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SCIENTIFIC COMMITTEE ON FOOD

SCF/CS/ADD/MsAd/178 final
29/03/99

**Opinion on
propane, butane and iso-butane as propellant gases
for vegetable oil-based aerosol cooking sprays and water-based emulsion
cooking sprays**

(expressed on 24 March 1999)

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Opinion on propane, butane and iso-butane as propellant gases for vegetable oil-based aerosol cooking sprays and water-based emulsion cooking sprays

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Terms of Reference

To advise the Commission on the safety in use of propane, butane and iso-butane as hydrocarbon propellant gases for vegetable oil-based aerosol cooking sprays and for water-based emulsion cooking sprays.

Background

When baking items such as cakes, biscuits etc., or when frying other food products that are likely to stick to the utensils, a fat film is required between the pan and the food products to achieve the necessary release of the food when the process is completed. Such a fat film can be applied by spraying an aerosol of food release oils or emulsions. A propellant gas is necessary to force the release liquid through the nozzle of the dispenser. To obtain an appropriate coverage of the frying or baking utensil a substantial pressure is required.

On the basis of Directive 95/2/EC,¹ the only acceptable gases to be used in connection with foodstuffs are carbon dioxide, argon, helium, nitrogen, nitrogen dioxide and oxygen. However none of these gases can produce the necessary pressure in the spray to obtain an homogeneous distribution of the fat film on the utensil. Butane, isobutane and propane are technological alternative hydrocarbon propellant gases. Chemical specification data of these propellants were provided to the Committee.²

Under the provisions contained in Directive 89/107/EEC³, the United Kingdom and Sweden approved a temporary national authorisation for the use of these gases for use in cooking sprays.

Safety assessment

The Committee has not considered propane, butane and isobutane as propellants but they have been evaluated in the context of their use as extraction solvents for which the SCF agreed an acceptable residue level per substance of *1mg/kg* in food consumed.⁴

The Committee was provided with residue data of the propellants after use in cooking representative foods. The data show that total hydrocarbons are present in the prepared foods in amounts *below 0.1 mg residual hydrocarbon/kg cooked food*. In most cases the amounts are substantially less than 0.1 mg/kg food. It is also shown that propane is present in lower concentrations in both the propellant blends and in the cooked foods compared with the two other hydrocarbons.

Effect of Time and Temperature on Propellant Residues

The hydrocarbon propellants used are, at all ambient indoor temperatures and at normal atmospheric pressure, in the gaseous state. The least volatile of the group, n-butane, has a boiling point of -0.5°C at 20°C ; The others boil at significantly lower temperatures. Accordingly also the hydrocarbons that are dissolved in fat or oil at ambient temperatures are present in the vapour state.

In the containers (aerosol dispensers) the propellants are present in the liquid state but when the content of the container is discharged, the released hydrocarbon propellant mostly vapourizes into the atmosphere leaving only a small amount dissolved in the cooking spray concentrate which is deposited on the surface of the cooking utensil.

The residual levels of hydrocarbon propellants in the water-based sprays would be expected to be less than those in the oil-based products because of their low solubility in water. This is confirmed by the analytical data on the levels of residues detected in the cooked food models.

Since the solubility of the hydrocarbon propellant gases in the concentrate decreases with temperature the propellants are expelled from the cooking spray during heating. In most cases temperatures of 200 to 220°C are reached. The limit of solubility of the propellants in the spray concentrate at these temperatures is reached in the time it normally takes to prepare the fried or baked foods and thus the propellant residues are reduced to a very low level during the time of preparation of the foods. In addition during frying or baking, the food and cooking spray concentrate are mixed and a portion of any residual hydrocarbon propellant will be transferred to the food. This will dilute the hydrocarbon to a concentration much less than its limit of solubility in the concentrate. No reaction of the hydrocarbon propellant gases with food components at cooking temperatures is to be expected.

Safety in use

The Committee was provided with information on flammability and wishes to draw attention to the fact that the oil-based aerosols may carry some risk of flammability.^{5,6}

Conclusion

In view of the low residue level of propellant gases the SCF has no toxicological concerns about the use of water-based emulsion sprays and oil-based aerosol sprays for baking and frying purposes, which contain propane, butane or iso-butane.

References

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4. Commission of the European Communities. Second report on Extraction Solvents. Reports of the Scientific Committee for Food, Twenty-ninth Series. (OPOCE, Luxembourg, 1992, Cat. N° EUR 14482).
5. Flammability of water-based aerosol cooking oils. Report by the « Laboratory of the Government Chemist, » Teddington, U.K., January 24, 1997
6. Safety examination of water-based aerosol cooking sprays, Report by the « Health & Safety Executive », London, UK, February 2, 1997