SYSTEMIC ACTIVITY OF CLOSANTEL FOR CONTROL OF LONE STAR TICKS, *AMBLYOMMA AMERICANUM* (L.), ON CATTLE

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**ABSTRACT**


Cattle were treated once at 5 mg/kg orally or subcutaneously or daily at 0.1–5 mg/kg orally or 0.1–1 mg/kg subcutaneously with closantel, N-[5-chloro-4-[(4-chlorophenyl) cyanomethyl]-2-methylphenyl]-2-hydroxy-3,5-diiodobenzamide, and numbers and weights of engorged females, weights of egg masses and hatch of eggs of lone star ticks, *Amblyomma americanum*, were recorded.

Effectiveness of treatments on reproduction was determined by comparing total estimated larvae (EL) (EL = wt. egg mass × est. % hatch × 20000) of ticks from treated cattle with that of ticks from untreated cattle. With certain treatments, we also determined the effect of manure of treated cattle on survival of larvae of the horn fly, *Haematobia irritans*, or effect on survival and of fecundity of adult horn flies or stable flies, *Stomoxys calcitrans*, fed on blood from treated animals.

The single oral treatment afforded essentially complete control of total EL only of ticks placed on the animal on the day of treatment, while the single subcutaneous treatment afforded >92% control of total EL of ticks placed on animal on treatment day and for 6 weeks posttreatment. Daily treatments of 0.5 mg/kg or greater orally and 0.1 mg/kg or greater subcutaneously afforded essentially complete control of total EL of ticks throughout the treatment period (3–12 weeks) and for 1–7 weeks after treatment was discontinued. An estimated concentration of >9 µg/ml of blood was calculated by probit analysis to be necessary to provide >90% control of total EL of lone star ticks; that same concentration also provided >90% control of hatch of eggs laid by treated females. A higher concentration (40 µg/ml) was necessary to prevent engorging of the females. No treatments tested were effective against larvae of the horn fly or adult horn flies or stable flies.

**INTRODUCTION**

Closantel, N-[5-chloro-4-[(4-chlorophenyl) cyanomethyl]-2-methylphenyl]-2-hydroxy-3,5-diiodobenzamide, a new broad spectrum, salicylanide anthelmintic, has also shown considerable activity as a systemic insecticide for the control of a variety of arthropod pests of livestock. Guerrero (1984)...
summarized a number of unpublished reports showing that oral or subcutaneous treatments of closantel were systemically active against *Hypo-derma bovis* (Linnaeus) larvae in cattle, and *Oestrus ovis* Linnaeus and *Cochliomyia hominivorax* (Coquerel) larvae in sheep. In addition, closantel has been reported to systemically active against *Gasterophilus* larvae in horses (Guererro et al., 1983; Nuytten and De Keyser, 1983), *Dermatobia hominis* (Linnaeus, Jr.) larvae (Chaia et al., 1981a, b; Lombardero and Luciani, 1982a), *Hypoderma lineatum* (Villers) larvae (Drummond, 1984) and all stages of *Boophilus microplus* (Canestrini) (Lombardero and Luciani, 1982b; Bulman et al., 1981) in cattle, *Psoroptes ovis* (Hering) in sheep (Perez Arrieta and Aloisi, 1983; Perez Arrieta et al., 1982a, b) and *Demodex* in dogs (Losson and Benakhla, 1980). It was ineffective against northern fowl mites, *Ornithonyssus sylvarium* (Canestrini and Fanzango), when given as a feed additive to chickens (De Vaney and Ivie, 1984).

One of the programs at the U.S. Livestock Insects Laboratory is research on animal systemic insecticides for the control of arthropod pests of livestock. Recently, we conducted a series of three tests to determine effectiveness of single oral or subcutaneous treatments and also to determine minimum effective dosages of daily oral or subcutaneous treatments of closantel for the control of adult lone star ticks, *Amblyomma americanum* (Linnaeus). Also, we determined if certain treatments were effective against larval horn flies, *Haematobia irritans* (Linnaeus), in manure of treated cattle or systematically effective against adult horn flies and adult stable flies, *Stomoxys calcitrans* (Linnaeus), fed blood treated cattle. The results of these tests are presented here.

MATERIALS AND METHODS

In all three tests, Hereford steers or heifers (200–300 kg) were placed in stanchions indoors, given a daily ration of a ground hay–grain mixture and had water available ad libitum.

*Treatment regimes*

In Test 1, one steer was treated daily orally with closantel at 5 mg/kg and another at 1 mg/kg. A sodium salt containing 47.5% a.i. of closantel was weighed and placed in a small gelatin capsule which was given orally with the aid of a balling gun. A third steer served as an untreated control. Later a fourth steer was treated daily at 1 mg/kg subcutaneously with an injectable solution that contained 5% closantel. The steer that served as control for the oral treatments also served as control for the subcutaneous treatment.

In Test 2, one heifer was given a daily oral treatment of 0.1 mg/kg with the sodium salt formulation of closantel as in Test 1. Four other heifers were treated with the injectable solution at dosages selected after the junior