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# Efficacy of Two Raccoon Eviction Fluids

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## **ABSTRACT:**

According to surveys of wildlife control operators (WCO), problems with raccoons (*Procyon lotor*) consistently rank among the top complaints for property owners. Among the more serious behaviors of female raccoons is their propensity to invade human-occupied structures to raise young. Distressed property owners frequently respond using lethal means, either on their own or through hiring WCOs. Even if live-captured and legally released, the handling of raccoons may result in injuries and potentially cause females to abandon young. Eviction fluids, developed in the early 1990s, are designed to smell like a male raccoon and therefore cause a nursing raccoon to leave the den with her young. Wildlife control operators use eviction fluid primarily to evict a female and her young from an inaccessible location. Though the precise formulas are not disclosed by manufacturers, the fluids consist of the glands and urine of male raccoons coupled with a preservative. We evaluated the efficacy of 2 raccoon eviction fluids to evict female raccoons with young from chimneys. Though our sample size was small ( $n = 15$ ), we found that eviction fluids merit further investigation as a viable non-lethal repellent for raccoons in human-occupied structures.

**Key Words:** chimney, *Procyon lotor*, raccoons, raccoon eviction, repellent

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## **INTRODUCTION**

Raccoons (*Procyon lotor*) play a major role in human-wildlife conflicts. Anthropogenic sources of food in urban areas concentrate raccoons (Prange et al. 2004) and rates of survival and reproduction often are higher in urban than in rural areas (Prange et al. 2003). More than half of female raccoons in urban populations den in human-occupied structures (O'Donnell and DeNicola 2006). In surveys of wildlife control operators (WCO), customer calls about raccoons consistently ranked among the top complaints (Williams and McKegg 1987, Clark 1994, Pest Control Technology 2002, NPMA 2007).

Distressed property owners frequently respond to raccoons in structures through

trapping or direct removal. Offending raccoons often are killed as many states prohibit the translocation of raccoons because of concern of spreading diseases or simply moving animals that will continue to be problematic in a new area. Even if live-captured raccoons are released, the process of handling may injure the raccoons and cause abandonment of young. Trapping and direct removal can be expensive and result in property owners seeking alternative methods of control. Frightening devices, such as ultrasonic devices, have failed to meet advertised claims of effectiveness by manufacturers (Sprock et al. 1967, Howard and Marsh 1985). Chemical repellents, such as mothballs and am-

monia, rely on noxious fumes to evict raccoons and are reportedly effective (Adler Jr. 1992, Vantassel 1999). The full array of consequences regarding the health and safety of female raccoons and their young often is not considered or may be ignored. In addition, these chemicals pose potential risks to humans and nontarget animals and may lack required registration by the U.S. Environmental Protection Agency in some instances. For example, mothballs not only are flammable but have harmed pets that have inhaled vapors or consumed pellets (Aiso et al. 2005, DeClementi 2005). In addition, the use of mothballs or ammonia to evict chimney-denning raccoons may cause the young to endure noxious fumes for days, unless the female raccoon removes them to another den site.

Given that raccoons have expanded their range northward, especially through the North Central states into Canada, and have increased in density in urban and rural areas (Gehrt et al. 2002), the need for cost-effective conflict resolution is high. Biologically based repellents are those that utilize odors to evoke an instinctual response of avoidance. They should have high potential for effectiveness because they rely on instinct, while avoiding many negative attributes. Though the precise formulas are not disclosed by manufacturers, biologically based repellents for raccoons, often known as “raccoon eviction fluid,” consist of the glands and urine of male raccoons along with a preservative (Erickson 2013). To our knowledge, no study has tested the efficacy of these products for raccoons and yet, individuals in the wildlife control industry have used biologically based products for years to evict raccoons with young from structures.

Our objective was to compare the efficacy of 2 commercially available biologically based eviction fluids. Specific questions that our study was designed to answer included:

- 1) Do biologically based repellents effectively result in eviction of female raccoons from den sites in human-occupied structures?
- 2) If female raccoons moved from their original den site, did they simply move to a different part of the same structure?
- 3) If female raccoons moved from their den site, did the relocations become permanent,

or did the raccoons return to the original den sites within a short time period?

- 4) Did biologically based repellents result in abandonment of young by female raccoons?

## METHODS

We conducted our study in urban areas of the eastern U.S. during the 2009–2012 denning seasons for raccoons. We tested Raccoon Eviction Fluid (REF), On Target ADC, Cortland, Illinois, USA (On Target-REF); and Raccoon Eviction Fluid, Wildlife Control Supplies, East Granby, Connecticut, USA (WCS-REF) to repel female raccoons and their young from human-occupied structures, specifically chimneys. We used filtered water as a control to allow us to differentiate between the effectiveness of the bio-repellents and human disturbance. We relied on cooperating WCOs to apply products, collect data, and reduce costs of the study. Tasks required of the WCOs included verifying that chimneys were occupied by a female raccoon with young, randomly selecting 1 of the 3 treatments, applying the treatment to the cotton balls contained in a plastic holder, dropping the container down the flue, recording data and the characteristics of the structure before their departure, and returning in 2 to 3 days to reinspect the chimney to determine efficacy of the treatment. We considered a treatment successful if the raccoons had left the chimney and had not relocated elsewhere on same property within 2 to 3 days.

## RESULTS

The WCOs recorded 17 uses of individual treatments during the study. A lack of complete information from WCOs resulted in 15 uses for comparison (Table 1). Despite the small sample size, WCS-REF was 50% effective, On Target-REF was 0% effective and water was 25% effective at removing female raccoons and young out of chimneys. None of the female raccoons that were removed by any of the treatments moved to a different part of the same structure or abandoned their young in the original den (with 1 possible exception). None of the WCOs reported that the female raccoons that were removed had returned to the treatment sites during the study between 2009-2012.

**Table 1. Efficacy of commercially available raccoon eviction fluid to repel female raccoons and young from chimneys, and resulting consequences of treatments, spring 2009-2012.**

Product	<i>n</i>	Efficacy <sup>1</sup> (%)	Same structure <sup>2</sup>	Permanent <sup>3</sup>	Abandonment of young <sup>4</sup>
Raccoon Eviction Fluid-Wildlife Control Supplies	6	50	0/3	3/3	0/3
Raccoon Eviction Fluid-On Target ADC	5	0			
Water (control)	4	25	0/1	1/1	0/1

<sup>1</sup>Efficacy was defined as a percentage of replicates with no raccoons present following treatment.

<sup>2</sup>Number removed that ended up in the same structure as original den.

<sup>3</sup>Number removed that never returned to original structure.

<sup>4</sup>Number removed that abandoned young in original den.

## DISCUSSION

Despite the small sample size, several findings from our study may be of value. The WCS-REF exhibited an efficacy rate of 50%, which was 100% higher than the control. The success rate of this repellent was high enough to suggest that WCOs may want to consider it when a customer requests or requires non-lethal or less-lethal control (Vantassel 2012) or if lack of access makes traditional control methods inappropriate. These data seem to support anecdotal reports from WCOs that disturbance of the natal dens of female raccoons may be enough to cause a behavioral response from females to relocate young. We had no evidence that raccoons returned to the property even when chimney caps were not installed. We did not expect the seemingly high failure rate of the On Target-REF. Its efficacy for evicting female raccoons with young has been reported in Wildlife Control Technology (Ryan, 1995) and in personal communications with WCOs. Furthermore, one of the authors recalls using the product successfully. Aside from participant error or random chance, it is possible the low efficacy rate was affected by limited shelf life of the product during our study. While these products do not have expiration dates printed on their labels, it also is possible that the active ingredient loses efficacy over extended periods of time (in our case 3+ years) or through temperature extremes common in WCO service vehicles. Concern about shelf-life was raised with the manufacturer prior to its use. Although the samples were stored in a cool place, as the manufacturer suggested, we cannot account for the storage practices of treatments by WCOs prior to their use.

We were concerned that the use of raccoon eviction products would cause undesirable behaviors, such as abandonment of young or relocation to another part of the building or property. Though 1 participant noted that they removed 2 young, it was unclear from their documentation whether any young had been abandoned. The WCOs also reported no evidence of raccoons moving to other portions of the structure or property. In addition, no animals were found dead during this study.

Our study also revealed that a high level of cooperation is required by WCOs to ensure protocols are followed. We found that our small stipend (\$5.00/implemented treatment) did not encourage compliance or participation. Participant compliance with study protocols was exceedingly difficult and often ignored, perhaps due to a lack of understanding or explanation by researchers of the importance of study design. Several participants stated that they had not received any jobs that met the study requirements, some for multiple years. Others initially were eager to participate in this study, but later decided to not participate for undisclosed reasons. We believe that a significant part of this behavior stemmed from the study occurring between March and June, the busiest period for WCOs. Operators may have found it difficult to suspend their traditional service procedure for the purposes of the study, or they did not comprehend study design or protocols. We recommend that other researchers consider whether a study protocol is in accordance with traditional operator practices and having a research technician accompany WCOs to assist with protocols to ensure that high quality data are collected, even though the latter would increase project costs.

## MANAGEMENT IMPLICATIONS

Our findings have several important implications for the control of female raccoons with young in human-occupied structures. First, when property owners request that raccoons and their young be removed using non-lethal techniques, REFs may enable WCOs to affect the desired result, especially in states where translocation of raccoons is illegal. Where translocation of raccoons is legal, use of REFs could provide a less expensive option to WCOs and their clients and may improve animal welfare as the need for direct removal and probability of harm or abandonment of young may be decreased. Although use of biologically based repellents among professionals may be uncommon, the potential of these and other repellents to modify or discourage undesirable animal behaviors through passive methods may be high. We recommend further research in the area of biologically based repellents to assess their efficacy in other situations.

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