

Dermal Absorption Study.



Prior to the late 1990s, only two human studies had been conducted regarding the skin absorption rate of DEET (N, N-Diethyl-Meta-Toluamide):

The first was a series of studies conducted by the industry in Belgium in the mid-1980's. In all, eight human subjects were observed. It is from these studies that the generally accepted 4% to 8% absorption rate, which is often used by the medical community, was obtained. Due to the complexity of the study not all DEET applied could be accounted for, but based on a long history of animal studies conducted by manufacturers during the EPA approval process, it was concluded that none of the DEET remains in the human body after 72 hours.

The second study was conducted in California in 1995 where DEET was observed as part of a blend with R-11, a repellent similar to R-326, and MGK-264. In this study, four human subjects were observed. The conclusion of the study was that when combined with these two larger molecules, the absorption rate of DEET was reduced to a range of 3% to 6%: a reduction of 25%. This blend of repellents is used in Sawyer® Composite formula, **Sawyer® Broad Spectrum**

During the late 1990s, the EPA (Environmental Protection Agency) issued PR Notice 2001-3, Insect Repellents: Labeling Restrictions for Use on Infants and Children and Restrictions on Food Fragrances and Colors, because many manufacturers and distributors were making labeling and marketing claims that their insect repellents were "safer" for children than other insect products. The EPA will not allow any registrant to claim their product is "safer" than any other product. (See EPA Regulations under Insect Repellents).

A new study published in November, 1999, confirmed the hypothesis that DEET being enmeshed in the sub-micron encapsulated Sawyer® Controlled Release formula would reduce absorption.

This New Study Confirms
**Sawyer® Controlled Release
Insect Repellent**

Would Significantly Reduce Skin Absorption
When Compared to DEET Spray Formulas

FIGURE 1

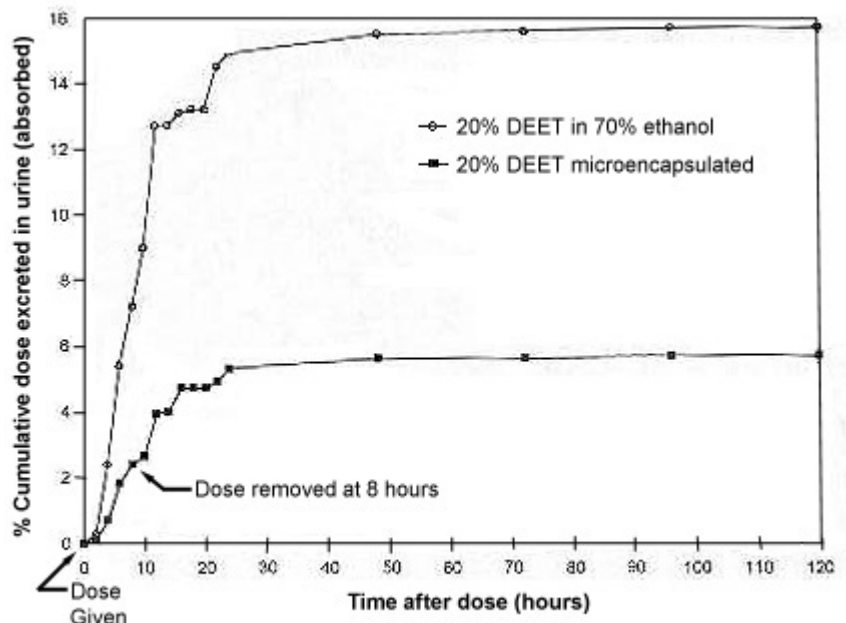


Figure 1 -- Dermal absorption of DEET in rhesus monkeys

Notes



by Frederick Coulston, Ph.D

**SUBJECT:
Dermal Absorption Study of Sawyer® Controlled Release
DEET Formula vs. 20% DEET Dissolved in Alcohol;
WSRC Study Number 980408**

While this research has determined that the alcohol preparation is three times more absorptive over an eight hour exposure period, reapplication (based upon mosquito efficacy) was not factored in. Depending on conditions, a 20% DEET alcohol preparation would require reapplication at least at four hour intervals. Therefore, for an eight hour exposure, the alcohol formula would normally be re-applied one+ times which would suggest increased DEET absorption.

Further, the above study does not take into consideration the alcohol absorption which is known to be of toxicologic concern, especially in children. Future investigations may take these features into account and we might expect magnitudes of order increases in absorption for the alcohol-based formulation versus the Controlled Release which would, predictably, remain as reported in this study over an eight (8) hour exposure.