

REPORT OF THE SCIENTIFIC COMMITTEE FOR ANIMAL NUTRITION ON THE USE
OF FORMALDEHYDE IN FEEDINGSTUFFS FOR PIGLETS

Opinion expressed 20 April 1983

TERMS OF REFERENCE (October 1981)

The Scientific Committee for Animal Nutrition is requested to give an opinion on the following questions :

1. Could the use of formaldehyde as preservative under the conditions proposed for skimmed milk (see Background) be harmful to piglets?
2. Does this use under the conditions proposed for piglets result in the presence of residues in tissues and organs of the animal? If so, what is the qualitative and quantitative composition of these residues? Could these residues be harmful to the consumer?
3. In the light of the answers to the above questions, are the proposed conditions of use acceptable?

BACKGROUND

In accordance with the provisions of Council Directive 70/524/EEC of 23 November 1970 concerning additives in feedingstuffs (1), as last amended by the thirty-eighth Commission Directive of 16 July 1981 (2), Member States are authorized by way of derogation to use formaldehyde without

(1) OJ No L 270, 14.12.1970, p. 1

(2) OJ No L 231, 15.08.1981, p. 30

specific conditions.

The admission of formaldehyde at Community level under the following conditions has been proposed :

Species of animal : piglets.

Feedingstuff : skimmed milk.

Maximum content : 0.06% (=0.15% of formalin containing 40% of formaldehyde).

OPINION OF THE COMMITTEE

1. Formaldehyde's antimicrobial properties are well known. It is a very reactive compound, in particular with proteins, with which it combines, inter alia via the primary amine radicals.

Depending on the dose-level, time lapse, pH and temperature of the medium, formaldehyde may be present in feedingstuffs in the free state or reversibly bound in the form of methylols and/or irreversibly bound by the formation of non-hydrolysable compounds. The proportion of irreversibly-bound formaldehyde increases with the dose-level, while protein solubility and sensitivity to the action of proteolytic enzymes decreases, together with the quantity and bio-availability of lysine (formation of ϵ -N-methyllysine) (Tome et al., 1979).

The metabolism of formaldehyde in monogastric animals is not fully known. Formaldehyde is oxidized to a slight degree to CO₂ and water in various tissues of the rat. (Koivusalo, 1956; Neely, 1964). Free formaldehyde may react by dismutation in the hepatocytes and produce

formic acid and methanol as a result of the action of alcohol dehydrogenase (Abeles and Lee, 1960; Gupta, 1970). Free formaldehyde may also condense with tetrahydrofolic acid to produce methyl tetrahydrofolate. It is therefore possible for formaldehyde, released in the digestive system, to be partly metabolized in monogastric animals. Additional studies, using ^{14}C labelled molecules, are needed to elucidate the metabolism of formaldehyde in pigs.

Considerable experimental evidence from feeding all-milk diets artificially to piglets and a milk supplement to suckling pigs and to bacon pigs (weight range 20-90 kg) indicates that formaldehyde in whole or skimmed milk up to a level of 0.04% (=0.1% formalin containing 40% formaldehyde) is without adverse effects on the animals, as judged by nutritional parameters and carcass characteristics. Reduced appetite has been reported at a dose-level of 0.06% but with little effect on overall performance.

2. When pigs were given part of their feed as meal and part as 3.5, 4.5 or 5.75 l/day of formaldehyde-treated (0.04%) skim milk, over a period of about 3 months, comparisons of samples of tissues from control and treated pigs taken at slaughter gave no evidence of increased amounts of formaldehyde attributable to the treated skim milk. The mean concentration of formaldehyde in the tissues of the control animals and the animals given formaldehyde-treated skim milk was about 20 mg/kg tissue, with a limit of accuracy of 10 mg/kg tissue for the method of analysis (Jordan and Weatherup 1976, Florence and Miller 1981, Mitchell 1981).

Formaldehyde may be found in various animal tissues used as human food but metabolic studies are difficult because of its reactivity with

food constituents, particularly proteins which give rise to bound forms presenting analytical problems. However, information on the toxicological effects of formaldehyde can be derived from a report of the joint FAO/WHO Expert Committee on Food Additives concerning hexamethylene-tetramine, the toxicological effects of which are stated to be due to the liberation of formaldehyde. On the basis of long-term studies with rodents and dogs an ADI for man of 0-0.15 mg/kg has been established.

3. On the basis of the foregoing information, bearing in mind the limitations of the analytical method, the Committee is of the opinion that the proposed conditions of use are acceptable. However, a number of precautions must be taken when adding formalin containing 40% of formaldehyde to skimmed milk. Formaldehyde solutions are irritant for the eyes, the skin and the respiratory tract.

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