

Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents

WHO FOOD ADDITIVES SERIES NO. 5

The evaluations contained in this publication were prepared by the Joint FAO/WHO Expert Committee on Food Additives which met in Geneva, 25 June - 4 July 1973

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1 Seventeenth Report of the Joint FAO/WHO Expert Committee on Food Additives, Wld Hlth Org. techn. Rep. Ser., 1974, No. 539; FAO Nutrition Meetings Report Series, 1974, No. 53.

FORMIC ACID

Explanation

Formic acid has been evaluated for acceptable daily intake by the Joint FAO/WHO Expert Committee on Food Additives (see Annex 1, Refs No. 6 and No. 9) in 1961 and 1964. The previously published monographs are reproduced in their entirety below.

BIOLOGICAL DATA

BIOCHEMICAL ASPECTS

Formate is an intermediate in normal metabolism. It takes part in the metabolism of one-carbon compounds and its carbon may appear in methyl groups undergoing transmethylation. It is eventually oxidized to carbon dioxide (Williams, 1959). When formate is administered it could also be expected to enter one-carbon metabolism. However, there is a species difference in the extent of this metabolism, for in rabbits no administered formate is excreted, whereas in dogs about half the administered formate is excreted unchanged in the urine (Croner & Seligmann, 1907). Its metabolism in human beings is probably somewhere between that in dogs and that in rabbits, judging from the relative amounts of formate excreted by man, dogs and rabbits receiving methanol (Lund, 1948a; Lund, 1948b).

Formic acid (or formate) is apparently more toxic than other fatty acids, possibly owing to its enzyme-inhibiting activity (Bleyer et al., 1933). However, no cumulative toxic effects are known.

#### TOXICOLOGICAL STUDIES

##### Special studies

No data are available.

##### Acute toxicity

Exact LD50 values are not available. In dogs, sodium formate in oral doses of 4000 mg/kg and i.v. doses of 3000 mg/kg bw produced toxic effects such as methaemoglobinaemia and heart congestion (Fleig, 1907). About 50 mg/kg in 10% aqueous solution given orally to dogs or 6 mg/kg given s.c. to rabbits produced methaemoglobinaemia which lasted about 10 days (Croner & Seligmann, 1907). This slow disappearance may be due to the inhibition of catalase by formic acid (Lück, 1957). 4.6 mg/kg i.v. given to six dogs produced no ill effect and 13.8 mg/kg only slight hypertension (Erra, 1958).

##### Short-term studies

###### Dog

0.5 g of formic acid daily in the food has been tolerated by dogs without effect (Dick, 1909).

##### Long-term studies

No data are available.

#### OBSERVATIONS IN MAN

2-4 g of sodium formate daily did not produce toxic manifestations in human subjects, even if they were suffering from

kidney disease. It has been stated that a daily intake of 2-4 g for therapeutic purposes could be tolerated for months without untoward effects (Rost, 1917).

Comments:

An evaluation may be made on the basis of the available biochemical studies on man and on the knowledge of its role in normal metabolism.

#### EVALUATION

Estimate of acceptable daily intake for man

0-3 mg/kg bw.

#### REFERENCES

Bleyer, B., Diemair, W. & Leonhard, K. (1933) Arch. Pharm. (Weinheim), 271, 539

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Dick (1909) Hygienische Rundschau, 14, 313

Erra, U. (1958) Fol. med. (Napoli), 41, 366

Fleig, C. (1907) Arch. int. Pharmacodyn., 17, 147

Lück, H. (1957) Biochem. Z., 328, 411

Lund, A. (1948a) Acta pharmacol. (Kbh.), 4, 99

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Williams, R. T. (1959) Detoxication mechanisms, London, Chapman & Hall

See Also:

Toxicological Abbreviations

Formic acid (ICSC)

Formic acid (FAO Nutrition Meetings Report Series 38a)

FORMIC ACID (JECFA Evaluation)