



Designation: E 590 – 95

Standard Guide for the Use and Development of Sodium Monofluoroacetate (Compound 1080) as a Predacide¹

This standard is issued under the fixed designation E 590; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

Vertebrate animal control is a relatively primitive science lacking many of the research tools and procedures which are well established in other biological areas. This field is still more of an art or skill highly dependent on field experience. This is particularly true in dealing with higher forms that are neither domestic nor commensal. All are capable of elementary reasoning in addition to learned behavioral patterns; thus, pesticidal work has been difficult and in some areas impossible to standardize. We recognize, however, that the effort to do so must be continued in order to provide reasonable safeguards in application and to improve the science.

1. Scope

1.1 Sodium monofluoroacetate (Compound 1080) has been used for 30 years in animal control. However, since effective application as a predacide is directly related to the use of specific delivery systems, a standard guide is deemed both desirable and necessary.

1.2 The target species are primarily wild canids that may cause economic damage to domestic animals and crops. Additional purposes may include local population suppression to control rabies or other epizootics in wild canids such as foxes and coyotes.

1.3 The major use of Compound 1080 is in coyote (*Canis latrans*) control programs by application of bait stations during winter months. It is also used in red fox (*Vulpes fulva*) control programs in some sparsely settled areas.

1.4 Several nations in the world use or have developed use of this material and since this is the most complete document developed, the committee feels the guide should remain, recognizing the major emphasis deals with North American fauna.

1.5 Field experience is absolutely essential in the use of this product and any dispersal technique. Other experience is inadequate for safe and effective use.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.* Specific hazard statements are given in Sections 5 and 12.

2. Physical and Chemical Properties

2.1 Sodium monofluoroacetate (FCH_2COONa), also known as Compound 1080, is a white, crystalline, essentially odorless powder. The pure compound has been described as having a mildly salty, sour, or vinegar taste. It is hygroscopic and highly soluble in water but relatively insoluble in organic solvents such as kerosene, alcohol, and acetone, and in animal and vegetable oils and fats. It is unstable above 110°C and decomposes at 200°C. It also decomposes slowly in aqueous solution.

2.2 Compound 1080 is absorbed through the gastrointestinal tract, open wounds, mucous membranes, and pulmonary epithelium. It is not readily absorbed through intact skin. Toxicity is approximately equivalent whether the chemical is administered orally, subcutaneously, intramuscularly, intraperitoneally, or intravenously.

3. Mode of Action

3.1 Compound 1080 toxicity is primarily caused by inhibition of the citric acid (Krebs) cycle, which is essential for conversion of food into energy. The inhibition is caused by fluorocitrate, a metabolite of Compound 1080, which blocks citrate and succinate metabolism. Increased citrate secondarily inhibits energy production by blocking glucose metabolism.

4. Toxicology

4.1 Toxic symptoms follow a variable latent period as short as 1/2 h to as long as several hours. Singly or combined, causes of death are cardiac failure, depression of the central nervous system, or respiratory failure. In general, death in herbivores is caused by cardiac failure and in carnivores by central nervous system disorders. There is no established antidote, although four drug treatments have shown therapeutic effects. Medical treatment is primarily symptomatic.

¹ This guide is under the jurisdiction of ASTM Committee E-35 in Pesticides and is the direct responsibility of Subcommittee E 35.17 on Vertebrate Control Agents.

Current edition approved Nov. 10, 1995. Published January 1996. Originally published as E 590 – 76. Last previous edition E 590 – 76 (1989)^{ε1}.

4.2 Compound 1080 is highly toxic to the family Canidae. The recorded LD50 (Note 1) for coyotes (*Canis latrans*) is 0.1 mg/kg (Note 2) and for gray foxes (*Urocyon cinereoargenteus*) is less than 0.3 mg/kg. Other recorded mammalian LD50 values range from 0.1 mg/kg in black rats (*Rattus rattus*) to 60.0 mg/kg for opossums (*Didelphus marsupialis*). Recorded LD50 values in birds lie between 0.6 and 1.3 mg/kg for magpies (*Pica pica*) and 20.0 mg/kg for Gambel's quail (*Lophortyx gambeli*). The estimated human LD50 is in the range from 0.7 to 2.1 mg/kg. (Other LD50 values are listed in Table 1.)

NOTE 1—LD50, the median lethal dosage, is a statistical estimate of the dosage that would be lethal to 50 % of a very large population of the test species.

NOTE 2—mg/kg refers to milligrams of toxicant per kilogram of body weight.

4.3 When used as a predicide, secondary toxicity to some species has occurred, but tertiary effects have not been shown. Most secondary hazards demonstrated have been unidirectional, from small to larger species. Partial metabolism, excretion, and distribution of Compound 1080 through body organs prior to death are factors that act to reduce secondary hazards. Additional factors are species sensitivity and body size, feeding behavior of the scavenger, and the parts of prey animals or carrion ingested.

4.4 Physical and chemical properties of Compound 1080 and relative sensitivity of canid species are such that it is one of the most effective known chemicals for canid control. Although Compound 1080 is highly toxic to many homeothermic species, there is a sufficient range of sensitivity between species and differences in species behavior to provide a degree of selectivity by appropriate bait formulation. Additional selectivity is provided by suitable station placement and exposure periods.

5. Storage and Handling

5.1 The use of toxic chemicals requires certain precautions; and the following safety rules should be observed at all times in handling Compound 1080 concentrate, solutions, and treated baits:

5.1.1 All applicators and supervisory personnel shall be adequately trained and qualified. They should be fully aware of exposure hazards and proper storing and handling procedures to prevent human or nontarget animal exposure. First aid instructions and necessary material must be available at all times during handling procedures.

5.1.2 Compound 1080 concentrate shall be stored and transported only in properly labeled containers. It should be held under lock at all times except during necessary procedures for packaging, issuing to applicators, and treating baits. Extraordinary care shall be taken to prevent contact with food and access by children, irresponsible individuals, livestock, and pets.

5.1.3 **Precaution**—Respirators, protective clothing, and gloves should be worn at all times when handling the concentrate. However, waterproof gloves are adequate for handling liquid solutions and treated baits. Smoking and eating should be avoided when preparing baits, and precautions should be taken to prevent contact of the chemical with skin or clothing.

Respirators, clothing, and gloves should be thoroughly cleaned or destroyed after each exposure to the chemical. The applicator should wash his hands after handling the chemical or treated bait. Supervisory personnel should be responsible for providing proper equipment and ensuring that it is used only by experienced applicators authorized to prepare Compound 1080 baits.

5.1.4 Inventories of Compound 1080 concentrate and treated baits must be maintained. These shall include amounts purchased, storage locations, amounts distributed to applicators, and amounts used. Applicators shall keep records of quantities of Compound 1080 issued to them by the agency, quantities used and returned to the agency, and numbers of baits treated and placed by them. Applicators shall return all unused Compound 1080 concentrate and empty containers to agency or administrative headquarters at the end of each baiting season.

5.1.5 Under no circumstances shall applicators transfer possession of Compound 1080 concentrate, solutions, or treated baits to unauthorized individuals. However, applicators may require assistance in handling of bait animals, mapping of station sites, transportation, and placement and exposure of baits at approved, authorized station sites. Such assistance is not considered transfer of possession.

6. Formulation

6.1 Since Compound 1080 is highly soluble in water, an aqueous solution injected into meat is an effective delivery method. The standard use formula in this method for control of wild canids is 1.6 g of Compound 1080/45.4 kg (100 lb) of bait material. This formulation has been used successfully on coyotes and wolves in Canada and the United States, dingos in Australia, and black-backed jackals in South Africa. The impregnated meat bait is especially suited for use in remote locations during winter months to control coyote populations, especially in northern or sub-alpine climates.

6.2 When treated according to standardized directions, 1.4 oz of impregnated meat bait is equivalent to 1 LD50 for coyotes. (Other LD50 values are listed in Table 1.)

6.3 An alternative method for Compound 1080 application to control wild canids is the use of small perishable baits, generally smaller than 20 g, each containing a single lethal dose. Bait materials normally used are ground or rendered lard, tallow, or other fats which are relatively solid and physically stable at cool temperatures, but which melt at temperatures of approximately 26 to 32°C. Baits of this type are destroyed by warm weather in the event that they cannot be recovered for burning or burial. Since Compound 1080 exhibits a high degree of adsorption to plant root tissues and other cellulosic materials and is degraded by soil bacteria, the amounts of Compound 1080 released present little or no hazard in the environment.

6.4 Based on available toxicity data and probable maximum body weights for wild canids, suggested minimum single dosages for perishable Compound 1080 baits are:

5.0 mg 1080/bait for coyotes; maximum body weight 25 kg
3.0 mg 1080/bait for red foxes; maximum body weight 9 kg
2.0 mg 1080/bait for gray foxes; maximum body weight 7 kg

Dose levels may be readily adjusted, where necessary,