ADVISORY COMMITTEE ON NOVEL FOODS AND PROCESSES

ANNUAL REPORT 1989

DEPARTMENT OF HEALTH,
MINISTRY OF AGRICULTURE,
FISHERIES AND FOOD.

ADVISORY COMMITTEE ON NOVEL FOODS AND PROCESSES

FIRST ANNUAL REPORT - 1989

INTRODUCTION

1. In October 1988, Ministers announced that the Advisory Committee on Irradiated and Novel Foods would be reconstituted as the Advisory Committee on Novel Foods and Processes (ACNFP) to reflect more accurately its interest in the rapidly developing area of food biotechnology. The Committee meets four times a year and its Secretariat is provided jointly by DH and MAFF.

2. The Committee is an independent body of experts whose remit is:

> "to advise Health and Agriculture Ministers of Great Britain and the Heads of the Departments of Health and Social Services and Agriculture for Northern Ireland on any matters relating to the irradiation of food or to the manufacture of novel foods or foods produced by novel processes having regard where appropriate to the views of relevant expert bodies".

3. The Committee is of the view that the advice it gives, and the reasoning behind that advice, should be available to the general public. Therefore the Committee has recommended and Ministers have accepted that an Annual Report should be published containing a summary of submissions made to the Committee, together with any advice that it gives on such submissions, and also any other topics considered.

4. This first Annual Report covers the period from the reconstitution of the Committee in October 1988 until the end of 1989 (5 meetings); subsequent reports will cover calendar year periods.

SUBMISSIONS/TOPICS CONSIDERED

5. In the period to the end of 1989, the Committee has completed consideration of a number of submissions and topics:

a) Genetically Modified Bakers Yeast

(i) A critical step in bread dough production is the efficiency with which the yeast produces the enzymes necessary for the digestion of sugars which are obtained from starch in the flour used in the dough. The producers of this genetically manipulated strain of bakers yeast have sought to accelerate the process of natural selection by replacing the genes responsible for the production of the enzymes maltase and maltose permease in one strain of bakers yeast by a more efficient set of genes from another strain. Apart from some short synthetic non-coding sequences linking the new genes to the rest of the yeast genome, there is no genetic material present in the manipulated yeast which does not come from the normal species of yeast, Saccharomyces cerevisiae.

ii) In view of the long history of safe use in human food of the organism Saccharomyces cerevisiae, the Committee was satisfied that the likelihood that the manipulated strain could generate toxic by-products was no greater than that of the unmodified strains used previously. The risk of genetic transfer from the manipulated yeast strain to human consumers or their gut microflora was also no greater than might be anticipated from any other strain of bakers yeast.

iii) The Committee concluded that there was no food safety reason why this genetically manipulated yeast should not be used in food. However, it recommended that the manufacturers should carry out regular checks to ensure there is no genetic drift in the yeast genome in use and that the product offered for sale complies with the specification of the yeast evaluated by the Committee. The Committee's conclusions related to the safety of consumers of the yeast and foods containing it. As the yeast cannot be contained in the factory the implications of this for worker and environmental safety have been evaluated by the Health and Safety Executive's Advisory Committee on Genetic Manipulation (and its Intentional Introductions Sub Committee), whose advice was that this proposed use posed no unacceptable risks to human health and safety. A report containing the Committee's advice on this submission has been forwarded to Ministers; a copy is attached as Annex I to this Report. The data supporting this submission has been deposited with the British Library (SUP NO. 11080, 115 pages; see * on page 5).

b) <u>Irradiated wheat and the possible induction of polyploidy</u>

i) Following the Government's announcement of its intention to seek powers to allow the irradiation of food, a number of comments were received about the safety of the process, in particular, citing a series of studies conducted by the Indian National Institute for Nutrition (NIN) in which the authors suggested a link between consumption of recently irradiated wheat and the induction of polyploidy. Our predecessor Committee (ACINF) reviewed these data in the course of its evaluation of the safety and wholesomeness of irradiated food and concluded that the quality of the work was inadequate. However, in view of the comments received citing these studies, ACNFP agreed to review

these data, together with any other relevant data that had become available subsequent to the advice being given by ACINF.

ii) It was concluded that there was no suggestion that polyploidy was induced in animal feeding studies with irradiated wheat which had been stored for over 12 weeks.

iii) With regard to freshly irradiated wheat, the ACNFP considered the data available from NIN (1-7), together with a review of this work for the Indian Government by Drs Kesavan and Sukhatme (8). Responses to this report by the principal author Dr Vijayalaxmi (now published as 9) and by NIN (10) were also made available to the ACNFP. The review by Drs Kesavan and Sukhatme concluded that "the bulk of the NIN data are not only mutually contradictory but also are at variance with the well established facts of biology". The report also concluded that "the results obtained in animals fed freshly irradiated wheat cannot be considered as incompatible with those obtained in animals fed unirradiated wheat". The ACNFP fully agrees with these views and is therefore of the opinion that it is highly unlikely that the eating of freshly irradiated wheat would cause polyploidy.

iv) The ACNFP also noted that in a point-by-point rebuttal of the claims made by the Health and Energy Institute, the American Food and Drug Administration said that it accepted the findings of the Indian Committee (8) that the conclusions reached by the investigators at NIN were not supported by the raw data. A detailed report of the FDA's appraisal of the original NIN studies and the various claims and counter-claims appears in the Federal Register (11).

REFERENCES

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2. Int. J. Radiat. Biol. 27, 1975, p 135-142
3. Int. J. Radiat. Biol. 27, 1975, p 283-285
4. Int. J. Radiat. Biol. 29, 1976, p 93-98
5. Canad. J. Genet. Cytol. 18, 1976, p 231-238
6. Toxicology. 9, 1978, p 181-184
7. Fd. Cosmet. Toxicol. 14, 1976, p 293-295
8. Unpublished report SUP NO.11081, 53 pages. *
9. Radiat. Phy. Chem. 34 (6), 1989, p 941-952
10. Unpublished report undated SUP NO.11082, 21 pages. *
11. Federal Register 53 (251) dated 30.12.88 p 53176-53209

* Information which supplements this article has been deposited with the British Library Document Supply Centre. Retention copies may be obtained by quoting the Supplementary Publication NO SUP .....(....pages)

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c. Code of practice on tasting beers produced by genetically manipulated yeasts

i) The ACNFP was asked to consider a draft protocol relating to the tasting of experimental beers produced by genetically manipulated yeasts. Before scaling up a new process for the production of beer, brewers need to evaluate the products of laboratory or pilot scale production to ensure consumer acceptability; this will include tasting. The beers may contain live yeasts and consumer acceptability trials could result in a release of the genetically manipulated yeast to the environment.

ii) The ACNFP, in consultation with the Secretariat and Members of the Advisory Committee on Genetic Manipulation, commented on the Draft Code of Practice, in particular on the selection of the tasters and the need for reference to existing ethical guidance on human volunteer studies. The need to set up local safety committees to oversee such taste trials was also stressed.

d. Chymosin enzyme from a genetically manipulated source organism

i) Traditional cheese manufacture has involved the coagulation of milk by an enzyme preparation (rennet) derived from the stomach of calves. A submission was received from a manufacturer of a chymosin enzyme derived from a genetically manipulated source organism. Enzymes are regarded as food additives and thus fall within the remit of the Food Advisory Committee (FAC). That Committee obtains advice on safety-in-use from the Committee on Toxicity. However, in view of the fact that the source organism for this particular enzyme had been genetically manipulated, the FAC sought the advice of the ACNFP as to whether there were any safety concerns arising from the particular genetic manipulation procedure used.

ii) The ACNFP has considered this aspect of the submission and passed its advice to the FAC; however the FAC has yet to reach a final decision.

e. Fructose syrup containing dextrans

i) Pharmaceutical grade dextrans for use as plasma expanders are produced by a process of fermentation of sucrose which results in a by-product consisting of a fructose syrup containing some, mainly lower molecular weight, dextrans. The ACNFP received a submission from a company wishing to use this by-product as a sweetener in food. The product is likely to be used in specialty food products intended for diabetic or dietetic use. The fermentation procedure is

used world-wide under well established, standard conditions and uses a naturally occurring strain of the organism Leuconostoc mesenteroides.

ii) In support of the safety-in-use in food of this product, the Committee noted that other fructose syrups are already in widespread use in the food industry, that there is previous experience of the use of this fermentation procedure to obtain dextrans for clinical use, that the advice of the Committee on Toxicity was that the dextrans present in this product would be metabolised in the gut and the fact that the intake of the product is likely to be limited due to an existing requirement to label diabetic foods containing conventional fructose syrups with a warning not to exceed a stated intake (because of possible laxation).

iii) The Committee concluded that there were no safety reasons why the use in food of this fructose syrup product should not be acceptable provided that the dextrans present are of a molecular weight range of 500-10,000 and that the dextrans are at least 95% straight chain molecules. A report containing the Committee's advice on this submission has been forwarded to Ministers; a copy is attached as Annex II to this Report. The data supporting this submission has been deposited with the British Library (SUP NO. 11083, 6 pages; see * on page 5).

f. Novel fat replacer

The Committee was informed that a number of products have been or are being developed for use as fat replacers. The Committee considered one particular product consisting of microparticulated egg and milk proteins, developed for use in uncooked foods such as mayonnaise and salad dressings, margarine and spread substitutes, and frozen desserts such as ice cream. Since the raw materials used to produce this product are not novel and the production process (micro-particulation) is widely used in the food industry, the Committee concluded that although

this product was not a novel food, its potential use was novel. The Committee was concerned about the possible nutritional implications of the use of this product, either on its own or in conjunction with other similar products. It was noted that MAFF's existing food surveillance arrangements would be used to monitor the intake of such products and that if, in the light of monitored intake patterns, a nutritional evaluation was thought to be necessary, the matter could be referred to the Committee on Medical Aspects of Food Policy.

6. In the same period the Committee has also discussed two other topics, consideration of which is not yet complete:

a) Transgenic animals - an introduction to the general issues involved

There was an initial discussion of the general issues to be taken into account when considering the consumption of food products derived from transgenic animals. A number of issues such as ethical considerations and consumer acceptance were identified which would need consideration in the context of any individual submission.

b) Gamma linolenic acid-rich oil

The Committee began evaluation of a submission from a Company manufacturing an oil rich in gamma linolenic acid, an important fatty acid. The manufacturing process was by fermentation using a micro-organism modified by the use of the chemical nitrous acid. This submission is still under review.

GUIDELINES

7. In order to assist those making submissions to the Committee, the ACNFP has undertaken to revise the guidance issued by its predecessor committee (the ACINF) on the testing of novel foods. To further this intention the ACNFP held a joint meeting with the Advisory Committee on Genetic Manipulation to discuss common issues such as risk assessment and the definition of novel foods and processes.

8. Arising from this meeting the ACNFP established a decision tree approach to the assessment of novel foods and processes. This decision tree approach forms the basis of a document entitled "Draft Guidelines on the Assessment of Novel Foods and Processes" which was issued for consultation in November 1989. A copy of the document is appended as Annex III to this Report. The draft guidelines will be revised in the light of comments received and a final version published in due course.

OTHER MATTERS

Publicising the work of the ACNFP

9. In addition the ACNFP has discussed the workings of the Committee, including in particular how to make the outcome of the Committee's deliberations available to the public. It has been agreed that the agendas of the Committee will be published in advance of meetings and that copies of the Committee's Reports to Ministers will be made available on request.

10. In conjunction with this, the Committee is instituting a procedure for the deposition of data from toxicological and other safety evaluation studies considered in support of an individual submission, with the British Library. A similar scheme is already in operation for data submitted in support of food additives. The Committee encourages Companies to deposit with the British Library all scientific data relating to the safety of their product that they provide in support of a submission. However the ACNFP does recognise that some of the information made available to it is of a commercially sensitive nature that it may not be possible to protect by patent, and thus accepts that such data cannot be deposited in the public domain in this way.

Labelling

11. The ACNFP is seeking the advice of the Food Advisory Committee on the need for labelling of foods produced using the techniques of genetic manipulation. It is hoped to include guidance on the matter in a final version of the ACNFP Guidelines.

Developments Elsewhere

12. The Committee is also kept up-to-date in any developments in the EC and in other countries on novel foods and processes and on irradiation.

13. In keeping with its remit the Committee undertakes a continuing assessment of any new scientific information that becomes available on irradiation or on novel foods and processes.

Contact Point

14. Those wishing to make submissions to the Committee, or seeking further information about the work of the Committee should in the first instance contact the Administrative Secretary, Mrs M. Fry, at Department of Health, Room 622 Eileen House, 80-94 Newington Causeway, London SE1 6EF.

GLOSSARY

GENE

A functional unit of inheritance.

GENOME

The sum total of the genes of an organism.

GENETIC MANIPULATION

Genetic manipulation is the propagation of combinations of heritable material by the insertion of that material, prepared by whatever means outside a cell or organism, into a cell or organism in which it does not occur naturally either:

a) directly; or

b) into virus microbial plasmid or other vector systems which can then be incorporated in the cell or organism.

POLYPLOIDY

Polyploidy is a multiple of the normal complement of chromosomes in a cell; this occurs naturally in some tissues of the body.

TRANSGENIC

A transgenic organism is one into which has been transferred genetic material from another species by means that would not occur naturally.

ADVISORY COMMITTEE ON NOVEL FOODS AND PROCESSES

REPORT ON A GENETICALLY MANIPULATED BAKERS YEAST

INTRODUCTION

1. In December 1988 the Committee was asked to examine the safety in food use of a genetically manipulated bakers yeast developed by Gist-brocades N.V. This is the first example of a genetically manipulated organism for food use to be assessed by the Committee. Our primary concern has been with the safety of consumers of the yeast and foods containing it.

2. Since yeasts cannot be contained in bakeries, this application will also result in the release into the environment of a genetically manipulated organism. The implications of this for worker and environmental safety have been evaluated by the Health and Safety Executive's Advisory Committee on Genetic Manipulation (Intentional Introductions Sub-Committee) with which we have liaised closely in our evaluation.

PRODUCT DESCRIPTION AND USE

3. The purpose of adding yeast to bread-making dough is to produce carbon dioxide gas which causes the dough to rise. Carbon dioxide is produced by the yeast as it grows, feeding on sugars which it obtains from the starch present in the flour in the dough. This starch is broken down into sugars by enzymes produced by the yeast.

4. A rate limiting step in dough production is the efficiency with which the yeast produces enzymes necessary for sugar digestion. In the past, bakers and

yeast suppliers could only improve these processes by selecting the most efficient yeast strains obtained by natural breeding of baking strains and other yeast strains present in the environment.

5. In producing a genetically manipulated strain of bakers yeast the producers have sought to accelerate the process of natural selection. They have replaced genes responsible in one strain of bakers yeast for the production of the enzymes maltase and maltose permease by a more efficient set of genes from another strain. The new genes have been linked to the rest of the genetic material in the yeast (yeast genome) with short synthetic sequences. Apart from these short linker sequences there is no genetic material present in the manipulated yeast which does not come from the normal species of yeast, Saccharomyces cerevisiae.

SAFETY EVALUATION

6. In assessing the potential hazard to consumers of the manipulated yeast and of food products in which it is present the Committee has focused its attention on three aspects; the potential for transfer of genetic material from the yeast genome to human consumers and/or their gut microflora; the potential of the manipulated yeast to produce toxic metabolites not normally produced by bakers yeast; and the stability of the genome of the manipulated yeast under the conditions intended for its use.

7. Apart from the short linker sequences the manipulated yeast contains no genetic material other than from strains of Saccharomyces cerevisiae an organism for which there is a long history of safe use in human food. The Committee is satisfied that the likelihood

that the manipulated strain will produce toxic metabolites is no greater than that of the unmodified strains used previously. The risk of genetic transfer from the modified yeast to human consumers or their gut microflora is also no greater than might be anticipated from any other strain of bakers yeast. On these counts the Committee has been satisfied that the manipulated yeast as described by Gist-brocades provides no unacceptable risk to human consumers.

CONCLUSION

8. The Committee is satisfied that there is no food safety reason why the use in food of the genetically manipulated yeast should not be permitted, without restriction to particular population groups. We recommend that the manufacturers should carry out regular checks to ensure that there is no genetic drift in the yeast genome in use and that the product offered for sale complies with the specification of the yeast evaluated by the Committee.

9. The Committee's conclusion relates only to the safety of the food as consumed. The Committee has been told that the Health and Safety Executive has been advised by its Advisory Committee on Genetic Manipulation that the proposal to use the manipulated yeast in human food poses no unacceptable risks to wider aspects of human health and safety. In reaching this decision the Advisory Committee took the advice of its Intentional Introductions Sub-Committee which also reviewed the proposal and in particular the environmental aspects.

10. Throughout the consideration of the safety of the manipulated bakers yeast this Committee has been conscious of public concern about the use of genetic

manipulation in the food chain. This concern has been highlighted because the yeast is the first genetically manipulated food organism to be evaluated for sale in the UK. The Committee has therefore sought the views of the Food Advisory Committee as to whether special labelling requirements should attach to the sale of the yeast or of products containing it. The Food Advisory Committee's advice is that no special labelling should be required to indicate that the yeast had been genetically manipulated. This was because the origin of the introduced genetic material was a strain of the same species of yeast.

ADVISORY COMMITTEE ON NOVEL FOODS AND PROCESSES

REPORT ON A FRUCTOSE SYRUP CONTAINING DEXTRAN OBTAINED BY FERMENTATION

INTRODUCTION

1. In July 1989 the Committee was asked to examine the safety in food use of a fructose syrup containing dextran submitted by Fisons Pharmaceuticals, a division of Fisons plc. The fructose syrup is intended for use as a sweetener.

PROCESS DESCRIPTION

2. The fructose syrup is a by-product of the manufacture of dextran for clinical use and is obtained in a fermentation process using a naturally occurring strain of the bacterium Leuconostoc mesenteroides. In this process, pharmaceutical grade sucrose is broken down by enzymes in the organism to yield fructose and glucose, the latter being subsequently polymerised to give dextran.

3. The organism used in this process is that used worldwide for the production of dextran for clinical use as a blood plasma expander. Following the fermentation the higher molecular weight dextrans for clinical use are removed and the remaining fructose syrup containing the lower molecular weight dextrans is filtered and concentrated prior to sale.

USE

4. This fructose syrup is intended for use as a sweetener in place of more conventional fructose syrups. The dextran performs no functional purpose which would take it within the control of food additives legislation. Potential food applications for this fructose syrup include cakes, coloured soft drinks, ice creams and biscuits. Fructose syrups generally are more expensive than glucose syrups and thus tend to be used in specialty products such as diabetic and dietetic foods. Fisons has indicated a similar potential market for its product.

SAFETY EVALUATION

5. No specific safety data have been provided on this particular fructose syrup product, although various data have been made available on dextrans. (1, 2, 3, 4, 5) In support of the safety-in-use in food of this product the Committee noted that:

   i) other fructose syrups are already in widespread use in the food industry

   ii) this fructose syrup product is a by-product of a well established, worldwide procedure using the same organism under standard conditions to produce dextrans for clinical use. These clinical dextrans are subjected to various pharmaceutical tests for toxicity and anaphylaxis and there is no evidence to suggest any toxin - producing potential of the source organism

iii) the advice of the Committee on Toxicity that the dextrans present in this product would be metabolished in the gut, particularly in view of the fact that the intake of the fructose syrup product, and thus that of the dextrans is likely to be limited (see iv below)

iv) diabetic foods containing conventional fructose syrups and other bulk sweeteners must be labelled that it is best not to exceed an intake of 25g/day (because of possible laxation). Thus if similar foods containing this particular fructose syrup product were also subject to such labelling, than the daily intake of the product is likely to be limited.

CONCLUSIONS

6. The Committee is satisfied that there are no food safety reasons why the use in food of this fructose syrup product should not be acceptable, provided that the dextrans present in the product are of a molecular weight range of 500-10,000, and that the dextrans are at least 95% straight chain molecules (i.e at least 95% of the bonds are 1-6 links and less that 5% are branched, 1-4 links). The Committee also notes that food products for diabetics containing this fructose syrup product would be subject to the same labelling requirements as those containing conventional fructose syrups.

REFERENCES

1. "Evaluation of the Health Aspects of Dextrans as Food Ingredients" 1975. Select Committee on GRAS Substances Report No 83. Prepared for Bureau of Foods, Food and Drug Administration, Department of Health, Education and Welfare, Washington DC, USA.

2. Unpublished report entitled "Dextran in the G.I. Tract" R M Alsop, R B Forrester and G Griffin, dated December 1985.

3. Unpublished report entitled "An investigation of Dextran-70 therapy in patients with chronic renal failure taking a low protein diet." L W Fleming and W K Stewart dated February 1989.

4. Unpublished report entitled "Dextran in G.I. Tract Summary Report. Metabolism in the large bowel" R B Forrester dated June 1989.

5. Letters to Mrs Hattersley from Mr Forrester, dated 2 August 1989 and 24 August 1989.

ADVISORY COMMITTEE ON NOVEL FOODS AND PROCESSES

Draft Guidelines on the Assessment of Novel Foods and Processes

November 1989

ADVISORY COMMITTEE ON NOVEL FOODS AND PROCESSES

Draft Guidelines on the Assessment of Novel Foods and Processes