INSECT REPELLENT DESIGN: RESEARCHING ALTERNATIVES TO DEET

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EXECUTIVE SUMMARY

This report summarizes the investigation of developing a new insect repellent that would be more effective, safer, and less expensive than the current market leader, a DEET-based repellent. However, after discovering that the relationship between repellent molecules' physical properties and their repelling abilities is poorly understood, another objective was pursued. The new aim was to develop a new product from an existing repellent. It was decided that the new repellent would contain Picaridin, a repellent that is new to the US market that has been shown to be just as effective as DEET, but less toxic and more pleasant for consumers to use.

To develop this new product, a utility function was created to measure the wants and needs of repellent consumers. Six important characteristics of a repellent were chosen: effectiveness, durability, feel, form, scent, and toxicity. Four ingredients were chosen to contribute to these characteristics: Picaridin, ethanol, aloe, and fragrance. A utility level for each of these characteristics was related to a physical property of the repellent formula using simple tests that a consumer could perform. These utilities were then combined in a weighted average, where each characteristic was weight-based to consumer preferences gathered in marketing surveys.

The resulting utility function was used in conjunction with a demand model derived from consumer choice theory that compares any proposed repellent formula's utility with a competing product's utility. Processing costs, shipping costs, raw material costs, and advertising costs were also included in the model for optimization.

When utility was maximized, the model suggested a product that was 98% Picaridin and 2% ethanol. The optimum situation when this product was placed in competition with the specialty repellent 'Deep Woods OFF! for Sportsmen' was shown to produce a net income of $310,000 producing 125,000 pounds per year to be sold at $80 per pound retail. However, this product showed a high likelihood of being unprofitable, so a different approach was investigated.

When the model was set up to find a product that could compete with a broader range of products, the most profitable formula was 43% Picaridin, 55% ethanol, and 1% each of aloe and fragrance. When 5 million pounds per year are sold at $28 per pound retail, the net income would be $2.55 million per year. This product had the potential of making a lot more money than the first product, but it showed even more risk of being unprofitable at this price. Further market research is needed to investigate whether consumers would be willing to buy this product at more than $28 per pound, which is uncertain at this time. If this product could be sold at a higher price, it would definitely be the more profitable option and should be pursued.