

COMMISSION OF THE EUROPEAN COMMUNITIES



REPORTS
OF THE SCIENTIFIC COMMITTEE
FOR FOOD

First series

SCIENTIFIC COMMITTEE FOR FOOD

The Committee was established by Commission Decision 74/234/EEC of 16 April 1974 (OJ No L 136 of 20.5.1974 page 1) to advise it on any problem relating to the protection of the health and safety of persons arising from the consumption of food, and in particular the composition of food, processes which are liable to modify food, the use of food additives and other processing aids as well as the presence of contaminants.

The Members are independent persons, highly qualified in the fields associated with medicine, nutrition, toxicology, biology, chemistry, or other similar disciplines.

The opinions of the Committee are submitted to the Commission and as a rule are published. The present series relates to opinions given during the period indicated in the individual titles.

The Secretariat of the Committee is provided by the Directorate-General for Agriculture of the Commission.

COMMISSION OF THE EUROPEAN COMMUNITIES

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FOR FOOD**

First series

31 December 1975

SUMMARY

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(1) O.J. No. C 114 of 27.9.1974, p. 22.

REPORT OF THE SCIENTIFIC COMMITTEE FOR FOOD ON SODIUM METHYL
PARAHYDROXYBENZOATE, POTASSIUM NITRITE AND POTASSIUM PROPIONATE

Opinion expressed 15 November 1974

Terms of Reference

To give an opinion on whether the sodium derivative of methyl parahydroxybenzoate, potassium nitrite and potassium propionate could from the point of view of safety in use be added to the Community list of preservatives for use in food.

Conclusions

1. The sodium derivative of methyl parahydroxybenzoate could be added to the Community list of preservatives for use in food.
2. Potassium propionate could be added to the Community list of preservatives for use in food.
3. Potassium nitrite could be added to the Community list of preservatives for use in food under the same conditions as for the sodium salt.
4. The Committee draws the attention of the Commission to the need for a review of
 - a) the use of nitrite and nitrate ;
 - b) the balance in human nutrition of mineral ions, in particular, of sodium and potassium.

Background

1. The accession of the three new Member States, namely Denmark, Ireland and the United Kingdom, to the Community was conditional upon certain amendments to the original Treaties. Certain of these amendments related to foodstuffs and in particular to antioxidants, colours and preservatives for use in food.
2. The present Directive on the approximation of the laws of Member States concerning the preservatives for use in food intended for human consumption (64/54/EEC, 5 November 1963) allows :
 - methyl parahydroxybenzoate (E218)- but not the sodium derivative ;
 - propionic acid (E280) ;
 - sodium propionate (E281) ;
 - calcium propionate (E282)- but not potassium propionate ;
 - sodium nitrite (E250) (1)- but not potassium nitrite.
3. The Treaty of Accession provides that the three substances under consideration may be included in the Community lists if, inter alia, scientific investigation proves that they are harmless to human health. It is on this aspect of the question that the opinion of the Committee has been requested.
4. The Committee was therefore asked to advise as to whether sodium methyl parahydroxybenzoate, potassium nitrite and potassium propionate could,

(1) (in mixture with sodium chloride).

from the point of view of safety in use, be added to the Community list of preservatives.

Sodium methyl parahydroxybenzoate

5. The Joint FAO/WHO Expert Committee on Food Additives has not considered this substance as such, but at its 17th meeting it allocated a combined ADI of 0-10 mg/kg bodyweight for ethyl, methyl and propyl parahydroxybenzoates. This evaluation included the sodium derivatives of these esters. The Committee saw no reason to differ from the opinion of the FAO/WHO experts.
6. The current Directive on preservatives allows methyl parahydroxybenzoate (E218), ethyl parahydroxybenzoate (E214) and its sodium derivative (E215), and propyl parahydroxybenzoate (E216) and its sodium derivative (E217). The Committee was informed that there was a technological need for the addition of the remaining substance in the series (namely the sodium derivative of methyl parahydroxybenzoate), and that it would be used as an alternative, in certain circumstances, to the currently permitted "parahydroxybenzoates". The addition of this substance to the list of preservatives did not mean therefore that there would be a greater load of "parahydroxybenzoate" in the diet.
7. The Committee concluded therefore, that the sodium derivative of methyl parahydroxybenzoate could be added to the list of preservatives permitted to be used in food in the Community.

Potassium propionate

8. At the 17th meeting the Joint FAO/WHO Expert Committee on Food Additives considered that as propionic acid, and its sodium, potassium and calcium salts are normal constituents of food and normal intermediary metabolites in man, it was unnecessary to establish ADIs for them. The Committee agrees with this opinion.
9. The Committee was informed that there was a technological need for this substance.
10. The Committee concluded that under these circumstances potassium propionate could be added to the list of preservatives permitted to be used in food in the Community.

Potassium nitrite

11. At the 17th meeting the Joint FAO/WHO Expert Committee on Food Additives considered the potassium and sodium salts of nitrates and nitrites. The FAO/WHO Expert Committee emphasised the need for further work on the problem of the formation of nitrosamines, but it acknowledged that in the absence of suitable alternatives, nitrates and nitrites were still required to control toxin-forming micro-organisms such as Clostridium botulinum. The FAO/WHO Expert Committee established an ADI for nitrites, potassium and sodium salts of 0-0.2 mg/kg bodyweight.
12. The Scientific Committee for Food restricted itself to the specific question as to whether potassium nitrite should be allowed on the list of preservatives under the same conditions as the currently permitted sodium nitrite. It made no attempt to consider the problem of the role of nitrite (or nitrate) in the formation of nitrosamines. However, the Committee agrees with the Joint FAO/WHO Expert Committee on Food Additives that there is need for further information, and recommends that the whole question should be studied at Community level.
13. The Committee concluded that potassium nitrite could be added to the list of preservatives permitted to be used in food in the Community under the same conditions as the sodium salt.

REPORT OF THE SCIENTIFIC COMMITTEE FOR FOOD ON
MERCURY IN FOOD

Opinion expressed 16 November 1974

Terms of Reference

To give an opinion on the feasibility of suggesting a maximum acceptable level of mercury in food, particularly in fish and fishery products.

Conclusions

1. The Committee is of the opinion that the recommendation of the Joint FAO/WHO Expert Committee on Food Additives (JECFA) of a provisional tolerable weekly intake of 0.3 mg mercury, of which not more than 0.2 mg should be present as methylmercury compounds (calculated as mercury) represents an acceptable estimate of the amount of mercury which may be ingested from food without creating a human health hazard. Although this conclusion is supported by the recent animal data the estimated intake remains provisional until more reliable human data have become available.
2. The Committee noted that total diet studies and other studies estimating the dietary intake of mercury tended to confirm a fairly constant relationship between weekly dietary intake and resulting blood levels of mercury in the general population in line with predictions from available observations on individuals where these parameters have been investigated in detail. The use of food consumption data derived from national food surveys tended to give higher estimates for weekly mercury intakes than total diet studies but the latter are probably a more accurate basis for assessment of exposure to dietary mercury.
3. The Committee noted that both mercury compounds and methylmercury compounds have been detected in human food. The likely major dietary sources of methylmercury compounds are fish and shellfish, but a few other foodstuffs may contribute small amounts. Foodstuffs other than fish and shellfish contribute predominantly inorganic mercury compounds.
4. There is a need to ensure that intakes of mercury, especially methylmercury compounds, by the general population be kept to the minimum. However, bearing in mind the provisional total weekly intake, the Committee is unable to lay down specific limits for mercury or methylmercury in individual foodstuffs which would be applicable throughout the Community, for the following reasons :
 - a) The estimated acceptable intake of mercury from the food is based on toxicological considerations and therefore applicable to the whole of the population of the Community in a uniform manner. The consumption of individual food items likely to contain mercury or methylmercury is very variable both in different populations and in different groups within a given population. It is not possible to select a limit which could usefully relate widely fluctuating consumption to a fixed acceptable intake.
 - b) The appropriate limiting concentration value for mercury or methylmercury in food products, particularly fish, will depend very much upon the fish eating habits of the individuals in the population

ingesting these products, on the sources and the degree of contamination, as well as on the species of fish and shellfish involved. The control of the average weekly intake below an acceptable level is therefore a local problem which must however be resolved if health hazards are to be avoided.

5. Information on the fish eating habits of most populations is relatively meagre. The problem is complicated by the fact that for certain population groups fish is an important source of protein in the diet. The choice of the appropriate limiting level of mercury is made particularly difficult because it has to make allowance for critical risk-benefit calculations in the nutritional field. In the opinion of the Committee the key problems of the future are related to the setting of appropriate limits for methylmercury concentrations in fish for those sections of the population where fish may supply the principal protein source in the diet. In particular, enforcement authorities should continue to exercise vigilance that for those sectors of the population, the figure quoted in paragraph 1 of these conclusions, is not exceeded.

Discussion

The advice of the Scientific Committee for Food was requested on the feasibility of suggesting a maximum acceptable level of mercury in food, particularly in fish and fishery products. The possible risks to the health of the consumer from mercury compounds and methylmercury compounds in food have been examined by many national and international scientific bodies and authorities. Much information is therefore available on the toxicology of mercury and its compounds in animals and man. Several recent publications have reviewed and summarized existing knowledge (1,2,3,4,5,6,7).

The Joint FAO/WHO Expert Committee on Food Additives (JECFA) evaluated the health hazards of mercury in food in 1972 and based its assessment mainly on information obtained in man (3). Usually the JECFA establishes an acceptable daily intake (ADI) for additives to and contaminants in food, where this is practicable, on the basis of toxicological information available to the Committee for assessment. The ADI, in mg/kg body weight, represents the amount of xenobiotic which can be ingested daily by the human consumer over his whole life span without any apparent harm to health arising.

Considering the variability of the human diet it is obvious that the occasional intake of a chemical in excess of its ADI over a few days will be balanced by other periods during which intake falls below the ADI. For food additives and most contaminants the magnitude by which the ADI is likely to be exceeded is small compared with the ADI itself. In the case of certain environmental contaminants, e.g. heavy metals, the ADI is quantitatively so small that the daily dietary variations represent large fractions, or even multiples of the ADI. These rather wide daily positive and negative deviations from the estimated ADI do not represent an acute hazard to health by themselves. However, they can give rise to concern in some quarters and cannot in fact be prevented by any direct control of the normal dietary variations within a given population. For these reasons the JECFA developed the novel concept of a tolerable weekly intake. This represents a better measure of the health hazard arising from contaminants in food. Only dietary intakes which persistently exceed the tolerable weekly intake to a substantial degree, are likely to result ultimately in a risk to the health of the consumer.

In the case of mercury the JECFA therefore recommended "a provisional tolerable weekly intake of 0.3 mg of total mercury of which not more than 0.2 mg should be present as methylmercury (expressed as mercury)". More recent data from Sweden and Finland suggested that intakes of mercury from the diet amounting to 2.1 - 5.6 mg per week gave rise to blood levels of 0.2 - 0.65 mg/l without any detectable adverse clinical effects particularly in relation to the central nervous system (8). On the other hand the available information from the Japanese incidents of methylmercury poisonings

in Minamata and Niigata pointed to the possibility of clinical symptoms occurring at blood levels of mercury ranging from 0.2 - 2.0 mg/l. Further evidence has been provided by an investigation of the recent incident of mercury poisoning in Iraq. Although dietary mercury intake figures which could be related directly to blood levels are not extant, the threshold body burden of methylmercury which could be correlated with the onset of clinical symptoms of poisoning was 25 - 40 mg. This agrees remarkably well with the body burden of 30 mg computed by the Swedish Expert Committee from the data on the Japanese epidemics (12). The provisional tolerable weekly intake proposed by JECFA may be equated to a mercury level in blood of 0.03 mg/l.

A knowledge of the average consumption of food items likely to contain mercury is needed, if mercury intakes are to be estimated. National food surveys provide one source of food consumption data, but these surveys vary greatly from country to country in the accuracy and details recorded and are often difficult to relate to each other. They tend on the whole to overestimate food intakes. As a result, the calculated intakes of mercury from the diet would overestimate the real situation. Total diet studies, on the other hand, are more representative of the actual dietary intakes of the average person in a country. Estimations of mercury intakes from total diet analyses are therefore more reliable measures of the dietary exposure of the average individual in a population.

The extensive surveys of mercury in food and the total diet studies made in the U.K. have shown that the average weekly intake of mercury for the average adult ranged from 0.035 - 0.070 mg and gave rise to an average blood level of 0.005 mg/l. A similar but smaller survey carried out in the Federal German Republic revealed an average weekly intake of mercury for an adult to range from 0.035 - 0.175 mg with a median value of about 0.053 mg, but reported a mean blood level of only 0.0008 mg/l (13).

The Swedish investigations detailed in the Report of an Expert Group (1) mention weekly dietary intakes of mercury as high as 2.1 mg associated with blood levels of mercury of the order of 0.2 mg/l. Recent work in the Netherlands quotes calculations of weekly mercury intakes as ranging from 0.01 - 0.04 mg which were found to be associated with blood levels of mercury ranging from 0.001 - 0.01 mg/l. However 99 % of the samples were below 0.01 mg/l, the median value being about 0.001 mg/l (9). A survey carried out in a comparatively isolated island population in Italy revealed an average weekly intake of total mercury in adults of 0.26 mg, of which 0.22 mg were methylmercury calculated as mercury. The corresponding mean blood level of mercury was found to be 0.06 mg/l (15).

These human data indicate an approximate relationship between weekly mercury intake and resulting blood levels of mercury in the non industrially exposed average person of the type : weekly intake (in mg) = 10 x blood level (in mg/l). The actual dietary average intakes reported above are well below the provisional tolerable weekly intake suggested by the JECFA. They have also been found to give rise to blood levels of mercury which are at the most 1/10 of, but are usually far less than the highest observed blood level of mercury found to be clinically without effects. This may be interpreted as indicating the existence of an additional margin of safety to that used by the JECFA in arriving at their estimate of a provisional tolerable weekly intake for mercury.

New animal data have also become available since the appearance of the report of the JECFA. They comprise a 90-day study in rats of methylmercury chloride at dietary levels of 0, 0.1, 0.5, 2.5 and 25 mg/kg diet, as well as a two year study and reproduction study in rats using methylmercury chloride at dietary levels of 0, 0.1, 0.5 and 2.5 mg/kg diet (10). The no-adverse-effect level in these studies was estimated to be about 0.5 mg/kg diet equivalent to 0.025 mg/kg body weight of methylmercury chloride. Using the usual safety factor of 100 would result in an estimated ADI of 0.00025 mg/kg body weight equivalent to a tolerable weekly intake of 0.105 mg methylmercury (calculated as mercury) for a 60 kg adult man.

Another recent study on the teratogenic effects of orally administered methylmercury chloride in cats using dietary levels of 0, 0.03, 0.083, 0.25 and 0.75 mg/kg body weight between days 10 to 58 of pregnancy allowed an estimate for a no-adverse-effect level of 0.03 mg/kg body weight (11). Using again the safety factor of 100 would allow the calculation of an ADI of 0.0003 mg/kg body weight of methylmercury equivalent to a tolerable weekly intake of 0.126 mg for a 60 kg adult.

Prenatal and postnatal exposure of mice to single intraperitoneal doses of methylmercury compounds has been shown to produce subtle deviations in behavioural studies at various stages of postnatal development although no overt signs of any toxic effect were detectable in these offsprings (14). Analyses of brain weight, brain protein, choline esterase and choline acetyltransferase showed no significant differences between controls and treated animals. These experiments extended over the whole lifespan of the offsprings and the single dose level used was 8 mg/kg body weight, chosen deliberately in order to produce recognisable effects. This dose represents about 2500 times the provisional tolerable weekly intake.

It may be seen from the foregoing estimates that animal data point to a tolerable weekly intake of methylmercury of 0.105 - 0.126 mg which is of the same order as the provisional tolerable weekly intake for methylmercury suggested by the JECFA. It should also be remembered that calculations based on animal data tend to err on the safe side because of the obvious limitations imposed when choosing the number of dose levels which can be used in practice to define a no-adverse-effect level.

The JECFA estimate of a provisional tolerable weekly intake excludes children and pregnant women. The recent reproduction studies in rats and the teratogenicity study in cats, as well as the behavioural studies in mice, indicate however that the estimate of the JECFA may be held to cover these two population groups. No evidence was obtained for any increased sensitivity of the foetus to methylmercury compared to the adult. Although the observed foetal blood levels of mercury were higher than the maternal blood levels, the no-adverse-effect levels seen in the reproduction and teratogenicity studies were similar to those in the non-pregnant adult animals. The long term studies in rats pointed to the kidneys as the most sensitive indicators of methylmercury toxicity rather than the central nervous system, at least in animal experiments, but human observations on renal involvement in methylmercury poisoning are not available.

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REPORT OF THE SCIENTIFIC COMMITTEE FOR FOOD
ON RAPESEED OILS

Opinion expressed 16 November 1974

Terms of reference

The Scientific Committee for Food has been given the task of specifying the state of our knowledge concerning the effects that might result from the consumption of rapeseed oil in food.

Conclusions and Recommendations

The Committee has considered not only conventional rapeseed oils from Brassica campestris, Brassica napus and Brassica tournefortii but also the rapeseed oils from Brassica hybrids which have an erucic acid content of 5 % or less. The Committee in the actual state of knowledge has agreed on the following conclusions :

I. Effects on animals

1. Rapeseed oils rich in long chain fatty acids, are liable to provoke lesions (effects on the growth of young animals, myocardial lipidosis and fibrosis) in a number of species of animals (rat, pig, turkey, duckling, gerbil, guinea pig, monkey, etc.). Erucic acid has been mainly incriminated, but its sole responsibility is still under discussion.
2. Rapeseed oils with a low erucic acid content have not had any slowing down effect on the growth of the animals and their effects on the myocardium appear milder than with the oils rich in erucic acid.

II. Effects on man

The investigations and studies conducted up to now on man, which have been few, have not provided evidence of adverse effects. The Committee recommends that these studies be continued.

III. Recommendations

1. In the present state of our knowledge, the Committee, as a matter of prudence, recommends that when rapeseed oils are used for human consumption, preference should be given to oils with low levels of long chain fatty acids (C₂₂ or higher).
2. Further research on long chain fatty acids and more generally on oils and fats used in food is necessary. The effects reported for rapeseed oils may not be unique to these oils.

REPORT OF THE SCIENTIFIC COMMITTEE FOR FOOD ON THE
REVISION OF THE DIRECTIVE ON COLOURING MATTERS
AUTHORIZED FOR USE IN FOODSTUFFS INTENDED FOR HUMAN CONSUMPTION

Opinion expressed 27 June 1975

Terms of reference

The Committee was asked to review the safety in use of all compounds proposed for inclusion in a revised Community list of colouring matters authorized for use in foodstuffs intended for human consumption

Conclusions

1. Colours for which an ADI could be established and which are therefore toxicologically acceptable for use in food within these limits :

Beta-apo-8'-carotenal)	ADI 0-5 mg/kg b.w.
Beta-apo-8'-carotenoic acid, ethyl ester)	as sum of the
Beta-carotene)	3 carotenoids.
Canthaxanthin		ADI 0-25 mg/kg b.w.
Caramel colour (made by other than ammonia processes)		ADI no upper limit specified
Chlorophyllin copper complex)	ADI 0-15 mg/kg b.w. as sum
Chlorophyll copper complex, Na or K)	of both complexes
Erythrosine		ADI 0-2.5 mg/kg b.w.
Indigotine		ADI 0-5 mg/kg b.w.
Iron oxides (and hydrated iron oxides)		ADI no upper limit specified
Red 2 G		ADI 0-0.1 mg/kg b.w.
Sunset Yellow FCF		ADI 0-2.5 mg/kg b.w.
Tartrazine		ADI 0-7.5 mg/kg b.w.

2. Colours for which a temporary ADI could be established and which are toxicologically temporarily acceptable for use in food within these limits until 31 December 1978 :

Amaranth	temp. ADI 0-0.75 mg/kg b.w.
Annatto extracts	temp. ADI 0-1.25 mg/kg b.w. as sum of bixin and norbixin
Azorubine	temp. ADI 0-2 mg/kg b.w.
Brilliant Black PN	temp. ADI 0-0.75 mg/kg b.w.
Brilliant Blue FCF	temp. ADI 0-2.5 mg/kg b.w.
Brown FK	temp. ADI 0-0.05 mg/kg b.w.
Caramel colour (made by ammonia processes)	temp. ADI 0-100 mg/kg b.w. single strength (20,000 EBC units, 200 ppm 4-methylimidazole)

Chocolate Brown HT (1)	temp. ADI 0-2.5 mg/kg b.w.
Food Green S	temp. ADI 0-5 mg/kg b.w.
Patent Blue V	temp. ADI 0-2.5 mg/kg b.w.
Ponceau 4 R	temp. ADI 0-0.15 mg/kg b.w.
Quinoline Yellow	temp. ADI 0-0.5 mg/kg b.w.
Yellow 2 G (1)	temp. ADI 0-0.01 mg/kg b.w.

3. ~~Colours for which an ADI could not be established but which are nevertheless acceptable for use in food :~~

a) for use in food generally :

Anthocyanins)	
Beet red)	
Chlorophyll)	
Curcumin)	from natural foods
Lycopene)	
Mixed α, β, δ carotenes)	
Xanthophylls)	

b) for external colouring and decorating of food only :

Aluminium
Calcium carbonate
Gold
Silver

c) for external and/or mass colouring of sugar confectionary :

Carbon black & Activated vegetable
Carbon
Titanium dioxide

d) for external colouring of cheese rind only :

Lithol Rubine BK (Ca and Al salts) (2)

e) for some alcoholic beverages :

Cochineal and carminic acid (2)

4. ~~Colours for which an ADI could not be established and which are not toxicologically acceptable for use in food :~~

Alkanet	Fast Red E	Orchil and Orcein
Allura Red	Fast Yellow AB	Ponceau 6R
Black 7984	Indanthrene Blue RS	Scarlet GN
Burnt Umber	Orange G	Violet 6B
Chocolate Brown FB	Orange GGN	
Chrysoine S	Orange RN	

(1) These colours were the subject of a supplementary opinion expressed 14 November 1975.

(2) Temporarily acceptable only until 1980.

5. Colours listed in the Community Directive under review but exempted from its provisions under article 3 of the Directive :

Certain coloured substances which are used primarily for their aromatic, sapid or nutritive properties in food are exempted from the provisions of the Community Directive on colouring matters in foodstuffs intended for human consumption. The Committee recommended that riboflavin be included among these substances because of its primary nutritional function as a vitamin.

Background

1. The present Directive on the approximation of the laws of Member States concerning the colouring matters authorized for use in foodstuffs intended for human consumption (1), allows the use of a number of colouring matters as well as certain substances for diluting and dissolving colours.
2. Since the adoption of the original Directive there have been significant developments in methods for the toxicological investigation of food additives and in the interpretation and evaluation of biological and clinical information. The need for a thorough review has long been apparent. Furthermore the accession to the Community of the 3 new Member States, namely Denmark, Ireland and the United Kingdom, was conditional upon certain provisions specified in the Treaty of Accession. Some of these provisions relate to colours for use in food.
3. The Treaty of Accession provides that new Member States may maintain in force up to and including 31 December 1975, provisions of national law existing at the date of accession which prohibit the use of the following colouring matters in foodstuffs intended for human consumption :

E 103 Chrysoine S	E 120 Cochineal	E 126 Ponceau 6R
E 105 Fast Yellow AB	E 121 Orchil - orcein	
E 111 Orange GGN	E 125 Scarlet GN	
4. The Treaty of Accession also provides that new Member States may, up to and including 31 December 1977, maintain in force national laws existing at the date of accession which permit the use of the following colouring matters in foodstuffs intended for human consumption :

Alkanet	Fast Red E	Titanium dioxide (for mass and surface colouring)
Brilliant Blue FCF	Iron Oxides (for mass and surface colouring)	
Brown FK	Orange G	Ultramarine
Chocolate brown FB	Orange RN	Violet 6B
Chocolate brown HT	Red 2G	Yellow 2G
5. The Treaty of Accession provides that the colouring matters listed in paras 3 and 4 above be considered for inclusion in, or deletion from, the Community Directive.

(1) Council Directive of 23.10.62 OJ 115 of 11.11.62 2645, as modified
- Dir. 25.10.1965 JO 178 of 26.10.1965 p. 2793/65
- Dir. 24.10.1967 JO 263 of 30.10.1967 p. 4
- Dir. 20.12.1968 JOL 309 of 24.12.1968 p. 24
- Dir. 13.07.1970 JOL 157 of 18.07.1970 p. 36

Current Review

6. The Committee was therefore asked to review all compounds on the current Community List of authorised colouring matters in foodstuffs intended for human consumption in addition to the compounds listed in para 4. It was also asked to consider those colouring matters proposed by Member States for inclusion in the Community Directive since the date of the Treaty of Accession. The Committee welcomed the opportunity of carrying out a total review as the best means of ensuring a uniform and consistent approach.
7. Not all the Members agreed on the need for colours in food. However, the Committee accepted that the existence of a Community Directive, and of national legislation in Member States and in many other countries on colouring matters in foodstuffs, and the fact that the Commission had requested the advice of the Committee indicated that many authorities regard the use of colours as justified. It is therefore necessary for the Committee to formulate advice on their safety.
8. The Committee noted that the Community Directive on colouring matters does not, in general, refer to the foodstuffs in which particular colours may be used. Eventually, this information will be specified either by addition to the Colours Directive or in Commodity Directives. Before listing such uses, consideration would have to be given to the possible intake from all sources of the colours in question. This is particularly important in the case of commodities consumed by children. Until such time as Community legislation is introduced concerning the colours that may be used in a particular commodity, Member States will rely on national legislation. The Committee therefore agreed to confine its attention at the present time to establishing whether the individual food colours concerned were acceptable from the point of view of safety.
9. The Committee decided first to establish the general criteria for the evaluation of the safety of the colouring matters under review. In doing this the Committee relied largely on the general principles published by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and the WHO Scientific Groups. Many other national and international publications relating to the same subject were also taken into consideration.
10. In each case the Committee considered the available information under the following headings :
 - a) Specifications : These should contain sufficient information to allow identification of the compounds used in the relevant biological tests. They should also allow conclusions to be drawn on the possible existence of impurities. For many colouring matters specifications have been established and published. References to these are included in the comments on individual colours. Colouring matters which do not comply with these specifications will require separate evaluation. In preparing specifications for food colours not only chemical impurities but also the possibility of microbiological contamination should be taken into consideration.
 - b) Biological information : In evaluating the biological information on the colouring matters under review the Committee was guided by the generally accepted procedures published in the various documents referred to in paragraph 9. In general, adequate data allowing a clearcut assessment of the results and their statistical significance will be needed on acute toxicity, short term studies in at least two species (of which one should preferably be a non-rodent), metabolic studies in at least two species (and, where feasible, in man), long term studies in two species (either both rodents or preferably one rodent and one non-rodent species) and multigeneration studies including teratogenicity studies. In selecting the species for conducting the tests it is desirable to choose, when possible, a

species in which the metabolism of the compound under investigation is similar to that in man.

- c) Hypersensitivity reactions to food colours : Various allergic reactions have been reported in man following the ingestion of certain food colours by sensitized individuals. However, cutaneous tests of these colours in animals to detect their potential for evoking hypersensitivity reactions in man have so far not been sufficiently predictive to be regarded as useful criteria. It would not be reasonable to accept the addition to food of any substance causing serious or widespread hypersensitivity reactions, but where the incidence of hypersensitivity reactions is low, acceptability might be considered(1). However, the Committee recommended that there should be appropriate and clear labelling.
- d) Mutagenic potential of food additives : In principle food colours, like any other food additive, should properly be evaluated for mutagenic potential.

The Committee noted that a WHO Scientific Group on the Assessment of the Carcinogenicity and Mutagenicity of Chemicals (WHO techn. Rep. Ser. , No., 540, 1974) stated that in vitro mutagenicity tests alone cannot yield definitive results applicable to man ; mammalian test systems are more promising but still require further development and trial. Much research in this area is presently in progress and no specific test system or combination of testing procedures can yet be recommended by the Committee as fully adequate to answer the question of mutagenic potential for man. Meanwhile every compound should be reviewed in the light of all available evidence.

Classification of Colours :

- 11. The Committee noted that the adequacy of the information on specifications and biological testing varied considerably when the criteria mentioned in para.10 were used as a guide. It classified the food colours reviewed into the following groups :
 - a) Colours for which an Acceptable Daily Intake (ADI) could be established and which are therefore toxicologically acceptable for use in food within these limits. In establishing ADIs the Committee considered all the toxicological data currently available to it, and the values of these ADIs are therefore not necessarily identical with those established earlier by other expert bodies. It should be remembered that an ADI represents an estimate of the average daily intake of a substance, which taken, throughout the human life span, would not result in any obvious harm to health. Where the ADI is expressed as "no upper limit specified", this means that, on the basis of the available data (toxicological, biological, chemical and clinical) the total daily intake of the substance, arising from its use or uses at the levels necessary to achieve the desired effect and from the acceptable background in food, does not represent a hazard to health. For this reason, and for reasons stated in the individual evaluations, the establishment of a numerical limit for the ADI is not considered necessary.
 - b) Colours for which a temporary ADI could be established and which are toxicologically acceptable for use in food within these limits until 31 December 1978. By temporary ADI the Committee had in mind the limits within which a colouring matter could be used in food until the end of 1978. Before that date the Committee would be prepared to

(1) One Member of the Committee could not accept the addition of any substance known to cause hypersensitivity reactions.

consider establishing an ADI if it is provided with a report on the tests indicated in Annex I as necessary. Exceptionally, the Committee would be prepared to consider recommending an extension of the period of validity of the temporary ADI provided that it was satisfied that substantial progress had been made with the tests required.

Any future recommendation on the use of these colours after this date would be dependent on the evaluation by the Committee of the reports supplied to the Commission on the further studies indicated as being necessary in Annex I.

- c) Colours for which an ADI could not be established but which are nevertheless considered acceptable or temporarily acceptable for use in food. In principle, colours for which an ADI cannot be established would not be acceptable for use in food, but the Committee recognised that exceptions might be made in the case of compounds which are in fact constituents of food and derived from coloured natural foods by purely physical processes. These substances are acceptable for use in food provided the quantities ingested do not differ substantially from the amounts likely to be ingested as a result of the normal consumption of the foods in which they occur naturally. However, in the event of the widespread use of a colouring matter prepared from natural foods then the colour will need to be tested adequately for safety if its acceptability for use in food generally is to remain.

Colouring matters either derived by physical processes from natural sources which are not natural foods or which are prepared by synthesis, will need to be tested adequately for safety before they can be accepted for use in food. This will permit an assessment of the presence or absence of any harmful constituents or impurities in these colours. Such a requirement would constitute an additional safeguard of the health of the consumer in the event of extensive use of a colouring matter derived from sources which are not natural foods or derived by synthesis. Other exceptions were made where the use was for external colouring or decoration only, or where the use would be restricted to a specific food which comprises a very small part of the normal diet.

- d) Colours for which an ADI could not be established and which are not toxicologically acceptable for use in food.

Detailed comments on individual colours are given in Annex I.

ANNEX I

Comments on Individual Colouring Matters

In order to avoid unnecessary textual repetition, the existence of a specification prepared by JECFA is indicated by the figure 1, and that of a specification in the Community Directive by the figure 2. If the biological data considered were those published in a monograph prepared by JECFA, this is shown by the figure 3.

Beta-apo-8'-carotenal (1,2,3)

The Committee endorsed the ADI established by JECFA of 0-5 mg/kg b.w. as sum of the carotenoids beta-carotene, beta-apo-8'-carotenal, beta-carotenoic acid, methyl and ethyl esters (WHO Food Add. Ser. No6, 1975, 65-67)

Beta-apo-8'-carotenoic acid, ethyl ester (1,2,3)

Only the ethyl ester is listed in the Community Directive and was the only compound considered. The Committee endorsed the ADI established by JECFA of 0-5 mg/kg b.w. as sum of the carotenoids beta-carotene, beta-apo-8'-carotenal, beta-carotenoic acid, methyl and ethyl esters (WHO Food Add. Ser. No6, 1975, 72-73)

Beta-carotene (1,2,3)

The Committee endorsed the ADI established by JECFA of 0-5 mg/kg b.w. as sum of the carotenoids beta-carotene, beta-apo-8'-carotenal, beta-carotenoic acid, methyl and ethyl esters (WHO Food Add. Ser. No6, 1975, 68-71)

Canthaxanthin (1,2,3)

The Committee endorsed the ADI established by JECFA of 0-25 mg/kg b.w. (WHO Food Add. Ser. No6, 1975, 51-58)

Caramel colour (made by other than ammonia processes) (1,2,3)

The Committee established an ADI without specifying an upper limit, endorsing the decision of JECFA 15th Report (1972) (WHO techn. Rep. Ser. No 488, 1972).

In the Committee's opinion this colour is acceptable for use in food.

Chlorophyll copper complex (1,3)

Chlorophyllin copper complex, sodium and potassium (1,3)

These are two distinct food colours. The Community Directive specification requires amendment. The Committee endorsed the ADI established by JECFA of 0-15 mg/kg b.w. as sum of both complexes (WHO Food Add. Ser. No6, 1975, 74-76) and recommended separate listing of these food colours.

Erythrosine (1,2,3)

The Committee emphasized the need to include in the specification a limit of 0.1 % for the common impurity fluorescein. The Committee also considered additional short term, reproduction and teratogenicity data. The Committee endorsed the ADI established by JECFA of 0-2.5 mg/kg b.w. (WHO Food Add. Ser. No6, 1975, 80-86).

Hypersensitivity reactions have been reported in certain individuals.

Indigotine (1,2,3)

The Committee considered additional biological data on long term, reproduction and teratogenicity studies. The Committee endorsed the ADI established by JECFA of 0-5 mg/kg b.w. (WHO Food Add. Ser. No6, 1975, 95-99)

Iron oxides (and hydrated iron oxides) (1,2,3)

Additional information before the Committee showed that only 1 % of the colour was likely to become solubilized in the human intestinal tract. This would not contribute significantly to the total dietary intake of iron. The Committee established an ADI without specifying an upper limit.

Red 2G (1,3)

The Committee considered additional information on biochemical, long term and reproduction studies. The Committee established an ADI, in the light of the additional evidence, departing in this respect from the decision of JECFA not to establish an ADI because of the inadequacy of the data (WHO/Food Add./66.25, 1966 ; 19).

Sunset Yellow FCF (1,2,3)

The Committee considered additional information on long term and reproduction studies. The Committee noted the ADI established by JECFA of 0-5 mg/kg b.w. (WHO/Food Add./66.25, 1966, p.83-87) but departed from it in respect of the numerical limit, in the light of the additional information.

Tartrazine (1,2,3)

The Committee endorsed the ADI established by JECFA of 0-7,5 mg/kg b.w. (WHO/Food Add./66.25, 1966, 88-92). Hypersensitivity reactions have been reported in certain individuals.

Amaranth (1,2,3)

The Committee considered many additional data on reproduction, teratology and long term studies. The Committee endorsed the temporary ADI established by JECFA of 0-0.75 mg/kg b.w. (WHO, Tech. Rep. ser. (19th meeting) in press). The Committee requested the results of further long term and reproduction studies now in progress.

Annatto extracts (oily and aqueous) (1,2,3)

The Committee endorsed the temporary ADI established by JECFA of 0-1.25 mg/kg b.w. expressed as bixin (WHO Food Add. Ser. No6, 1975, 43-46). It requested that the results of the metabolic studies, now said to be in progress, be presented for evaluation. The metabolic and other biological data must relate to the main pigment in the annatto extracts, not to another geometrical isomer.

Azorubine (1,2,3)

The Committee also considered additional information on long term teratogenicity studies (see also WHO Food Add. Ser. No6, 1975, 47-50). The Committee established a temporary ADI of 0-2 mg/kg b.w. and requested the results of an adequate long term study in another species as well as metabolic studies in several species and, if possible, in man.

Brilliant Black PN (1,2,3)

The Committee considered also additional studies in mice and rats. The Committee established a temporary ADI of 0-0.75 mg/kg b.w., departing in this instance from the latest decision of JECFA establishing a temporary ADI of 0-2.5 mg/kg b.w., (WHO Food Add. Ser. No6, 1975, 53-56), in view of the additional evidence. The Committee requested by 1980 the results of metabolic studies in several species and, if possible, in man, reproduction including embryotoxicity and teratogenicity studies and full details still outstanding of studies so far reported.

Brilliant Blue FCF (1,3)

The Committee considered additional long term, reproduction and teratogenicity studies. The Committee established a temporary ADI of 0-2.5 mg/kg b.w., departing in this instance from the latest decision of JECFA establishing an ADI of 0-12.5 mg/kg b.w., (WHO/Food Add/70.36, 1970, 24-27), because this was not based on new evidence of toxicity.

It requested the results of metabolic studies in animals and, if possible, in man.

Brown FK (1)

The Committee considered the available biological data and established a temporary ADI of 0-0.05 mg/kg b.w. It requested the results of a further long term study in another strain of rat as well as reproduction and teratology studies. When carrying out the long term study the Committee recommended that the nitrite level in the animal diets be estimated as an additional parameter.

Caramel colour (ammonia processes) (1,2,3)

The Committee considered additional short term studies and endorsed the temporary ADI of 0-100 mg/kg b.w., (WHO Food Add. Ser. No6. 1975, 59-64). It requested the results of long term and reproduction (including teratogenicity) studies on samples of caramel colours prepared by the ammonia or ammonium sulphite process and which contain several levels of 4-methylimidazole. It also requested adequate studies on the latter impurity. The Committee drew attention to the fact that the temporary ADI applied to the single strength material with a colour intensity of 20,000 EBC units containing not more than 200 ppm of 4-methylimidazole. The ADI for higher strength material would be proportionately smaller.

Chocolate Brown HT

The Committee was provided with a specification as well as the results of acute, short-term and long-term tests on several animal species. Metabolic studies are needed as well as reproduction and teratology studies. The long term studies in mice and rats revealed no adverse effects of importance for the safety evaluation for man. The Committee established a temporary ADI and requested submission of the results of metabolic and reproduction (including embryotoxicity and teratogenicity studies) by 31.12.1978.

Food Green S (1,2,3)

The Committee endorsed the temporary ADI established by JECFA of 0-5 mg/kg b.w., (WHO/Food Add/ 70.36, No 46A, 1970, 57-59), but departed in this instance from the latest decision to withdraw the temporary ADI (WHO Food Add. Ser. No6, 1975, 89-92) because this was not based on new evidence of toxicity. The Committee considered that it would not create a risk to the health of the consumer if the period of temporary acceptability of this colour for use in food were extended. However, the Committee emphasized the need to provide the results of an adequate long term study in a second species, metabolic studies in several species and, if possible, in man, and studies on reproduction and embryotoxicity including teratogenicity.

Patent Blue V (1,2,3)

The Committee considered the temporary ADI established by JECFA of 0-2.5 mg/kg b.w. (WHO/Food Add/ 70.36, No 46A, 1970, 49-50), but departed in this instance from the latest decision to withdraw the temporary ADI (WHO Food Add. Ser. No6, 1975, 106-108), because this was not based on new evidence of toxicity. The Committee considered that it would not create a risk to the health of the consumer if the period of temporary acceptability of this colour for use in food were extended. However, the Committee emphasized the need to provide the results of an adequate long term study in a second species as well as a short term study in a non-rodent species. Metabolic studies in several species and, if possible, in man, and teratogenicity studies are also needed.

Ponceau 4R (1,2,3)

The Committee considered additional information on long term and teratogenicity studies. It endorsed the temporary ADI established by JECFA of 0-0.125 mg/kg b.w., (WHO Food Add. Ser. No6, 1975, 109-112), but departed from the decision of JECFA in respect of the numerical limit in the light of the additional evidence. It requested the results of metabolic studies in animals and, if possible, in man, as well as of a long term study in rats and a reproduction study.

Quinoline Yellows (1,2,3)

The Committee was informed that in the manufacture of these colours by the existing processes the impurities were qualitatively the same. Therefore toxicological data obtained on the colour containing the methylated derivative could be used as collateral evidence to assure the safety of the non-methylated preparation. The Committee endorsed the temporary ADI established by JECFA of 0-0.5 mg/kg b.w. (WHO Food Add. Ser. No6, 1975, 116-119).

Yellow 2G (1,3)

The Committee considered the available specification as well as the information contained in the monograph prepared by JECFA in 1974 (WHO Food Add. Ser. No6, 1975, 122-123), and the results of the long term studies now provided. The short term studies in the rat and pig did not reveal any serious adverse toxicity, but the long term study in rats demonstrated some questionable adverse effects on renal function and kidney weight, in one sex only, at the highest levels tested. The long term study in mice showed considerable scatter in the incidence of lymphosarcomata in the different animal groups compared with the incidence in contemporary and historical controls. For these reasons the Committee established a temporary ADI and requested submission of the results of multigeneration (including embryotoxicity and teratology) studies as well as repetition of the long term mouse study with special emphasis on the assessment and review of the variability in incidence of lymphosarcomata in the strain of mouse used.

Anthocyanins (from natural foods) (1,2)

No biological data were available. The Committee did not establish an ADI but decided that anthocyanins, prepared from natural foods by physical processes, could be accepted for use as colouring matter in food without further investigation.

Beet red (1,2,3)

The Committee did not establish an ADI but felt able to accept the use of this colouring matter in food without the need for further investigations, departing in this respect from the latest decision of JECFA of an ADI (temporary) not specified (WHO Food Add. Ser. No6, 1975, 51-52). Metabolic studies in several species and, if possible, in man, and an adequate long term study in one acceptable species will be needed if considerable extension of the use in food of this colour is contemplated at some future date.

Chlorophyll (from natural foods) (1,2)

No specific biological data were available to the Committee. The Committee did not establish an ADI but felt able to accept the use of chlorophyll prepared from natural foods by physical processes without further investigations, as colouring matter in food.

Turmeric and Curcumin (1,2,3)

The Committee did not establish an ADI for turmeric because this material is excluded from the provisions of the Community Directive on colours under Article 3. The Committee did not establish an ADI for curcumin but felt able to accept the use of this colour without the need for further investigations, departing in this respect from the decision of JECFA of a temporary ADI of 0-0.1 mg/kg b.w. (WHO Food Add. Ser. No6, 1975, 120-125). Metabolic studies in several species and, if possible, in man, adequate long term studies in another species, reproduction and embryotoxicity including teratogenicity studies will be needed if considerable extension of use in food of this colour is contemplated at some future date.

Lycopene (from natural foods) (2,3)

The Committee noted the latest decision of JECFA not to allocate an ADI (WHO tech. Rep. Ser. No557, 1974, 17-18). The Committee similarly did not

establish an ADI, but felt able to accept the use of lycopene prepared from natural foods by physical processes, without further investigations, as a colouring matter in food.

Mixed α, β, δ carotenes (from natural foods) (2)

No specific biological data were available to the Committee. The Committee did not establish an ADI but felt able to accept the use of mixed carotenes prepared from natural foods by physical processes, without further investigations, as colouring matter in food.

Xanthophylls (from natural foods) (2)

No specific biological data were available. The Committee could not therefore establish an ADI, but nevertheless recommended that xanthophylls prepared from natural foods by physical processes be accepted for use as colouring matters in food without further investigation. For the purposes of the Directive, the Committee suggested that the acceptable natural xanthophylls be defined as including the 3-hydroxy- and 3,3'-dihydroxy-derivatives of α, β, δ carotene, their naturally occurring mono- and di-epoxides, neoxanthin, neochrome, and the fatty acid esters of these compounds present in natural foods.

Aluminium

No specification was available. The Committee did not establish an ADI because of the inadequacy of the available data. The Committee was however able to accept the use of this colour for the surface colouring of food only. The Committee recommended that the general problem of the total intake of aluminium from all sources be studied in the future.

Calcium carbonate (2)

The Committee did not establish an ADI. This colouring matter is only to be used for surface colouring and decoration of food. The Committee therefore felt able to accept the above use of this colouring matter without further investigations.

Gold

No specification was available to the Committee. The Committee did not establish an ADI because of the inadequacy of the available biological information but felt able to accept the use of this colour for surface colouring and decoration of food only, without further investigations.

Silver

No specification was available to the Committee. The Committee did not establish an ADI because of the inadequacy of the available biological data but felt able to accept the use of this colour for surface colouring and decoration of food only, without further investigations.

Carbon black, Activated vegetable carbon (food grade) (1,2,3)

The Committee felt that all carbon blacks used as colouring matter in food, from whatever source and however produced, should comply with an appropriate test for polycyclic aromatic hydrocarbons. The Committee did not establish an ADI for these colours but felt able to accept their use in food as colouring matter.

Titanium dioxide (1,2,3)

The Committee did not establish an ADI, departing in this respect from the latest decision of JECFA of an ADI not limited (WHO/Food Add/70.36, 1970, 55-56), but felt able to accept the use of this colouring matter for the surface and mass colouring of sugar confectionary only, without the need for further investigations.

Lithol Rubine BK, calcium and aluminium salts (2,3)

The Committee considered additional data on reproduction and teratogenicity. The Committee did not establish an ADI but felt able to accept temporarily the use of this colour for the surface colouring of cheese rind. It requested by 1980 the results of migration studies, metabolic studies in animals and, if possible, in man, long term studies in 2 species, because it had been informed that deliberate ingestion of cheese rind containing this colouring matter had become a practice.

Cochineal and Carminic Acid (1,2,3)

The Committee departed from the decision of JECFA not to establish an ADI because of inadequacy of the available data (WHO Food Add. Ser. No6, 1975, 78-79). In the Committee's opinion the colour is temporarily acceptable for use in some alcoholic beverages until the end of 1980. The Committee will require the results of long term and reproduction including teratogenicity and embryotoxicity studies now in progress before consideration can be given to the use of this compound.

Alkanet (1)

No biological data were available to the Committee. The Committee did not establish an ADI. In the opinion of the Committee this colour is not acceptable for use in food.

Allura Red (1,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO Food Add. Ser. No6, 1975, 38-41). In the opinion of the Committee this colour is not acceptable for use in food.

Black 7984

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO/Food Add/66.25, 1966, 16). In the Committee's opinion this colour is not acceptable for use in food.

Burnt Umber (2)

No biological data were available. The Committee did not establish an ADI. In the Committee's opinion this colour is not acceptable for use in food.

Chocolate Brown FB (1)

The Committee noted that the colouring matter had no clearly defined composition and was unable to relate the biological data to identifiable material used in food. The Committee did not establish an ADI. In the Committee's opinion this colour is not acceptable for use in food.

Chrysoine S (1,2,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO/Food Add/66.25, 1966, 15). In the Committee's opinion this colour is not acceptable for use in food.

Fast Red E (1,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO/Food Add/ 66.25, 1966, 17). In the Committee's opinion this colour is not acceptable for use in food.

Fast Yellow AB (1,2,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO/Food Add/66.25, 1966, 17). In the Committee's opinion this colour is not acceptable for use in food.

Indanthrene Blue RS (1,2,3)

The Committee did not establish an ADI and noted the latest decision of JECFA (WHO Food Add. Ser.No6, 1975, 93-94) to withdraw the previously established temporary ADI of 0-1 mg/kg b.w., (WHO/Food Add/70.36, 1970, 41-42). In the Committee's opinion this colour is not acceptable for use in food.

Orange G (1,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO/Food Add/66.25, 1966, 18). In the Committee's opinion this colour is not acceptable for use in food.

Orange GGN (1,2,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO/Food Add/66.25, 1966, 19). In the Committee's opinion this colour is not acceptable for use in food.

Orange RN (3)

Two commercial products appear to exist, one containing only Orange RN, the other containing 85 % Orange RN and 15 % subsidiary dye. Some of the biological data referred to one product, and some to the other. The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the available data (WHO Food Add. Ser. No6, 1975, 102-105). In the opinion of the Committee this colour is not acceptable for use in food.

Orchil and Orcein (1,2,3)

The Committee endorsed the decision of JECFA not to attempt to establish an ADI because of the inadequacy of the data (WHO/Food Add/66.25, 1966, 18). In the Committee's opinion this colour is not acceptable for use in food.

Ponceau 6R (1,2,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the data (WHO Food Add. Ser. No6, 1975, 113-115). In the Committee's opinion this colour is not acceptable for use in food.

Scarlet GN (1,2,3)

The Committee endorsed the decision of JECFA not to establish an ADI because of the inadequacy of the data (WHO/Food Add/ 66.25, 1966, 19). In the Committee's opinion this colour is not acceptable for use in food.

Violet 6 B (1,3)

The Committee agreed with the decision of JECFA not to establish an ADI (8th Report (1965) WHO Technical Report Series No 309, 21) and, in the light of the adverse information from more recent studies, considered this colour not to be toxicologically acceptable for use in food.

1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that this is crucial for ensuring transparency and accountability in the organization's operations.

2. The second part of the document outlines the various methods and tools used to collect and analyze data. It highlights the need for a systematic approach to data collection and the importance of using reliable and valid measurement instruments.

3. The third part of the document discusses the ethical considerations that must be taken into account when conducting research. It stresses the importance of obtaining informed consent from participants and ensuring that their privacy and confidentiality are protected throughout the study.

4. The fourth part of the document describes the various types of research designs that can be used to investigate different research questions. It compares and contrasts experimental, quasi-experimental, and non-experimental designs, highlighting their strengths and limitations.

5. The fifth part of the document discusses the importance of data analysis and interpretation. It outlines the various statistical techniques that can be used to analyze data and interpret the results of the study. It also emphasizes the need to report findings in a clear and concise manner.

6. The sixth part of the document discusses the importance of disseminating research findings. It outlines the various channels through which research results can be shared, such as through journal articles, conference presentations, and public reports. It also emphasizes the need to communicate findings in a way that is accessible and understandable to a wide range of audiences.

7. The seventh part of the document discusses the importance of ongoing evaluation and improvement of research practices. It emphasizes the need to regularly assess the effectiveness of research methods and procedures and to make adjustments as needed to ensure the highest quality of research.

8. The eighth part of the document discusses the importance of collaboration and teamwork in research. It emphasizes the need to work closely with colleagues and to share resources and expertise to achieve the best possible results.

9. The ninth part of the document discusses the importance of staying current in the field of research. It emphasizes the need to regularly read and review the latest research findings and to attend to professional development opportunities.

10. The tenth part of the document discusses the importance of maintaining a positive and productive research environment. It emphasizes the need to foster a culture of respect, collaboration, and open communication among all members of the research team.

REPORT OF SCIENTIFIC COMMITTEE FOR FOOD
ON VINYL CHLORIDE MONOMER

Opinion expressed 27 June 1975

Terms of Reference

The Scientific Committee for Food has been charged with the evaluation of the hazards to human health arising from the migration into food of vinyl chloride monomer present in certain plastic materials and articles intended to come into contact with food.

Conclusions and Recommendations

1. The Committee has considered the available information on the adverse effects of vinyl chloride monomer (VC) on experimental animals and man. The data show conclusively that VC is carcinogenic to man as well as to other species, and VC has been shown to produce other adverse effects on the central nervous system, bone and liver. The aim should therefore be to take all possible steps to reduce all forms of exposure to VC.
2. Consideration of the analytical results reveals that there is no good correlation between the free vinyl chloride monomer concentration in polyvinylchloride (PVC), and related polymers prepared from VC, and the amount of VC migrating into food in contact with these polymers. Setting specific limits for VC in different polymers in contact with food does not therefore represent an adequate method for protecting the health of the public. However, the levels of VC in PVC and related polymers should be reduced as far as possible.
3. The Committee recommends that VC should not be detectable in food or potable water by an agreed method. Attempts should be made to develop generally applicable analytical methods for VC with a sensitivity of the order of 0.001 - 0.002 mg/kg.
4. The Committee also recommends that the situation be reviewed at intervals in the light of data collected in Member States as progress is made in manufacturing technology and risk evaluation.



REPORT OF THE SCIENTIFIC COMMITTEE FOR FOOD
ON ETHOXYQUIN

Opinion expressed 13 November 1975

Terms of reference

The Committee was asked to give its opinion on the acceptability, from the point of view of safety in use, of the application of ethoxyquin to apples and pears for the treatment of scald.

Conclusions

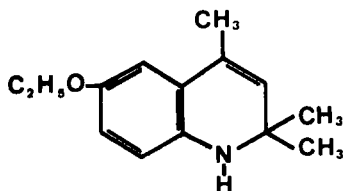
There is no toxicological evidence to oppose the use of ethoxyquin on apples and pears restricted by a residue limit of up to 3 mg/kg.

Background

1. Ethoxyquin is used in some Member States in the treatment of scald on apples and pears. There have been requests from governments of Member States for approval to be given for this purpose throughout the Community and the Commission has asked the Committee to advise on those aspects relating to the safety in use of ethoxyquin. The Committee was presented with information on the biological properties, technological efficacy and need for the product.

Specification

2. Ethoxyquin is 6 - ethoxy - 1,2 - dihydro - 2,2,4 - trimethylquinoline, an amber coloured oily product with a tendency to polymerise on exposure to light and oxygen.



The product to be used in trade is specified to contain not less than 92 % monomer, the remainder should consist of the dimer and higher polymers.

Properties, Technological Efficacy and Need

3. Ethoxyquin has antioxidant properties and is thus used in animal feeding stuffs as a permitted additive under the terms of the Community Directive on additives in animal feeding stuffs (1). The permitted concentration is up to 150 mg/kg (0.015 %) in the final product. Higher concentrations (e.g. 0.01 -) 0.1 % of ethoxyquin may be used in certain ingredients of animal feedingstuffs. In fishmeal 0.04 % is used before shipment. The addition of antioxidants to fishmeal is a requirement of shipping lines and insurance companies because of the danger of self-ignition. BHT and ethoxyquin are the most commonly used antioxidants for this purpose.

(1) O.J. No. 70/524/EEC of 23/11/1970

4. Ethoxyquin is also used to control scald on apples and pears. Scald is thought to be caused by the accumulation of oxidation products of alpha-farnesene, a component of the waxy coating of apples. Pre- or post-harvest treatment of fruit with ethoxyquin prevents scald. Ethoxyquin may be applied by spraying the fruit on the trees within the 48 hours before harvesting, dipping or spraying after harvesting, wrapping fruit in treated wraps or packing in impregnated trays. The quantities of ethoxyquin used are adjusted to ensure that the final residue on the fruit does not exceed 3 mg/kg.

Dietary Intake

5. Contributions to the daily intake of ethoxyquin in the diet may arise from residues present in carcass meat, certain organs such as the liver, milk and eggs, as a result of its use as an animal feed additive. To these residues must be added the contribution from residues on treated apples and pears. The Committee was informed of estimates of intake from use on apples and pears for the United Kingdom based on an average daily combined intake of apples and pears amounting to 33.5 g per person. If all the fruit was consumed complete with skin and contained ethoxyquin at the maximum proposed level of 3 mg/kg then the average daily intake of ethoxyquin would be $3 \times 10^{-3} \times 33.5 \text{ mg} = 0.1 \text{ mg/person}$ or 0.0016 mg/kg bodyweight. This is likely to be an overestimate of the actual intake of ethoxyquin from apples and pears because not all fruit would contain ethoxyquin at the proposed maximum level. In any case ethoxyquin remains essentially in the peel, therefore the level in cooking apples which have been peeled before use will be a very small proportion of the ethoxyquin applied. The same argument holds for dessert apples which many people peel before consumption.
6. For other countries, different food factors may have to be taken into consideration. In the Netherlands the consumption of apples and pears is apparently 90-100 g, the highest in Europe. On this basis the above calculation may be adjusted as follows: $3 \times 10^{-3} \times 100 \text{ mg} = 0.3 \text{ mg/person}$ or 0.005 mg/kg bodyweight as average daily intake from apples and pears. No factual information was available to the Committee on fruit consumption in other Member States.
7. More difficult is the question of the intake from other food commodities. The level of residual ethoxyquin in them is not known with sufficient accuracy at present for valid calculations to be made. Such information as exists suggests that the residue concentrations depend on dosage levels in the animal feed and the withdrawal periods in force. Reports for individual commodities range up to 1.0 mg/kg but no total diet or market-basket studies are available.
8. On the assumption that 1 mg/kg is present in a total diet of 1.500 g the contribution from residues amount to 1.5 mg/person giving an average daily intake of 0.025 mg/kg bodyweight. If in the extreme case the figures for fruit and other items of the diet are added up, the maximum intake under UK conditions would amount to 0.027 mg/kg bodyweight and under conditions in the Netherlands to 0.030 mg/kg bodyweight. These figures represent a gross over-estimate of the actual conditions as it is most unlikely that all food other than apples and pears contains residues of 1 mg/kg ethoxyquin.

Biological data

9. The metabolic and short term data which have been obtained in a large number of species are adequate. They point to rapid excretion with some accumulation in liver, kidney, and body fat on continuous feeding. The available long term studies are not adequate by modern standards and can therefore only be used to arrive at a temporary acceptable daily

intake (ADI). The 2 year rat study points to a no-effect level of 60-125 mg/kg in the diet corresponding to 3-6 mg/kg bodyweight. The 18 months study in chickens given an apparent no-effect level of 75 mg/kg in the diet corresponding to 9 mg/kg bodyweight. A 5 year dog study used only one testing level of 300 mg/kg, equivalent to 25 mg/kg bodyweight, and no adverse effects were found ; while an earlier 1 year study showed 3 mg/kg bodyweight to be a no-effect level. Taking therefore the no-effect level in the most sensitive species, i.e. 3 mg/kg bodyweight in the dog, as the basis for calculating the temporary ADI, the estimated figure would be 0.03 mg/kg bodyweight.

10. The question of potential carcinogenicity has been raised because of the close chemical similarity of ethoxyquin to 1,2-dihydro-2,2,4-trimethylquinoline (Flectol H). The latter has been reported as causing an increased incidence of lymphomas and adenomas in groups of rats. The numbers of test and control animals used are too small for any conclusions to be drawn and only at the highest level is a possible effect on lymphoma incidence apparent. The figures for adenomata are not dose-related and cannot be evaluated as showing any significant difference from controls except for the middle dose level. This evidence relating to Flectol H cannot serve as a basis for any suspicion of carcinogenicity with ethoxyquin. A further study on newborn and infant mice produced equivocal results which would require repetition of the experiment with large numbers of animals.

Evaluation

There is no toxicological evidence to oppose the use of ethoxyquin on apples and pears restricted to a residue limit of up to 3 mg/kg. It is estimated that the contribution of ethoxyquin from apples and pears would be less than 15 % of that from other foods.

Because of the inadequacy of the long term and reproduction studies, acceptance can only be temporary and the results of additional studies will be required by the end of 1978. Meantime further extension of use cannot be considered. In addition, information is required on residues in other foods resulting from the use of ethoxyquin as an animal feedingstuff additive as well as the results of total diet studies.

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