 'The idea of anyone walking into Holland And Barrett and scooping up GM fish oil is ridiculous.'

Helena Paul, director of GM Freeze, added: 'Hundreds of thousands of hectares of land would be required to grow this GM Camelina to produce enough to replace global fish oil used for feeding fish.'

'If this is the case, we would simply be replacing one problem, over-consumption of fish stocks to feed farmed fish, with another – additional demand for land for feed for animals rather than for growing food for humans.' Prof Napier played down concerns.

He said: 'If you have a crop that's got the potential health benefits and sustainability and environmental benefits, and we can articulate that clearly, then I think people will see this is an okay thing to do.'

A Defra spokesman said: 'Ministers will decide in due course whether this trial should be approved based on the expert scientific advice they receive from the independent Advisory Committee on Releases to the Environment.'

In the last decade only four GM field trials have been approved - three for blight-resistant potatoes and one, in 2011, for aphid resistant wheat.

Environment Secretary Owen Paterson is enthusiastic supporter of GM technology.

Earlier this month he accused opponents of GM developments as being 'politically-motivated' and said blocking the technology risked making the UK a 'museum of world farming'.

Only one crop has ever been approved for commercial cultivation in Europe, an insect-resistant corn variety given the go-ahead in 1998.

Mr Paterson has indicated he will vote for Europe's second GM crop to be approved by the EU later this month - an insect-resistant maize developed jointly by DuPont and Dow Chemical.

Guardian

<http://www.theguardian.com/environment/2014/jan/24/fish-oil-from-gm-crop>

Fish oil could soon come from GM crop

- Damian Carrington
- The Guardian, Friday 24 January 2014

Fish oils – specifically omega-3 long-chain polyunsaturated fatty acids – have been shown to cut the risk of cardiovascular disease. Photograph: D. Hurst/Alamy

A genetically-modified plant that produces seeds packed with fish oils is set to be grown in open fields in the UK within months, scientists announced on Friday. The oils could provide feed for farmed fish, the researchers hope, but they could ultimately be used as a health supplement in human foods such as margarine.

Fish oils – specifically omega-3 long-chain polyunsaturated fatty acids – have been shown to cut the risk of cardiovascular disease and are a popular food supplement. But about 80% of the fish oil harvested from the oceans every year is actually fed to other fish being raised in aquaculture. With many fish stocks already over-exploited, the government-funded researchers from Rothamsted Research in Hertfordshire have spent 15 years developing the new GM plant and hope to have permission for field trials by March, with planting to start shortly after if approval is given.

Environment secretary Owen Paterson will make the final decision after a public consultation and advice from experts on the independent Advisory Committee on Releases to the Environment. Paterson is an enthusiastic supporter of GM crops and earlier this month said: "The longer Europe continues to close its doors to GM, the greater the risk that the rest of the world will bypass us altogether. Europe risks becoming the museum of world farming."

But if the field trial is approved, as is likely, it could spur protests such as those that accompanied a field trial of GM wheat at Rothamsted Research in 2012, when hundreds of campaigners gathered at the site and threatened to destroy that crop.

If fish are fed on the oil from GM plants in future, they might not need to be labelled as GM-derived, because cattle today are widely fed on GM soya, but are not required to reveal this on labels."

Professor Jonathan Napier, who is leading the trial said: "The field trial is still an experiment. After that, if it is successful, you could grow plants either for animal feed or ultimately you could imagine a situation where it is used for human nutrition. If we can explain the benefits, maybe people will agree this is a good thing to do."

It was possible, he added, the plant-produced oil might overcome one of the major downsides of edible fish oil: the strong taste. "We have not tasted it, but we have smelled it and it did not smell fishy," he said.

The particular fish oils that benefit the health of both fish and humans, called EPA and DHA, are not in fact produced by fish themselves but instead accumulated by eating marine microbes. Napier's team therefore took up to seven genes from algae that produce the fish oils and transplanted them into oil seed plants called camelina. It naturally produces short-chain oils and has been grown as a food crop for

centuries in southern and eastern Europe and is used as a biofuel crop in North America. The GM camelina has passed laboratory and greenhouse trials and about 25% of the oil in the seeds is EPA and DHA, a similar proportion to that in fish oil.

Napier said camelina cannot cross-pollinate with oil seed rape, a common UK crop, and that there are no wild relatives of camelina at the 300-hectare Rothamsted site, where 200 square metres of the GM crop would be planted for the next four years. Along with an independent group in Australia, who are using oil seed rape (canola) as the carrier plant, the field trials will be the first in the world to use plants to grow the special oils. Napier said harvesting the oil direct from algae would be much more expensive and require large amounts of water and energy.

He said Rothamsted Research had patents related to the GM camelina: "Our research is 15 years of taxpayer-funded research, so we have some intellectual property to give a mechanism to recover some of that."

On the question of environmental impact of the GM camelina, Napier said success would have clear benefits for the overfished oceans, while on the question of safety, he said: "The scientific consensus is that there is no evidence of problems to human health."

However, Helena Paul, director of campaign group GM Freeze, said: "This would simply replace one problem, over-consumption of fish stocks to feed fish, with another, additional demand for land for feed for animals, rather than for growing food for humans." She also pointed out that a GM flax crop, called CDC Triffid, was originally grown on a small-scale in Canada in 2001, but was later found to have contaminated some non-GM crops.

Peter Melchett, policy director of the Soil Association which promotes organic farming, said the demand for GM fish oil supplements was likely to be limited: "People buying health supplements are among the least likely consumers to be interested in a GM product. This seems to be yet another GM product searching for a market which does not exist. Eating a healthy balanced diet gives people enough omega-3 without any need for additives in processed food."

But concerns over human health risk were dismissed by Colin Lazarus, a scientist at the University of Bristol who has worked on putting genes for fatty acids into lab plants. "We have 15 years of experience on the other side of the Atlantic, where people have been eating GM foods willy-nilly and loving them," he said. "There is no rational concern for human health."

Only five field trials of GM crops have been permitted to date in the UK, and none for a trait that enhances the nutritional value of the crop. The Rothamsted wheat was modified to provide resistance to aphids, while three potato trials aimed to provide resistance to disease. A pea trial tested a gene for drought resistance.

Telegraph

<http://www.telegraph.co.uk/earth/agriculture/geneticmodification/10593892/GM-crops-containing-fish-oil-nutrients-could-be-grown-in-UK-within-months.html>

GM crops containing fish oil nutrients could be grown in UK within months

Field trials of the first genetically modified crops to produce high yields of omega-3 fatty acids normally found in oily fish could start in Britain in just three months.

By Miranda Prynne, News Reporter

7:21AM GMT 24 Jan 2014

Genetically modified crops rich in fish oil nutrients could be grown in Britain for the first time within just three months after scientists applied to carry out field trials.

The researchers hope to produce the world's first sustainable plant source of omega-3 fatty acids, normally found in oily fish, by "cutting and pasting" genes taken from marine algae.

Permission could be given within just three months for the team to start sowing the seeds at the same high-security research site in Hertfordshire where GM wheat trials have successfully taken place in the last two years.

The government-funded project is the first step towards developing more food enriched with vital omega-3 fatty acids which are believed to protect against heart disease.

The fish-oil producing crop is part of a first wave of genetically engineered plants designed to provide vital nutrients.

Initially the aim is to benefit the fish farming industry, which consumes 80 per cent of fish oil supplies.

But in 10 years time, the GM-produced oil could be finding its way into food products such as margarine.

The application, submitted to the Department for Environment, Food and Rural Affairs (Defra) last Monday, will now be subject to a public consultation and an inquiry by the government's scientific committee which monitors the release of GM organisms into the environment.

The plant, *Camelina sativa*, or "false flax", is widely cultivated in Europe and North America as a source of vegetable oil, animal feed and biofuel.

Scientists chose it for the research because it already contains high levels of plant fatty acids and its genes are easy to manipulate.

By substituting synthetic versions of up to seven genes from marine algae, the researchers have engineered Camelina plants to produce two key omega-3 fatty acids normally obtained from oily fish, EPA and DHA.

Professor Jonathan Napier, who is leading the 15-year research project, said: "We now have a vegetable oil enhanced with these two critical fish oils.

"The next really exciting challenge for us is to say, 'We know it works in the glasshouse; does it work in the real world?'

"We have applied to Defra for permission to carry out a field trial."

The open-air field trial will take place behind a high wire fence and be protected by 24hr CCTV to prevent anti-GM activists destroying the plants.

Last year Anti-GM activists in the Philippines destroyed field trials of GM "golden rice", which is fortified with genes for precursors to vitamin A.

Plants such as flax and linseed contain omega-3 fatty acids, but they are not the same as the long-chain compounds in fish oil.

Oily fish such as tuna, mackerel, and sardines do not produce long-chain omega-3 fatty acids naturally but obtain them by consuming certain types of marine algae.

The economics of fish farming mean that, rather than feeding on algae, farmed fish have to be given their omega-3 in the form of fish oil.

With farmed fish accounting for half current fish consumption there are concerns about providing enough marine omega-3 to maintain the industry and meet human demand.

GM plants such as Camelina have the potential to make fish farming more sustainable and ease the pressure on wild fish populations, the scientists believe.

Prof Napier doubts omega-3 supplements would be a "natural market" for fish oil nutrients produced from GM plants.

But he does believe the fatty acids being incorporated into food products such as margarine.

He said: "By the end of this decade, there's a possibility that people will be able to obtain a GM plant-based source of fish oils."

Despite past controversy surrounding field trials of GM crops, the team does not expect its work to meet strong opposition.

"If you have a crop that's got the potential health benefits and sustainability and environmental benefits, and we can articulate that clearly, then I think people will see this is an OK thing to do," Prof Napier said.

"It's not a controversial thing to do. The technology is not particularly controversial."

A hectare of GM Camelina would be expected to generate just under a tonne of vegetable oil, about 80 per cent of the yield level of oil seed rape.

Tests show that about a quarter of the oil consists of long-chain omega-3 fatty acids, 14 per cent DHA and 12 per cent EPA.

ITV News

<http://www.itv.com/news/update/2014-01-24/scientists-bid-to-begin-field-trials-into-fish-oil-gm-crop/>

7:44am, Fri 24 Jan 2014

Scientists bid to begin field trials into fish oil GM crop

Last updated Fri 24 Jan 2014

British scientists have applied to begin field trials of a genetically modified crop containing fish oil nutrients in its seeds in what could be a big boost to the fish farming industry.

An application to conduct the trials at Rothamsted Research agricultural institute has been submitted to the Department for Environment, Food and Rural Affairs (Defra) and is expected to begin from April if endorsed.

The scientists are bidding to produce the world's first sustainable plant source of fish oil omega-3 fatty acids by "cutting and pasting" genes taken from marine algae, which could help protect against heart disease.

While the fish farming industry, which consumes 80% of fish oil supplies, stands to benefit from the trials, in the long term the GM-oil could also be included in food products like margarine.

Independent

<http://www.independent.co.uk/news/science/first-nutrientenriched-gm-crops-could-be-grown-in-the-uk-within-months-9081305.html>

First nutrient-enriched GM crops could be grown in the UK within months

Scientists have applied for formal permission to grow plants containing omega-3 fatty acids found in fish oil

Steve Connor

Science Editor

Friday 24 January 2014

A genetically modified crop boosted with a dietary supplement could be grown for the first time in Britain as early as this year following a request by scientists to conduct a controversial field trial at a heavily-protected research site in Hertfordshire.

The government-funded researchers have applied this week for formal permission to grow the first GM plants that are designed to produce high yields of the same omega-3 fatty acids found in fish oil, which are linked with a healthy diet.

They could receive the go-ahead within three months and the first GM seeds could be sown this spring on the same high-security plot of land within the large estate owned by Rothamsted Research in Harpenden, where GM wheat trials took place successfully over the previous two years without being destroyed by activists.

If the fish-oil field trials are successful, the technology could be used to produce food that is enriched with the omega-3 fatty acids linked with alleged health benefits such as a lower risk of cardiovascular disease – although the scientific support for these claims is mixed.

The GM crop fortified with the genes for making fish oil is among the first of a new generation of genetically engineering food plants designed to boost vital dietary supplements – so-called “nutraceuticals”. Anti-GM activists in the Philippines last year destroyed field trials of GM “golden rice”, which is fortified with genes for precursors to vitamin A.

Wary of public opposition to the trial, the Rothamsted researchers emphasised that they are more interested in showing it is possible to produce commercial quantities of omega-3 fatty acids to supply the fish-meal market for farmed fish which currently accounts for 80 per cent of the omega-3 fish oils harvested from wild-caught marine organisms.

Rothamsted Research applied on Monday for a licence to conduct the field trial from the Department for Environment, Food and Rural Affairs. The scientists could be given the go-ahead within 90 days, following a public consultation and an inquiry by the government’s scientific committee overseeing the release of GM organisms into the environment.

GM crops could help to solve the problem of over-fishing

The open-air field trial behind a high wire fence and 24hr CCTV will involve the planting of a flax-like plant called *Camelina sativa* engineered with synthetic omega-3 genes that trigger the production of the “fish oil” in the seeds of the harvested crop.

Although omega-3 is often described as fish oil, it is in fact made by microscopic marine algae that are eaten or absorbed by fish. Among the many health claims made about omega-3, the strongest relate to its supposed benefits in reducing the risk of heart disease – although some medical authorities have questioned the evidence.

“Despite claims that fish oil supplements can help prevent numerous conditions including cancer, dementia, arthritis and heart problems, there is little hard evidence for them,” says the advice on the NHS website.

However, the scientists from Rothamsted Research said today that the main aim of the research is to produce GM crops that could be made into food for farmed fish, which cannot grow healthily without a diet rich in omega-3 fatty acids, currently derived from wild-caught marine organisms.

Farmed fish grown in cages are unable to absorb sufficient omega-3 in their diets so they have to be fed on smaller fish, such as sandeels, caught in the wild. The scientists said the practice is unsustainable and it would be better for the environment to produce fish feed enhanced with omega-3 derived from GM farm crops.

“I honestly believe there is an opportunity for our plant-derived fish oil to be a sustainable source of terrestrial fish oils for the fish-farming industry,” said Professor Jonathan Napier, the project’s lead scientist at Rothamsted.

“In general, ultimately down the line, you could also imagine using plant-derived oils as another source of fish oils for human consumption... Fish oils are known to be important for human health and nutrition and they have a proven role in reducing cardiovascular disease. However, global fish stocks are in decline,” Professor Napier said.

At the same time, the human population is growing and demand for fish oil will continue to increase, he said. “It is difficult to imagine how everyone on the planet can have equal access to these important fatty acids,” he added.

Helen Wallace, director of GeneWatch UK said that omega-3 fish oils have recently been implicated in raising the risk of prostate cancer, and it is not clear whether GM-derived fish oils will be safe for human or animal consumption.

“GM crops with altered oil content raise new safety issues for consumers. It is hard to predict the effects on health because many nutrients will be changed and some could be harmful for some people,” Dr Wallace said.

“If these plants are grown to feed to fish, the oil content of the fish will also require testing. And there will be questions about the use of land that could be used for food. People will also want these products to be labelled and consumers may not want to buy them,” she said.

What are omega-3 fatty acids

Omega-3 fatty acids are made up of a complicated soup of large, organic molecules that are variously described as being good for human health. Oily fish are particularly

rich in certain types of omega-3 fatty acids linked with a healthy diet, notably EPA and DHA fatty acids.

It is a misnomer to call them “fish” oils given that fish cannot manufacture these substances – they are in fact made by microscopic marine algae that are eaten or absorbed by the fish. This is why farmed fish need omega-3 fatty acids to be added to their diet.

The Rothamsted Research scientists have copied and synthesised the genes from the algae that are involved in the manufacture of EPA and DHA fatty acids. They have stitched these gene copies into a plant called *Camelina sativa*, known as “false flax”, which is widely grown in parts of Europe and North America for its seed oil.

The scientists hope to develop an alternative source of omega-3 fatty acids that can be fed to farmed fish – about 80 per cent of the world’s supply of ocean-derived fish oil is fed to farmed fish. They believe that growing GM crops on arable land will be more sustainable and better for the environment than trawling the sea for small fish in order to feed them to bigger fish.

Financial Times

<http://www.ft.com/cms/s/0/b784b742-8451-11e3-b72e-00144feab7de.html#axzz2rJ93bE00>

January 23, 2014 6:45 pm

UK scientists genetically modify crops to produce fish oil

By Sarah Spickernell

Scientists have altered camelina to produce fish oils

Scientists think they may have found a way to modify crops genetically to produce the two most important fatty acids in fish oil for human health, helping conserve global fish stocks.

By genetically modifying camelina, an oilseed crop, to contain the seven genes needed to produce the two fatty acids, EPA and DHA, the UK scientists hope to develop a new source of the oil and cultivate it on a commercial scale within 10 years.

Having successfully produced the oil under greenhouse conditions, the next stage will be to test the plant in a field at Rothamsted Research in Hertfordshire.

The health benefits from eating fish oil include reducing the risk of cardiovascular disease and improving the modulation of immune responses. But the growing global population means that demand will outweigh supply, said Professor Jonathan Napier, the study’s lead researcher.

“Fish oils are known to help human health but the global fish stock is in decline,” he said. “We need to find an alternative sustainable source, because although the current number of fish is enough to feed the world’s 7bn mouths, in 30 to 40 years from now not everyone will have access to the fatty acids they need.”

Professor Martin Parry, acting director of Rothamsted Research, said: “This will potentially enable us to provide knowledge that may contribute to reducing the pressure on marine resources.

“Carrying out a field experiment will be the only way to assess the viability of a solution that can bring economic benefits to farmers, returns to the UK taxpayer, benefits to the UK economy as a whole and the environment in general.”

Rothamsted is seeking approval for the trial from the Department for Environment, Food and Rural Affairs (Defra).

But the project, which receives public funding from the Biotechnology and Biological Sciences Research Council, has raised concerns among anti-GM groups.

“We would simply be replacing one problem, overconsumption of fish stocks . . . with another – additional demand for land,” said Helena Paul, interim director at campaign group GM Freeze.

“And the concerns about the safety of this crop remain. Why spend all this time and money on something that may not work and even if it does, may not be safe?”

PA (via Yahoo News)

<http://uk.news.yahoo.com/fish-oil-gm-crop-bid-submitted-000127717.html>

Fish oil GM crop bid submitted

Press Association – 10 hours ago

Field trials of a genetically modified crop containing fish oil nutrients in its seeds could begin in the UK this year.

Scientists hope to produce the world's first sustainable plant source of fish oil omega-3 fatty acids by "cutting and pasting" genes derived from marine algae.

Initially the aim is to benefit the fish farming industry, which consumes 80% of fish oil supplies.

But in 10 years time, the GM-produced oil could be finding its way into food products such as margarine.

An application to conduct the trials at Rothamsted Research agricultural institute has just been submitted to the Department for Environment, Food and Rural Affairs (Defra).

Assuming all the regulatory hurdles are crossed, the first crop could be sown in around three months time.

The plant, *Camelina sativa* - or "false flax" - is widely cultivated in Europe and North America as a source of vegetable oil, animal feed and biofuel.

Scientists chose it for the research because it already contains high levels of plant fatty acids and its genes are easy to manipulate.

By substituting synthetic versions of up to seven genes from marine algae, the researchers have engineered *Camelina* plants to produce two key omega-3 fatty acids normally obtained from oily fish, EPA and DHA.

Both are said to have important health benefits, including protection against heart disease.

"We now have a vegetable oil enhanced with these two critical fish oils," said lead researcher Professor Johnathan Napier, whose team based in Harpenden, Hertfordshire, has worked on the project for 15 years.

"The next really exciting challenge for us is to say, 'We know it works in the glasshouse; does it work in the real world?'

"We have applied to Defra for permission to carry out a field trial."

Plants such as flax and linseed contain omega-3 fatty acids, but they are not the same as the long-chain compounds in fish oil.

Oily fish such as tuna, mackerel, and sardines do not produce long-chain omega-3 fatty acids naturally either.

They only obtain them by consuming certain types of marine algae.

In this way, the molecules move up the food chain.

The economics of fish farming mean that, rather than feeding on algae, farmed fish have to be given their omega-3 in the form of fish oil.

Enormous quantities of fish oil are taken up by the aquaculture industry, amounting to 80% of available supplies.

With farmed fish accounting for half current fish consumption there are concerns about providing enough marine omega-3 to maintain the industry and meet human demand.

GM plants such as *Camelina* have the potential to make fish farming more sustainable and ease the pressure on wild fish populations, the scientists believe.

Prof Napier doubted omega-3 supplements would be a "natural market" for fish oil nutrients produced from GM plants.

But he did envisage the fatty acids being incorporated into food products such as margarine.

"By the end of this decade, there's a possibility that people will be able to obtain a GM plant-based source of fish oils," he said.

Despite past controversy surrounding field trials of GM crops, the team does not expect its work to meet strong opposition.

"If you have a crop that's got the potential health benefits and sustainability and environmental benefits, and we can articulate that clearly, then I think people will see this is an OK thing to do," Prof Napier said.

"It's not a controversial thing to do.

"The technology is not particularly controversial."

A hectare of GM Camelina would be expected to generate just under a tonne of vegetable oil - about 80% of the yield level of oil seed rape.

Tests show that about a quarter of the oil consists of long-chain omega-3 fatty acids, 14% DHA and 12% EPA.

Independent (Voices)

<http://www.independent.co.uk/voices/editorials/gm-crops-could-help-to-solve-the-problem-of-overfishing-9081021.html>

Editorial

Friday 24 January 2014

GM crops could help to solve the problem of over-fishing

Our need for high-yield, low-impact foods is sharper than ever

One of the thornier questions we face is how to feed a global population heading towards 10 billion and beyond. Not only are rising temperatures squeezing the amount of viable farmland; industrialised farming techniques are also reaching the limits of sustainability. Pest mutations, denuded soils and a collapse in the number of bees are already taking their toll.

The solution, at least in part, lies with genetic modification. True, the technology got off to a terrible start. The rapacity of agrochemical giants – locking farmers into buying their products by designing crops linked to their own herbicides – only exacerbated underlying concerns about the perils of “Frankenfoods”. But, 20 years on, our need for high-yield, low-impact foods is sharper than ever, and GM has itself evolved.

The latest development at Rothamsted Research in Hertfordshire is a case in point. After 15 years of painstaking work, scientists at what is one of the world's oldest agricultural research institutions applied this week for permission to start field trials of an enhanced strain of a flax-like oil-seed crop which they hope could ease the strain on, of all things, fish stocks. Leave aside the issue of over-fishing to feed human beings directly. Vast quantities of marine creatures are also pulled from the sea to make feed stock for the fish farms designed to alleviate the pressure. The challenge, then, is to find a non-fish source of the omega-3 oil needed to sustain farmed populations. And to solve the problem, researchers at Rothamsted have made synthetic genes from marine algae (which make omega-3) and inserted them into *Camelina sativa* to create a seed that is rich in the necessary nutrients but can be grown in bulk.

If successful, the Rothamsted crop offers a way out of one of the tighter bottlenecks in modern food production. Nor does the potential end there. Given that fish oils are directly beneficial to people, a successfully enhanced crop could also have a place in our own diets.

GM still has many ideological opponents. But their case is ever harder to make. The Rothamsted trials could take us a step closer to a world that can sustainably feed itself. As such, they should proceed with all possible expedition

Farmers Guardian

<http://www.farmersguardian.com/home/arable/rothamsted-trialling-gm-omega-3-plants/61696.article>

Rothamsted trialling GM omega-3 plants

24 January 2014 | By Olivia Midgley

SCIENTISTS are trialling genetically modified (GM) camelina plants which produce the omega-3 fatty acids usually found in fish.

Researchers from Rothamsted Research in Harpenden who have been working on the project for the last 15 years say the GM plants could satisfy the growing demand for fish oils in a 'sustainable' way.

Researchers believe one day the GM oils could be found on the shelves of high street health shops and in margarine.

The oils have been shown to benefit human health and help protect against coronary heart diseases.

Fish do not produce these oils but accumulate them through their diet in the wild or through fish oil and fishmeal in farmed fish.

Around 80 per cent of all fish oil is consumed by the aquaculture sector and Prof Johnathan Napier who is leading the project said this rapidly expanding industry will need new omega-3 sources to ensure its production practices remain sustainable.

“Global fish stocks are in decline. There is a problem with the availability of fatty acids,” said Prof Napier, speaking to journalists in London yesterday (Thursday).

“This is about sourcing fatty acids in a sustainable way.”

During laboratory trials, Prof Napier’s team introduced synthetic sequences from marine organisms (algae) into the camelina plants.

The genetically engineered plants have been growing in glasshouses and the team have successfully extracted the oil from the flax-like seeds.

The next stage of the experiment will be to grow the plants out in the field.

An application was submitted to Defra this week. If approved, the GM plants could be in the ground later this year. The trial site is less than 200 sq m.

Prof Napier added: “We know this works in the glasshouse but does it work in the real world? We think feeding the testing the material in the field is the critical and logical next step.”

The trial is thought to be a world first and follows on from Rothamsted’s controversial aphid resistant wheat trial in 2012 – the results of which are expected to be published soon.

Prof Napier said the camelina plants were ‘easy to manipulate and easy to transform’ and have similar characteristics to oilseed rape, however they require less Nitrogen.

He said he expected to yield 0.8 tonnes of oil per hectare. OSR yields around 1.2t/ha.

The University of Sirling has been involved with a joint research project with Rothamsted using these plant oils in fish feed as part of their salmon feeding trials.

Reuters

<http://www.reuters.com/article/2014/01/24/us-science-britain-gm-idUSBREA0N0M720140124>

British scientists seek go-ahead for GM 'Omega-3' crop trial

By Kate Kelland

LONDON Fri Jan 24, 2014 5:50am EST

(Reuters) - British scientists have applied for permission to run an open-air field trial of a genetically modified (GM) crop they hope may one day become a sustainable and environmentally friendly source of healthy Omega-3 fats.

The proposed trial - likely to generate controversy in a nation where GM foods have little public support - could start as early as May and will use Camelina plants engineered to produce seeds high in Omega-3 long chain fatty acids.

No GM crops are currently grown commercially in Britain and only two - a pest-resistant type of maize and a potato with enhanced starch content - are licensed for cultivation in the European Union (EU).

But scientists at Britain's agricultural lab Rothamsted Research have developed Camelina plants to produce Omega-3 fats that are known to be beneficial to health but normally found only in oils in increasingly limited fish stocks.

The idea, they told journalists at a briefing on their plans, is initially to supply the fish farming industry - which currently consumes around 80 percent of fish oils taken from the sea - with a non-fish source of these Omega-3s.

Beyond that, possibly within a decade, the GM-produced Omega-3 oils could be used in food products such as margarine, the researchers said.

"We now have a vegetable oil enhanced with these two critical fish oils," said Johnathan Napier, a professor of plant science and head of a 15-year research project which has so far shown that the fish-oil producing plants can be grown successfully in greenhouses.

"We know it works in the glasshouse, now (we need to see) does it work in the real world?" he said.

The researchers said that although the trial would be in the open air, there was no risk of cross-pollination between the Camelina plant and other field crops grown in Britain.

The application for permission to conduct the trial, which submitted to the Department for Environment, Food and Rural Affairs (Defra) on Monday, is subject to a public consultation and an inquiry by a scientific committee that monitors such GM plans.

A decision could be made within 90 days.

While Britain and the EU have been very reticent about the use of GM crops, they are commonplace elsewhere.

The first GM seeds were planted in the United States more than 15 years ago and so far no evidence has been documented of adverse health impacts for people eating GM-derived foods.

GM crops can also be imported into Britain and used to produce ingredients for human food and for animal feed.

While he acknowledged there is likely to be some public opposition to the idea of a GM field trial, Napier said he hoped the potential for boosting health and protecting the environment would persuade sceptics of the project's value.

"If you have a crop that has got potential health benefits and sustainability and environmental benefits, and we can articulate that clearly, then I think people will see this is an OK thing to do," he said.

Omega-3 oils found in fish are known to help reduce the risk of cardiovascular diseases including heart attacks and strokes.

(Reporting by Kate Kelland, ; Editing by John Stonestreet)

Internal Defra email 23 January

Defra press office circulated note of the SMC press conference on the Rothamsted camelina trial:

Jonathan Napier, Rothamsted:

- Terrestrial, sustainable source of human nutrients
- Working on this for 15yrs
- Fish oils very important for human health. Proven role in reducing risk of heart disease. Global fish stocks in decline, problem of pollution in fisheries.
- Growing global population needs fair and equal access to fatty acids
- Plant seeds with omega 3 fatty acids, but these don't have the same health benefits as fish stocks
- 80% of fish oils consumed by fish farming. Fish oils created by microbes in the ocean but needed in farming. That's where we get fish oils from in our diet.

Olga Sayanova, Rothamsted:

- This Camelina would be able to produce new plant oils with the same composition as fish oil.
- This work could solve a major issue for aquaculture.

Jonathan:

- Application is the first step in an approval process, ACRE will evaluate this and Defra will put out a consultation.
- Testing this in the field is the next step.

Ben Spencer, Mail:

1. Is this going to be just used as a fish farm feed, or could it create synthetic cod liver oil?

- Down the line with appropriate approvals, people could eat this.

2. What does a field trial mean?

- On our secure outdoor site at Rothamsted.
- Nothing that comes off that field would enter the food chain.

Michael (didn't say where he was from):

1. Can you tell us more about this plant?

- Camelina is an old crop plant. It's widely grown in Canada and USA.
- It doesn't cross-pollinate with oilseed rape so no risk.
- There are a few wild relatives but we can't find any on Rothamsted's farm site.
- Comparable yield to oilseed rape but needs less nitrogen.
- In terms of profit, Rothamsted is publicly-funded so patent products for the taxpayer to recover their investment. It's a mature research product but still a research project.

Hannah Devlin, Times:

1. Why can't you just squeeze it out from algae?

- Lots of companies are trying to do this, but it's very expensive and not environmentally friendly because algae production uses a lot of water.
- Need to improve algae strains.

- Algae is brilliant source of genes.

Ben Jackson, The Sun:

1. What's the process to commercial viability?

- For us, the field trial is another experiment.
- If it works in the field, plants could be grown for fish farming. If had appropriate approvals could be used for human nutrition.
- Might be in the food chain by end of this decade.
- Supplement market not obvious place to sell it, but might go into margarines on similar.

John, Press Association:

1. Yield?

- Camelina yields about 80% of yield of oilseed rape. Around .8 of a tonne/hectare of oil.
- Trial won't yield much.

2. Why are you reluctant to think that this would go into health supplements?

- The pressing market is the aquaculture market. Fish farming is a big industrial process and a really efficient way of producing animal protein.

Damian Carrington, Guardian:

1. How long does the approval process take?

- 90 days, assuming there are no issues. Submitted Monday.

2. Will this oil taste fishy?

- It doesn't smell fishy. It would smell planty.

Tom, Today Programme:

1. Are you anticipating much controversy?

- I think that there are lots of good reasons why we think this trial is valid and useful. There are lots of health benefits and environmental benefits of GM.
- We just want to see if this crop will grow in the field.

Ben Spencer, Mail:

1. Health tests for consumers?

- We've just been trying to develop the oil. Food trials would be way down the line.
- I don't think there is a big scientific controversy about the health and safety aspect of GM food. EFSA support GM food. There is no evidence of problems to human health.

2. Concerns that GM crops will contaminate other crops?

- Camelina is not a GM modification of flax. Different species and not chance of cross-pollination.
- One of the advantages of Camelina is that it doesn't cross with oilseed rape.

Kate, Reuters:

1. Is Camelina grown elsewhere?

- In NA, it's a biofuel.
- No GM forms elsewhere.
- A group in Australia trying to engineer oilseed rape to accumulate fish oils. At similar stages to us.

Hannah Devlin, Times:

1. How frustrated do you feel about being able to do this in Europe?

- My view is that our target is a global problem, and fish oils are a global commodity.
- Don't necessarily have to grow the crops in the UK or Europe, but could set up a company here.

2. Do European politics bother you?

- It's not a constraint.

Ben Jackson, The Sun:

1. If you're delivering it into aquaculture, consumers won't have the choice to know if there's GM in the food chain?

- This is an important point. Consumers need to have the choice.
- It's slightly different with animals, as it's not GM. Case with universal soyabean protein.

Steve, Independent:

1. Would you sow it this year?

- Assuming timing is right, yes.

2. Is this the first field trial of a good supplement in the UK?

- Yes for UK, not sure about world.

3. How sure are health benefits of omega 3?

- Good evidence for cardiovascular health.

4. What happens to fish without it?

- They need a low level of omega 3s to develop. Get eye problems.

Reuters:

1. Is it any different to fish oil?

- Yes, it's enhanced vegetable oil but not fish oil.
- Could have different health benefits to other fish oils but similar studies have been done before.
- Doing a study with Stirling Uni. Is being trialled as fish food atm.

Mike, New Scientist:

1. Some plants can produce toxic oils. Are you sure you know what's in it?

- Yes. We've got sophisticated analytical techniques.

Tom, Today:

1. Is it genes or gene?

- It's genes from algae.

- Application is to test three different genes. One is antibiotic resistant but has been used for 15yrs.

SMC email to Defra - 23 January

Subject: RE: SMC GM briefing

That's ----- for you!!!! Always looking for a conspiracy...'SMC silences Defra'

Defra email to SMC – 23 January

Subject: RE: SMC GM briefing

No worries at all, totally understood. As I said to -----, my question was asked anyway. I think ----- was quite intrigued to know what I'd wanted to ask, and slightly disappointed when I told him!

SMC email to Defra – 23 January

Subject: RE: SMC GM briefing

I am sorry too as I should have explained that it has been very strict SMC policy not to allow questions from anyone but journalists (after a bad experience some years ago with an industry press officer) We are happy to allow our friends to sit in on these briefings on request but they always have observer status only during the press briefing. We don't mind at all if you then chat to journalists afterwards

Sorry ----- – should have explained all that when you asked if you could attend

Cheers

SMC email to Defra – 23 January

Subject: RE: SMC GM briefing

Hi -----

Sorry I had to cut you short there – I'm afraid we have to keep press briefing questions to journalists only, otherwise we can too easily run out of time or go off on a tangent – hope you understand!

I thought that was a really good briefing, ----- was such a clear speaker. What did you think?

Cheers

Defra email to SMC – 22 January

Subject: RE: SMC GM briefing

Thanks, see you tomorrow.

SMC email to Defra – 22 January

Subject: RE: SMC GM briefing

Sure – here you go

See you tomorrow

Web: www.sciencemediacentre.org

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SMC email attached - 20 January

Subject: SMC News Briefing: Field trial of omega-3 GM plants - 10.30am Thu 23 Jan (EMBARGO 00.01 UK time Fri 24 Jan)

Please note: some of the science behind this new field trial was published in November and has been reported in a few articles in recent weeks. The field trial announcement is new and this briefing is to give journalists the opportunity to question the scientists about the trial and hear about what they hope to achieve.

Science Media Centre and Rothamsted Research news briefing

UNDER EMBARGO UNTIL 00.01 UK time on Friday 24 January

What? GM plants for omega-3 – announcement of new field trial

When? 10.30am Thursday 23 January 2014

Where? The Wellcome Trust, 215 Euston Road, London NW1 2BE

Rothamsted Research has applied to Defra to conduct a field trial of GM plants that produce omega-3 oils and may provide health, environmental and economic benefits.

Consumption of omega-3 oils from oily fish (e.g. salmon and mackerel) has been linked with improved health. Fish do not produce these oils themselves but rather accumulate them through their diet.

Scientists at Rothamsted Research have developed Camelina plants that accumulate omega-3 long chain polyunsaturated fatty acids (LC-PUFAs) in their seeds and therefore can provide a novel method of making these essential oils with existing farming practice and machinery.

Scientists have already demonstrated that plants growing in glasshouses produce the right profile of fatty acids in significant quantities. The purpose of the proposed trial is to evaluate the performance of this trait in the field.

The proposed experiment is publicly funded by the Biotechnology and Biological Sciences Research Council (BBSRC). An open public consultation on this work has now begun.

Speakers will include:

Professor Johnathan Napier, Rothamsted Research

Dr Olga Sayanova, Rothamsted Research

For further information please call Tom Sheldon on 020 7611 8366 or Darren Hughes / Matina Tsalavouta at Rothamsted on 01582 763133 x2673 / x2525

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Defra email to SMC – 22 January

Subject: RE: SMC GM briefing

Thanks -----!

----- would you be able to send me details about the event?

Thanks both

SMC email to Defra - 21 January

Subject: Re: SMC GM briefing

Hi -----,

Yes that's fine -----...see you there

Copying my colleague ----- in because it's his briefing

Cheers

Sent from my iPad

Defra email to SMC – 21 January

Hi -----,

Please can I come along to the GM briefing on Thursday morning?

Thanks