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## Animal Nutrition Studies

### Update from Professor Ian Givens

#### Milk and Saturated Fatty Acids (SFA) and Monounsaturated Fatty Acids (MUFA)

We have completed the study looking at the use of ordinary versus high oleic acid rapeseeds to reduce SFA levels and increase *cis*-MUFA in milk. Overall there is some advantage from the high-oleic rape in terms of slightly more reduction in SFA and more increase in *cis*-MUFA, alongside no

difference in *trans*-fatty acids (TFA), which have known atherogenic properties. Based on the outcomes we have done some modelling of the impact of such changes in milk fat composition on intake of SFA and *cis*-MUFA across the population. Work has now moved into a longer term study to see if such changes in milk fatty acids are persistent.

#### Poultry meat and omega-3 fatty acids

We have completed further examination of intakes of the long-chain omega-3 fatty acids: eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) by

different parts of the adult population (younger vs. older, male vs. female, low income vs. general population). In general, young adults and people on a low income have substantially lower intakes of these long-chain omega-3 fatty acids.

Poultry meat enrichment has looked at effects of dietary vitamin E and fish oil inclusion rates on stability and acceptability of meat. Generally, higher inclusions of fish oil need higher inclusions of vitamin E but, overall, vitamin E is very effective. Some work has also been done on EPA/DHA in retail poultry meat and products, and on the effects of cooking.

## Conference Report

# Incorporating Omega 3 in the food chain – why, where and how?

15th November 2007

Royal College of Physicians, London

This event attracted a high level of interest in the *Lipgene* project. A total of 120 delegates registered to attend this one day conference in London. The event included delegates from across Europe and created a great deal of media interest, resulting in positive coverage around the world for the animal nutrition and biotechnology work of *Lipgene*.



## Below is a summary of the speakers' presentations from the conference

### Professor Christine Williams, University of Reading



Chairing the event, Professor Christine Williams, Dean of Life Sciences at the University of Reading, told the audience that

"the challenges faced by consumers in achieving current dietary guidelines for omega-3 fatty acids, together with the longer term problem of sustainability within the food chain, are key issues for policy makers, agriculture and the food industry".

### Long-chain Omega-3 Fatty Acids – what they are, and why we need them

#### Dr. Joanne Lunn, The British Nutrition Foundation



Joanne outlined the health benefits of omega-3 fatty acids, highlighting that there is now strong evidence regarding

the importance of long-chain omega-3 fatty acids (found primarily in fish oils) to health, especially in respect to heart disease. In the UK, average omega-3 intake is only about 50% of the 450mg/day recommendation, and given that a high proportion of this comes from fish and surveys show that 75% of the UK population eat no oily fish at all, it is clear that the majority of the UK population have intakes well below the recommended level.

### Current Intakes of Omega-3 Fatty Acids in the UK and Options for Increase

#### Rachael Gibbs, University of Reading



Rachel, a PhD student with *Lipgene*, outlined the options for increasing eicosapentaenoic acid (EPA) and

docosahexaenoic (DHA) intakes, including the use of fish oil supplements, increased consumption of fish or consumption of foods

enriched with omega-3. Foods derived from animals whose diets have been manipulated to contain omega-3 fats could be future dietary supply vehicles, with the level of supply being determined by the type of product and animal species. Foods such as omega-3 enriched milk and dairy products could supply up to a total of 72mg/d based on current consumption of milk products. By far the greatest contributor to intakes from enriched meats is chicken meat and chicken meat products (75mg/d) owing to their popularity and diversity. Overall, substitution of 'normal' animal-derived foods with enriched ones could result in a mean increase in intake for UK adults of 186mg/d from 244 to 430mg/d (of which 231mg/d is animal-derived). In contrast to consumption of oily fish, the UK National Diet and Nutrition Survey shows that young adults widely consume animal-derived foods and could benefit substantially from consuming enriched alternatives. With the enrichment of animal-derived foods there are food chain issues to consider, the most important being the sustainability of using fish oil and fish meal as a source of omega-3. Vital research into alternatives such as algal and plant based fats is currently underway to maximise future options for enriching foods.

### The Issues Surrounding Fish as a Source of Long-Chain Omega-3 Fatty Acids

#### Dr. Douglas Tocher, University of Stirling



Dr Tocher outlined the role of polyunsaturated fatty acids in aquatic food webs. He told delegates that the

global fish supply is in decline, and explained how the role of 'aquaculture' is becoming more important in supplying fish for human consumption. The demands for fish meal and fish oil to feed farmed fish are increasing as aquaculture grows in importance.

He outlined the major issues in aquaculture, namely the problems of sustainability, the need to find a replacement for fish oil and the problems of contaminants such as mercury, arsenic, dioxins, PCBs (polychlorinated biphenyls) and PBDEs (polybrominated diphenylether flame retardants) in the natural sources of fish oil. Dr Tocher recommended that future aquaculture strategies must aim to reduce dependence on fish oil and fish meal, reduce contaminant levels and preserve current levels of long-chain omega-3 fatty acids in farmed fish.

### Enrichment of Poultry Meat with Omega-3 Fatty Acids

#### Dr. Caroline Rymer, University of Reading



Dr Rymer told the audience that chicken meat is widely consumed in the UK, and is amenable to manipulations that increase its long-chain omega-3 polyunsaturated fatty acid (PUFA) content. The long-chain omega-3 fatty acid (EPA and DHA) content of skinless white chicken meat can be increased to approximately 150 mg/100 g uncooked meat without adversely affecting the taste of the freshly cooked meat.

The use of algal biomass rather than fish oil enables enrichment with particular fatty acids, and there is also future potential from genetically modified plant sources.

Meat enriched with omega-3 fatty acids needs to have its oxidative stability maintained; this can be done by the inclusion of high concentrations of vitamin E in the poultry diet.

### Modifying the Composition of Animal-Derived Foods: its Role in Public Health Nutrition

#### Professor Ian Givens, University of Reading



Professor Ian Givens, head of the Nutritional Sciences Research Unit at the University of Reading explained

how increasing the amounts of long-chain omega-3 fatty acids in meat, milk and eggs could impact public health. In summing up the possible impact of his research he told delegates that "in terms of poultry meat, animal nutrition can be used to enrich the meat

with these fatty acids which would significantly help the situation".

### The Production of Long-Chain Omega-3 Fatty Acids in Transgenic Plants - Towards a Sustainable Source of Fish Oils

#### Professor Johnathan Napier, Rothamsted Research



Professor Johnathan Napier, a research group leader at the Centre for Crop Genetic Improvement at Rothamsted

Research, gave a summary of the progress made and the difficulties encountered in attempting to introduce genes from marine algae into plants. The aim of his work is to enable the synthesis and accumulation of EPA and DHA in oilseeds. In conclusion Prof. Napier stated "we are making good progress towards the goal of producing 'fish oils' in plants".



Speakers at the *Lipgene* conference held at the Royal College of Physicians in London, from left to right: Prof Ian Givens, Dr Joanne Lunn, Prof Christine Williams, Dr Caroline Rymer, Rachael Gibbs, Prof Johnathan Napier and Dr Doug Tocher

## News Briefing at the Science Media Centre

UK press and broadcast journalists were invited to a press briefing on the day of the conference. Nine journalists from national newspapers and the BBC attended to hear a summary of the *Lipgene* project and the highlights of the animal and plant work from Prof Ian Givens and Prof Johnathan Napier. Prof Judy Buttriss, Director General of The British Nutrition Foundation and Prof Christine Williams, Dean of Life Sciences at Reading University, conference chair also helped journalists to put the animal and plant findings into the correct context of human health with an emphasis on the metabolic syndrome. Written summaries were also provided to assist the media in communicating accurate information about *Lipgene* as a whole.

Significant positive coverage was achieved, with national newspapers and BBC online publishing articles explaining the problems of shortages of fish oils and the potential contribution that enriched animal products and genetically modified oilseeds might make to human nutrition. Subsequently, the story was picked up in media and on-line coverage around the world, for example by an advocacy group led by American farmers interested in exciting developments in biotechnology.



News Briefing at the Science Media Centre: Prof. Judith Buttriss, Prof. Ian Givens, Prof. Johnathan Napier and Prof. Christine Williams take part in a briefing and question and answer session resulting in extensive and positive coverage in UK and international news media

**GM FISH OIL CROPS MAY BE FED TO HENS**

Daily Mirror  
Friday November 16, 2007

The Times  
Friday November 16 2007

**GM crops are the only way to solve Britons' diet failings, say scientists**

**GM plants that produce fish oils could help fight heart disease**

The Guardian  
Friday November 16, 2007

## Dissemination and Communication – materials available

One of the aims of *Lipgene* is to establish wide-ranging dissemination activities which effectively communicate the key findings of *Lipgene* to a range of target audiences, including *Lipgene* partners, to demonstrate how the project has progressed. The British Nutrition Foundation is the lead partner, with input from colleagues in Dublin and from work package leaders.

Our 'approach' to dissemination has been devised around the fact that *Lipgene* is a multi-disciplinary project, with different work packages delivering results at different stages throughout the five years. For example, in year 3 we focused on the consumer science work package, and in year 4 on the animal and plant biotechnology work packages.

By hosting workshops to provide a forum in which to present the results, we have generated information for general media, published articles and information for the web, as can be seen on the website [www.nutrition.org.uk/lipgenefindings](http://www.nutrition.org.uk/lipgenefindings).

We have also been publishing 'Updates' on the project, in the form of a brief summary of progress from each of the work packages. The most recent of which is available (and downloadable) from <http://www.nutrition.org.uk/lipgenefindings>, along with this newsletter. Translations of this newsletter have been prepared in German, French, Italian and Spanish and are now available on the website.



## Lipgene Website Update

The team has continued to update the dedicated *Lipgene* pages on the BNF website and to ensure that all information is available on the official *Lipgene* site now hosted on the University College Dublin servers (<http://www.ucd.ie/lipgene>). The main *Lipgene* website was moved from Trinity College Dublin following the move of project co-ordinator Prof. Mike Gibney and his team to University College Dublin.

Prominent links now exist between the project homepage ([www.ucd.ie/lipgene](http://www.ucd.ie/lipgene)) and the pre-existing *Lipgene* web pages on the BNF site ([www.nutrition.org.uk/lipgene](http://www.nutrition.org.uk/lipgene)). Both sites provide information for non-consortium members and information is now available in Spanish, Italian, French and German to ensure that people from across the EU can gain access to both background information and up-to-date findings from the *Lipgene* project.

## Forthcoming Lipgene events

**Monday 30th June 2008, 3-5 pm**

Satellite *Lipgene* meeting at the UK's Nutrition Society Summer Meeting in Nottingham. UK

**December 4th-5th 2008**

Final consortium meeting and an international conference to present the findings of the *Lipgene* project, in the context of other work in the field. Dublin

For more information visit [www.nutrition.org.uk/lipgeneforthcomingevents](http://www.nutrition.org.uk/lipgeneforthcomingevents)

## Lipgene Training Event

Through the *Lipgene* training programme, members of the *Lipgene* consortium have the opportunity to develop useful skills in addition to their area of expertise, and in addition to the experience and learnings gained in the day-to-day operation of the project. A training programme exists to promote this on a more formal basis in addition to the experience gained in the day-to-day operation of the project.

The *Lipgene* coordinating team is planning a training event open to the entire *Lipgene* consortium to focus on important skills such as communication. This will take the form of a free to attend workshop in late May/early June in Dublin highlighting the best ways to organise events to present research findings, the skills involved in giving interviews, and writing for the news media.

If you are interested in attending this interactive workshop, please contact [anne.nugent@ucd.ie](mailto:anne.nugent@ucd.ie)

Places are limited and will be allocated on a first come first served basis.

# Lipgene news

## Background

The *Lipgene* project is now beginning its final year. The main aim of *Lipgene* has been to investigate the interaction between dietary fat composition and genotype in the development of the metabolic syndrome in humans, drawing upon knowledge gained from research in the areas of human nutrition, plant biotechnology, animal nutrition, economics and consumer science. Excellent progress has been made on all aspects of this multidisciplinary project and much of the experimental work is now completed. Researchers are now beginning to analyse and interpret the results, and this year some of the interim results of the Animal Nutrition and Plant Biosciences work were presented at a London conference which posed some important questions in relation to the use of genetic modification technology, and gained favourable media interest. As we enter the last year of the project the results will be finalised, and we shall have a much clearer understanding of how the nature of dietary fat interacts with an individual's genetic make up in the development of the metabolic syndrome.

## An update from the work packages

### Human Nutrition Dietary Intervention Study

#### Update from Professor Helen Roche

The Human Dietary Intervention component of the project is well underway; we have finished the intervention phase and conducted the biochemical analysis. The results are currently being prepared, so we would hope to submit the findings in the scientific press early in 2008. Our greatest challenge will be integrating the gene-nutrient data,

in terms of identifying the genetic determinants of dietary responsiveness and determining why non-responders exist. Indeed, since this is such a complex issue we have plans to organise a workshop in this area which will be open to all *Lipgene* partners.

As Work Package Leader I would like to say a BIG THANKS to all partners, as all have given a huge effort to achieve over the last 4 years and we all look forward to the fruits of our hard work.

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For more information about the *Lipgene* project visit [www.nutrition.org.uk/lipgene](http://www.nutrition.org.uk/lipgene) or email [lipgene@nutrition.org.uk](mailto:lipgene@nutrition.org.uk)