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Assessment of Acaricidal Activity of NeemAzal® Washing Emulsion using Dogs under Field Conditions in Zaria

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Abstract

Twenty dogs visually confirmed to be infested with ticks were topically treated with **NeemAzal®** washing emulsion with the aim of determining its acaricidal activity under field conditions. The dogs were treated twice within an interval of three days. Tick counting was carried out on days 0, 3 and 6; [before treatment and three days after each treatment]. The number of attached ticks on the predilection sites (ears, around the neck region and feet of the dogs) were counted. The data generated suggested that this product had acaricidal activity with the highest percentage of tick reduction after 1st treatment at 86.2% and 2nd treatment at 96.6%. The oil based nature of the product posed some aesthetic problems to dog owners and also the product failed to attain 99.9% tick reduction within 3 days of treatment; a property that should be exhibited by any good acaricide used on dogs.

Keywords: Acaricidal activity, NeemAzal, dogs, field conditions, Zaria.

Introduction

Most homes today have at least one dog. Dogs are in fact the most common domestic animal found among human communities. This trusted work partner and beloved pet, learned to live with humans more than 14,000 years ago. Although it is not known how humans and dogs first learned to coexist, people soon discovered the many ways dogs could enrich their lives. Dogs have been used in Nigeria and around the world to hunt for food, herd animals, guard livestock and property, destroy rats and other vermin, pull carts and sledges, perform rescue operations, and apprehend lawbreakers. They have been used during wartime as sentinels and message carriers. Today, trained dogs are used to alert deaf people to common household sounds, such as the ringing telephone or doorbell; guide the blind; or retrieve objects for quadriplegics. Perhaps the most common of the many roles served by the domestic dog, however, is that of companion. As animals with strong social tendencies, dogs typically crave close contact with their owners. And people tend to form loving bonds with dogs. This companionship often helps to ease the pain and isolation of the elderly or people whose physical or mental health requires long-term convalescence or institutionalisation [1].

Tick infestations are of great importance in the induction of diseases of animals. Many are active blood suckers and may cause death from anemia. Some species cause tick paralysis while others elaborate toxins other than those causing disease [2]. Heavy tick burdens cause sufficient worry to interfere with feeding [3], lowering their

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developmental potential and performance. Their main importance however, is that they serve as biological vectors and reservoirs of all kinds of organisms which are pathogenic to man and animals. These organisms include protozoa, rickettsia and rickettsia-like organisms, bacteria, fungi, viruses and spirochaetes [4]. Of all arthropod vectors common to dogs, ticks have been known to transmit canine diseases of which the most common is canine babesiosis; an infectious disease of dogs caused by a protozoan parasite called *Babesia canis* which is transmitted to dogs by the brown dog tick-*Rhipicephalus sanguines* [7]. These ectoparasites (ticks) are found everywhere in the world [8], but predominantly in warmer climates where they constitute a nuisance to dogs and dog owners by lowering the developmental potential and performance of dogs and other animals [9].

Objectives

* To carry out field testing of NeemAzal® on dogs to establish tick control.
* To determine the percentage of tick reduction on topical application of NeemAzal® on dogs.
* To compare acaricidal activity of NeemAzal® (tick reduction) in relation to date of application, hair length, infestation intensity.
* To document any problems associated with field testing of NeemAzal® on dogs.

Justification of Study

Ticks do not only bite, attach to and feed on animal blood; they do same to humans, if given the opportunity [10]. It is common knowledge that domestic animals serve as reservoirs for a number of vector transmitted parasites and diseases like; trypanosomiasis, leishmaniasis, giardiasis, toxoplasmosis and malaria [11]. Thus with *Rhipicephalus sanguineus* tick infestation of dogs, there is a possibility of transmission of *Babesia spp.* to man via tick bite, because people relate closely with their dogs. Cases of ***Babesia*** infections have actually been reported in humans [12]. Knowledge of the dynamics of the ***Babesia*** parasite in this biological vector (*Rhipicephalus sanguineus*) is not only of veterinary importance, but also of public health importance to the society at large.

Introduction of an acaricide (NeemAzal®) with an active agent **Azadirachtin** that is biodegradable it degrades within 100 hours when exposed to light and water and shows very low toxicity to mammals the LD_{50} in rats is > 3,540 mg/kg making it practically non-toxic both to target and non target animals [5] .One of the major problems associated with chemical control of ticks, is that many of the acaricides in use (organochlorines and organophosphates) are highly toxic to vertebrates and accidental poisonings, resulting from careless use, overdosing or inappropriate treatment, are common. Cats are particularly sensitive to **Lindane**. Small or young dogs and cats can be easily overdosed with organophosphate insecticides used for **flea** treatment, particularly where flea collars are ingested, or used inappropriately or used simultaneously with other organophosphate treatments [6]. The **pyrethroids** are generally believed to have a wide margin of safety with mammals, but are toxic to crustaceans and fish. Nevertheless, in cats and small dogs, neurotoxic effects have been recorded, particularly with **Permethrin, Fenvalerate, Tetramethrin, Chrysanthemate and Deltamethrin,** although in most cases these have been associated with overdosing [6].

Environmental contamination and effects on non-target animals have been well documented in the case of the organochlorine insecticides, and growing concern is associated with the organophosphates. The disposal of pesticides may create problems, particularly when large volumes of liquids, such as organophosphate cattle dips, are involved. As more is known of the long-term risk from disposal sites, proper and legal disposal have become more difficult and of greater public health interest [6].

Methodology

Research Design

The experiment was conducted from September 2009 to October 2009, in Samaru Zaria, Kaduna State (latitude 32° S and 50°N) .A total of 20 dogs out of which 3 experimental dogs of the Department of Veterinary Surgery and Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University (ABU) were used after due permission was obtained from the ABUVTH and 17 others dogs in ABU residential areas.

The sampling was biased as only dogs visually

confirmed to be heavily infested with ticks were used. The most common tick identified was the **brown dog tick (*Rhipicephalus sanguineus)*** in which the initial number of ticks was noted before initial treatment which was repeated 3days after. Tick counts were carried out before and three days after every treatment. The percentage of tick reduction after the first and second treatments were noted and analysed for any significance. Also, the dog breed, hair length, age, sex, colour and weight were also noted.

Materials

some of the materials used in executing this research project included:

* NeemAzal® washing emulsion by ***Trifolio-M.*** It contains : 3% Neeem Seed Extract NeemAzal®,47 % Non ionic tensides,50% plant oil (Figure 1).

Tick counting

Attached ticks in the ear, around the neck and foot were located with gloved fingers and counted in situ [Figure 4,5 and 7].

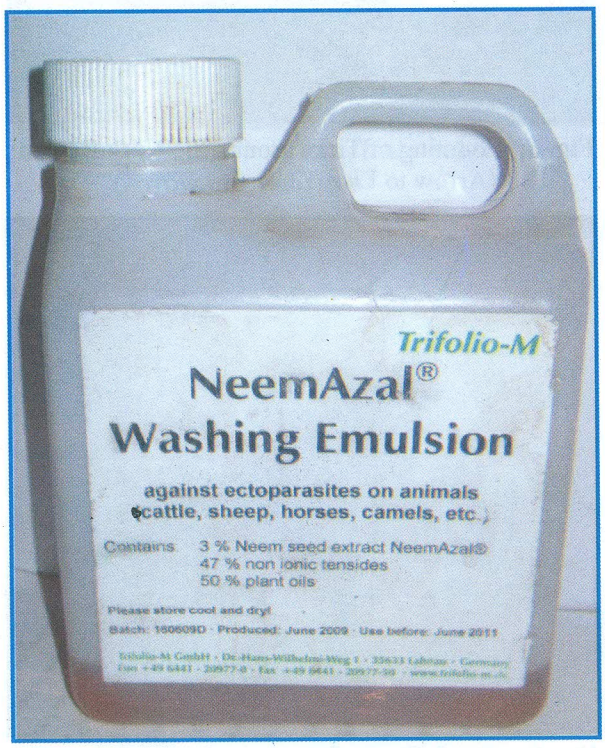

Fig. 1: Neemazal® Washing Emulsion by *Trifolio-M*

Topical treatment

The dog skin was first wetted with water. NeemAzal® washing emulsion was then applied using gloved hands. It was applied liberally topically all around the dogs body with extra emphasis on areas with attached ticks. Between 20 and 80mls of the emulsion was used depending on the dogs size and hair length, with higher quantities in large dog's and long haired dogs. Treatment was repeated after three days.

Data analysis

Data analysis was performed using Statistical Package for Social Science (SPSS) version 16.0. The statistical method employed was paired sample t-test. P value less than 0.05 was considered significant.

Results

There was tick reduction after 3 days of treatment. The number of attached on the predilection sites (ears, around the neck region and feet of the dogs were counted (table 1). The highest percentage of tick reduction after first treatment was 86.2% and second treatment was 96.6% (table 2, fig 2). The oil based nature of the product posed some some aesthetic problems. (fig 4). The product failed to attain 99.9% tick reduction within 3days of treatment.

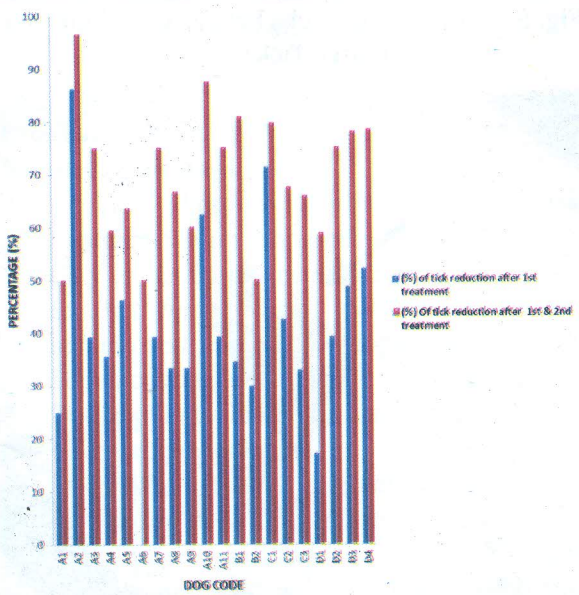

Fig. 2: Acaricidal Effect of Neemazal® Washing Emulsion after 1st and 2nd Treatment

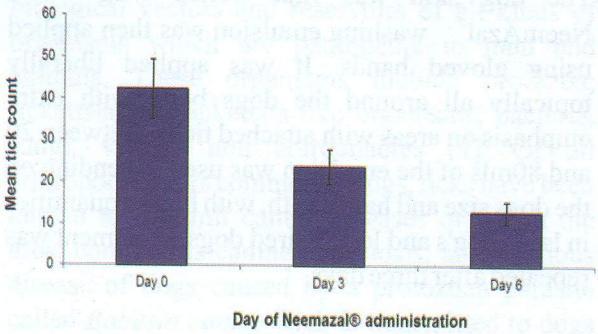

Fig. 3: Tick Count on Investigated Dogs for the Acaricidal Activity of Neemazal® Washing Solution

Fig. 4: Counting of Ticks in the ear (Arrow to live Ticks)

Fig. 5: Counting of Ticks between the digits (Arrow to live Tick)

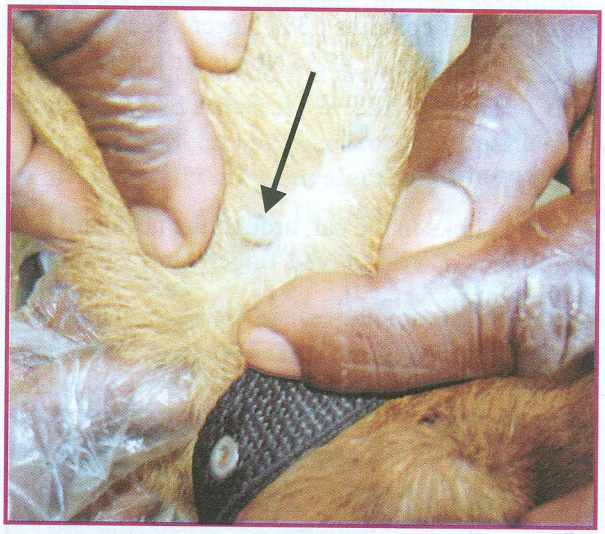

Fig. 6: Counting of Ticks around the Neck Region (Arrow to Live Tick)

Fig. 7: Pictoral Evaluation Dog Code(A4), Hair Length(Moderate), Infestation Intensity(Very High) and Percentage of tick reduction (46.3%)
Ear before treatment (Arrow to live Ticks)

Fig. 8: Ear 3-Days after treatment (Arrow to live Ticks)

Fig. 9: Interdigital Space Before Treatment (Arrow to Live Ticks)

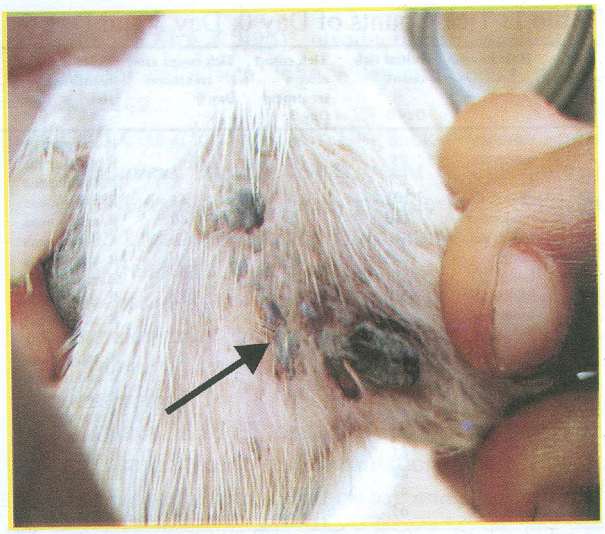

Fig. 10: Interdigital Space 3-Days after Treatment (Arrow to Live Ticks)

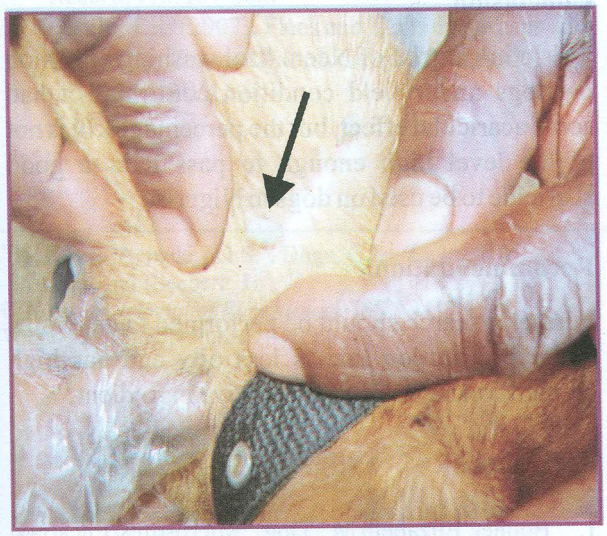

Fig.11: Neck region before treatment (Arrow to Live Ticks)

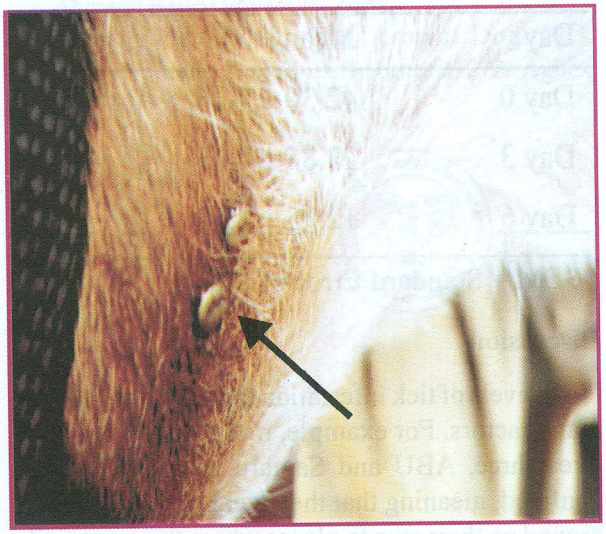

Fig. 12: Neck 3-days after treatment (Arrow to Live Ticks)

Fig. 13: Dogs skin very oily after treatment

Problems Associated with Field Testing of Neemazal® on Dogs

* Requires thorough application and repeat treatment within short interval.
* Oily emulsion on the skin makes it not ideal for hot temperatures with the dog being restless and uneasy after topical treatment in both moderate hair dogs and long hair dogs.
* Dog kept indoors may be messy because of the oil-based preparation.
* Dogs skin very oily three days after treatment (noticed in both long and moderate hair dogs ,but more in long haired dogs) and accumulates sand and dust making the skin very untidy , necessitating skin Grooming.

Table 1: Tick Counts of Day 0, Day 3 and Day 6

Dog Code	Hair Length	Initial tick count Day 0	Tick count after 1st treatment Day 3	Tick count after 2nd treatment Day 6	Most identified tick
A1	moderate	20	15	10	*R. sanguineus*
A2	moderate	29	4	1	R. sanquineus
A3	Long	28	17	7	R. sanquineus
A4	moderate	101	65	41	R. sanquineus
A5	moderate	110	59	40	R. sanquineus
A6	moderate	10	10	5	R. sanquineus
A7	Long	28	17	7	R. sanquineus
A8	Long	3	2	1	R. sanquineus
A9	Moderate	30	20	12	R. sanquineus
A10	Moderate	8	3	1	R. sanquineus
A11	Moderate	28	17	7	R. sanquineus
B1	moderate	26	17	5	R. sanquineus
B2	Moderate	20	14	10	R. sanquineus
C1	Moderate	98	28	20	R. sanquineus
C2	Moderate	40	23	13	R. sanquineus
C3	Moderate	82	55	28	R. sanquineus
D1	Long	51	42	21	R. sanquineus
D2	Long	28	17	7	R. sanquineus
D3	Long	41	21	9	R. sanquineus
D4	Long	65	31	14	R. sanquineus

Table 2: Average Tick Counts on Dogs on Day 0, Day 3 and Day 6

Day	Mean ± SEM
Day 0	42.30 ± 7.16
Day 3	23.85 ± 4.05
Day 6	12.95 ± 2.61

*SEM = Standard Error of Mean

Discussion

High levels of tick infestation could be attributed to many factors. For example, most of the dogs from Area three, ABU and Samaru areas were semi-confined, meaning that they were allowed to roam around on their own to places where they can easily pick up ticks. Also, Faculty of Veterinary Medicine ABU experimental dogs had high infestation which could be attributed to enormous infestation of the kennels with ticks. The most identified tick was *Rhipicephalus sanguineus*. This agreed with the work of [8] and [13] that in Africa, brown dog ticks prefer to feed on dogs in all stages of their development.

This clinical trial demonstrated acaricidal activity of NeemAzal washing emulsion, with tick reduction after three days of treatment giving the highest percentage of tick reduction of 86.2% and the lowest percentage of 0%. On second treatment, it had the highest percentage of tick reduction of 96.9% and lowest percentage of 50%.This agreed with the work done by [14] that established acaricidal property of NeemAzal after topical medication on dogs.

One of the qualities of a good acaricide is that it must have a good killing effect of almost 99.99% [15]. This was not achieved in the experiment because the highest percentage of tick reduction obtained after first treatment was 86.2% and a higher percentage of 96.6% was only achieved after a second treatment. This could have been attributed to low concentration of the active ingredient in NeemAzal or to re-infestation of ticks from the environment [16].

There was a significant difference in tick count between day 0 and day 3 ($P < 0.05$), day 0 and day 6 ($P < 0.05$) and also, day 3 and day 6 ($P < 0.05$) (see Figure 2). The highest tick count was recorded on day 0 followed by day 3, with the lowest count on day 6 (Table 2).

Conclusion

This clinical trial of NeemAzal washing emulsion on dogs under field condition confirmed it had some acaricidal effect, but the percentage kill is not of the level high enough to pass it as a good acaricide to be used on dogs in Nigeria.

Recommendation

Further research should be performed to develop a better preparation that is less oily and has high enough concentration of the active ingredient.

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