# Current Worldwide Research on Control of Ticks Involved in Human Diseases[1]

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It is a pleasure to review the current status of research on the control of ticks involved in human diseases. Tick control has been obtained in the past through use of insecticides or environmental manipulations such as changes in vegetative cover or control of movements of domestic or wild-animal hosts. A review of the literature revealed that recent research has concentrated on development and use of insecticides, so our paper will emphasize this area of research. However, we have added a short discussion on the development of personal-use repellents and the possible application of the sterility approach to tick control.

Insecticides for control of ticks can be used in 2 ways: (1) for treating infested domestic animals to kill engorging ticks; and (2) for treating houses, animal buildings, grounds, or vegetation to kill ticks that are in a resting condition or awaiting an opportunity to feed. Since the treatment of domestic animals is the subject of the next paper, we shall confine our review to the latter types of treatment, mentioning only methods for domestic animals where the two were used together. Essentially we present a summary of current methods of (1) insecticidal control, (2) research on the improvement of existing materials and methods, (3) the use of repellents, and (4) the feasibility of the sterility approach.

In the USA, early work (Smith and Gouck 1946) led to the development and recommendation of chlorinated hydrocarbon insecticides for area control of ticks. Currently DDT (1–3 lb/acre), chlordane (1–3 lb/acre), toxaphene (1–3 lb/acre), and lindane (0.5–1 lb/acre) are suggested in USDA-AH (1967) with certain restrictions to prevent residues, contamination, and hazards to other forms of life. These materials have been used on a limited basis by communities and individuals, particularly where the American dog tick, *Dermacentor variabilis* (Say), or the Rocky Mountain wood tick, *D. andersoni* Stiles, have been a problem.

In the USA, 2 interesting control programs dealing with imported species of ticks have recently been conducted (Hourrigan et al. 1969). In the early 1960's, the 2-host tick *Rhipicephalus evertsi* Neumann was found in Florida in a wild-animal compound called Africa, USA. Six ground applications of DDT (2 lb/acre) at 3-week intervals greatly reduced, but did not eliminate, the ticks. Four additional treatments resulted in complete eradication. Various zoo animals were treated with 0.15% dioxathion. Recently the tropical bont tick, *Amblyomma variegatum* (F.), was found on the island of St. Croix, U. S. Virgin Islands. Tick collections over many years indicated that this tick was only recently introduced to the island. An eradication program was initiated by the Insular Government, livestock owners, and the Animal Health Division of the USDA. The program involved dipping animals with coumaphos and the treatment of premises and vegetation with carbaryl (2 lb/acre) using ground and aerial equipment. Area treatments were to be made every 3 weeks. The authors reported that the results were encouraging as to the possibility of eliminating the tick. However, it was too early to predict complete eradication.

At our laboratory in Gainesville, Fla., we have undertaken an evaluation of candidate insecticides for use in area control of ticks. The lone star tick, *Amblyomma americanum* (L.), has been the test species. Essentially the program involves screening of candidate organophosphorus and carbamate insecticides in laboratory tests and the field evaluation of promising materials in cooperation with the Naval Medical Field Research Laboratory, Camp Lejeune, N. C. (Mount et al. 1968). In field tests with some of the promising materials, Dursban® (*O,O*-diethyl *O*-3,5,6-trichloro-2-pyridyl phosphorothioate), diazinon, fenthion, and Sumithion® (*O,O*-dimethyl *O*-4-nitro-*m*-tolyl phosphorothioate) were at least as effective as DDT. Aerial and ground ultra-low-volume treatments appeared promising as methods of applying the insecticides. More data is needed on the minimum dosage levels which might be used.

In USSR, the control of ticks (Ixodidae) is an important area of research because of the problem of tickborne encephalitis and tick rickettsiosis. Soviet scientists have studied the efficacy of applications of chlorinated hydrocarbon insecticides for area control of ticks applied with various equipment and formulations at different seasons of the year. They call treatments in autumn, "under the snow" and treatments in early spring, "on the snow." Treatments have been made also in late spring before foliation. They have been able to compare effectiveness of treatment with epidemiological effect. DDT applied from ground or aerial equipment at rates of 27–45 lb of 10% dust/acre proved to be the most suitable. Against *Ixodes persulcatus* Schulze, the chief vector of spring-summer encephalitis, 90–99% control was obtained the 1st year and elimination followed the single treatment in 4 years (WHO 1963). In Czechoslovakia, *I. ricinus* (L.) is apparently less susceptible to DDT. Ten percent lindane dusts (71 lb dust/acre) have given almost complete control for an entire year (WHO 1963).

[1] Mention of insecticides in this publication does not constitute a recommendation for use of this insecticide.