To the Graduate Council:

I am submitting herewith a dissertation written by Shally Lynne Carlson entitled "The Effectiveness of Fear Appeals as a Measure of Persuasion in the Acceptance of Pesticide Protective Garments." I have examined the final copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Home Economics.

Jacquelyn DeJonge, Major Professor

We have read this dissertation
and recommend its acceptance:

Mary Frances Drake

Roger W. Swaby

David J. Bonar

Charles E. Cox, Jr.

Accepted for the Council:

L. Evan Pond
Vice Chancellor
Graduate Studies and Research

THE EFFECTIVENESS OF FEAR APPEALS AS A MEASURE OF PERSUASION IN THE ACCEPTANCE OF PESTICIDE PROTECTIVE GARMENTS

A Dissertation

Presented for the

Doctor of Philosophy

Degree

The University of Tennessee, Knoxville

Shally Lynne Carlson

August 1982

3063154

Dedicated to

my husband, Carl

who has made all of this a reality.

ACKNOWLEDGMENTS

The author wishes to express appreciation to her major professor, Dr. Jacquelyn DeJonge, Professor and Department Head, Textiles, Merchandising and Design, for her continuous support and guidance throughout the research project. Special gratitude is also extended to Dr. Charles E. Cox, Assistant Professor, Textiles, Merchandising and Design for his assistance in the conceptual development and methodology. Dr. Mary Frances Drake, Associate Professor, Textiles, Merchandising and Design, for her guidance in instrument development. Appreciation and gratitude is likewise extended to the remainder of her committee, Dr. Roger M. Swagler, Associate Professor, Child and Family Studies, and Dr. David J. Barnaby, Professor of Marketing and Transportation for their support and assistance.

A special thanks is offered to Dr. William L. Sanders, Statistician, Agricultural Experiment Station, for his guidance in the statistical analysis of the data and Mr. Paul S. Wright, computer consultant, for his continued cooperation. Thanks is extended to Mr. Gary K. McCurry, Assistant Professor, Textiles, Merchandising and Design for his excellent graphic illustrations for the high fear appeal mailings, to Dr. Jane B. Dunlap, Assistant Professor, Advertising for her advice and suggestions in the development of the high fear appeal mailings, to Nancy J. Taylor, Pesticide Assessment Coordinator, for her assistance in obtaining research samples. Gratitude is also extended to Nancy J. Taylor, Dr. Elmer Ashurn, Dr. Gene Burgess, Dr. Charles Hadden and Dr. David Lackwood, Agricultural Extension for their time and efforts in evaluating the high fear mailings.

The author is also indebted to the Department of Textiles, Merchandising and Design and The University of Tennessee, Knoxville, for their academic and financial support and to the Southern Region, Pesticide Impact Assessment Program and the College of Home Economics for their grants to support this research project.

Lastly, a special thanks is offered to the author's friends, Maureen Grasso, Andrew Rosen, and Faye and Richard Reneager whose good humor and support kept this research project in perspective, and especially to my husband, Carl, whose patience, support and encouragement never waivered throughout the entire graduate program.

ABSTRACT

The purpose of this study was to test the effectiveness of fear appeals as a measure of persuasion in the acceptance of pesticide protective garments. It was hypothesized that a fear appeal would raise the level of anxiety within the pesticide applicators to such a level that they would accept the use of protective garments as an alternative to potential physical injury from pesticide poisoning. It was further hypothesized that a high fear appeal would be more effective than a low fear appeal.

A questionnaire was sent to pesticide applicators in Michigan and Tennessee to determine attitude and behavior regarding pesticide use. A fear appeal strategy with three levels of fear was then administered by mail to those responding to the first questionnaire. A second questionnaire was then sent to determine if there was a change in attitude toward or increased use of protective clothing.

A split-plot-in-time design was used to analyze the collected data. A least squares analysis of variance was performed to determine significant variable effects. The independent variables of time, state and appeal were examined for each of four dependent variables: Perception of Hazard, Benefits of Protective Clothing, Intentions for Future Use, and Reported Behavior. Results indicated that the appeal was significant in change for all dependent variables except Reported Behavior. However, there was no significant difference for the high versus the low fear appeal.

The degree of Prior Knowledge of pesticides was examined as a potential modifier of the effectiveness of the fear appeal. Prior Knowledge though high was related to only Perception of Hazard. Demographic characteristics were viewed as another possible source of modification as was the use of other media as sources of pesticide information during the testing period.

TABLE OF CONTENTS

CHAPTER		PAGE
I.	INTRODUCTION	1
	Rationale	1
	Conceptual Framework	3
	Objectives and Hypotheses	5
II.	REVIEW OF LITERATURE	7
	Relevant Legislation	7
	Functional Designed Protective Garment	10
	Acceptance of Innovation	11
	Communications Theory	15
	Attitude Measurement	32
	Implications for This Research	36
III.	METHODOLOGY	39
	Research Design Framework	39
	Instrument	42
	Sample	46
	Treatment	47
	Analysis	51
IV.	RESULTS AND DISCUSSION	53
	Results	53
	Discussion	75
	Summary	78
V.	SUMMARY OF RESULTS	80
	Summary, Results and Conclusions	80
	Limitations	82
	Contributions	84
	Recommendations for Future Research	85
REFERENCES		88
APPENDIXES		94
Appendix A		95
Appendix B		97
Appendix C		99
Appendix D		101
Appendix E		104
VITA		106

LIST OF TABLES

TABLE		PAGE
I.	Coefficient Alpha Level of Test Reliability	56
II.	Arithmetic Means as Descriptors of Variable Subgroups	58
III.	Least Squares Analysis of Variance for Perception of Hazard	61
IV.	Least Squares Means of Significant Main Effects by Dependent Variable	61
V.	Least Squares Means of Significant Interactions for Perception of Hazard	62
VI.	Least Squares Analysis of Variance for Benefits of Protective Clothing	63
VII.	Least Squares Analysis of Variance for Intentions for Future Use	64
VIII.	Least Squares Analysis of Variance for Reported Behavior	65
IX.	Estimated Mean Differences of Appeal Level by Time for Dependent Variables	66
X.	Demographic Characteristics of Type of Farming by State	70
XI.	Demographic Characteristics of Pesticide Use by State	71
XII.	Demographic Characteristics of Respondent by State	72
XIII.	Media Choices of Respondent by State	73
A-1.	Item Number by Questionnaire for Dependent Variable Category	96
C-1.	Response Rate to Questionnaire by Time and State	100

LIST OF FIGURES

FIGURE		PAGE
1.	Facilitating and Inhibiting Effects Leading to Nonmonotonic Curve	21
2.	The "Health Belief Model" as Predictor of Preventive Health Behavior	29
3.	A Model to Explain and Predict the Effectiveness of a Fear Appeal Strategy in Promoting Preventive Health Behavior	41
4.	Schedule of Mailings	48
B-1.	First Questionnaire	98
D-1.	Low Fear Appeal Flyers	102
D-2.	High Fear Appeal Flyers	103
E-1.	Second Questionnaire	105

CHAPTER I

INTRODUCTION

Fear of physical harm may provide sufficient motivation in some circumstances to effect a change in attitude and/or behavior. It is not clear exactly what circumstances and conditions make fear motivations most successful. Past theoretical research has not been conclusive, and in fact, has not always supported the hypothesis.

Developing a method to encourage agricultural workers acceptance of a pesticide protective garment provides an appropriate research setting in which to further investigate the persuasive effects of the fear appeal.

Rationale

Pesticide application is critically important to the modern agricultural producer. Agriculture has become dependent on pesticides to maintain efficient production to supply the world's food and fiber needs. Because many of these chemicals are toxic to man, there are inherent hazards in their use, especially as a health hazard to those workers who are administering them in the form of pesticide sprays.

Data has shown most accidents occurring during the mixing and loading operation (Maibach et al., 1971). However, exposure during application itself can be sufficient to be a health threat. Dermal absorption is the most detrimental to worker health although respiratory and oral/gastrointestinal absorption have accounted for additional

poisonings. Most of the chemicals used as agricultural pesticides produce toxins which interfere with the functioning of the nervous system. Other suspected long-term effects as a result of prolonged usage include carcinoma and sterility.

Federal legislation has attempted to reduce the risks associated with pesticide application (Federal Register, May 10, 1974) by suggesting the use of appropriate clothing. Nevertheless, agricultural workers applying pesticides have paid little heed to these recommendations and limited use is made of specialized clothing for the purpose of protection from contact with pesticides. Their criticism rests upon the fact that the few specialty garments currently available are designed to meet all the particular needs, including comfort and convenience. A joint effort by Michigan State University and The University of Tennessee, Knoxville, has examined the problem and has produced a functionally designed pesticide protective garment prototype. Efforts now must be made to determine and if possible improve the acceptance and use of these garments.

Henry (1980) found that pesticide applicators, being immediately concerned with convenience and comfort, often disregard possible harmful effects on their future health by not using protective garments. Calebresi (1970) has shown that most individuals tend to depreciate future risk. That is, the likelihood of a future event occurring is discounted by the probability of actual occurrence and the feeling that it will happen to others rather than oneself.

It seems important to communicate to agricultural workers the need for protection from exposure during application, and the availability of

an acceptable alternative in the form of the functionally designed protective garment. This research will evaluate the effectiveness of a fear appeal strategy in informing agricultural workers about pesticide dangers, thereby persuading them to use protective clothing.

Conceptual Framework

The model used to help explain and predict the effectiveness of a fear appeal strategy is derived from a value-expectation framework of behavioral motivation. It predicts that the probability of an individual engaging in preventive health care activities is a function of three factors (1) benefits-barriers, an analysis of the advantages and disadvantages of the suggested preventive health care activity, (2) perceived threat, what circumstances accompany the anticipated health threat, and (3) cues to action, including mass media and personal interactions. Two antecedents define perceived threat; perceptions of susceptibility and the expected severity of the hazard by the individual. These form the basis of the perception of threat (Rosenstock, 1966).

The current research suggests through the use of this model that the agricultural worker will not attempt to use protective garments for protection from pesticides unless he possesses a minimum level of knowledge and motivation. He must perceive himself as potentially vulnerable and in a state of threat from pesticide exposure. The agricultural worker must be convinced of the acceptability of the protective garment to provide protection and see few disadvantages in the use of such garments. The fear appeal strategy attempts to cue the agricultural worker to action in the form of garment use.

The use of a fear appeal strategy in the persuasion of agricultural workers to use protective garments during pesticide application is a form of emotional appeal. If effective, it increases the individual's awareness of a potential threat. It will raise his level of anxiety to the point at which the alternative action will be taken in an attempt to reduce the anxiety produced (Niles, 1964). A change in preventive health behavior will result from this strategy increasing the agricultural worker's perception of susceptibility to potential pesticide hazard and the seriousness of such an injury.

This study will examine demographics and prior knowledge of pesticide danger as possible modifying factors. As an example of the effect of demographic factors, past research suggests that fear appeals are more persuasive among the lower socioeconomic audiences (Haefner, 1965). Prior knowledge of the subject of a fear appeal also tends to reduce its effectiveness (Hovland et al., 1953; Lewan and Stotland, 1961).

The likelihood of the agricultural worker taking the recommended preventive health action will be measured by examining four parameters (1) Perceptions of Pesticide Hazard, (2) Perceived Benefits of Protective Clothing, (3) Reported Behavior, and (4) Intentions for Future Use. The Perceptions of Pesticide Hazard and Perceived Benefits of Protective Clothing will be measures of attitude change after the cue to action is supplied by the fear appeal strategy. Behavior and Intentions for Future Use of protective clothing will be measured by reported changes in activity.

Objectives and Hypotheses

The following research objectives are identified:

1. To evaluate an alternative strategy for the dissemination of pesticide garment information that will encourage product adoption.
2. To contribute to the body of knowledge on the use of fear appeal communication strategies.
3. To better understand the behavior underlying applicator adoption and use of protective clothing.

The following hypotheses will be tested in support of the stated research objectives:

1. Attitudes regarding pesticide protection during application will change with the introduction of pesticide protection information and alternatives.
   A. Those workers exposed to a high fear appeal strategy will experience greater attitude change than those exposed to a low fear appeal strategy.
   B. Those workers exposed to a high fear appeal strategy will experience greater change in attitudes concerning future use than those exposed to a low fear appeal strategy.
2. Actual behavior will change with the introduction of pesticide protection information and alternatives.
   A. Those workers exposed to the high fear appeal strategy will experience greater behavior change than those exposed to the low fear appeal strategy.

B. There will be a high positive relationship between intentions to use and actual behavioral change.

CHAPTER II

REVIEW OF LITERATURE

A review of the literature has focused on several general areas: relevant federal government legislation, functionally designed protective garments, acceptance of innovation, communication theory (with emphasis on fear appeal effectiveness on persuasion), and attitude measurement. Each of these areas has contributed to the development of the present research strategy.

Relevant Legislation

Concern over pesticides began as early as 1900. As society became more aware of the inherent potential dangers of agricultural chemicals, and with the development of a whole new class of synthetic pesticides after World War II, government agencies began to place controls on pesticide distribution, sale and use. Legislation even attempted to influence the wearing of a protective garment during application procedure, with little if any effect.

Major legislation was enacted in 1972 in the form of the Federal Environment Pesticide Control Act (Federal Working Group on Pesticide Management, 1972). This included an attempt to increase the competency of those handling toxic chemicals through training and certification. Individual states are given the responsibility of certifying applicators who they have trained in safe procedures for handling chemicals. It is actually close to a licensing restriction, because only those certified

are allowed to apply pesticides that are classified as restricted (Freidman, 1962). However, in actuality these controls are only relevant to the purchase of the chemicals, which can be fairly easily enforced. Once purchased, anybody can apply them. Enforcement at this stage is difficult, if not impossible.

In 1973, an amendment was proposed which specified field reentry times and protective clothing requirements.

> HIGHLY TOXIC pesticides--for reentry within 24 hours after application, wear protective clothing to include a garment or garments of impermeable material to cover the entire body, hat, natural rubber gloves, impermeable shoe coverings, and goggles or face shields, wear also a respirator of the type approved by the U.S. Department of the Interior (Bureau of Mines).
>
> For later entry to perform work involving prolonged and substantial contact with foliage but before the end of the reentry period, wear of coverall type of garment of close-woven washable fabric, hat, shoes, and possibly gloves. To perform work involving little or no contact with foliage, no special protective equipment is considered necessary after 24 hours.
>
> LOW, SLIGHTLY AND MODERATELY TOXIC pesticides--for reentry within 24 hours after application, wear protective clothing to include a coverall type of garment of closely-woven fabric, normal footwear to cover the entire foot, and an approved respirator where inhalation or ingestion is a hazard.
>
> For later reentry involving prolonged and substantial contact with the foliage, the coverall type of garment and footwear described above should be worn. To perform work involving little or no contact with foliage, no special protective equipment is considered necessary.
>
> (Federal Register, July 31, 1973)

Criticism was nationwide. The major concern was the impracticality of the protective garment under normal working conditions. Impermeable garments are too uncomfortable. Gloves are felt to actually collect pesticide residue, thereby increasing the rate of dermal absorption.

Hats are felt by some to decrease visibility and are difficult to keep on one's head.

The final protective standard adopted on May 10, 1974, yielded to the pressures of opposition and defined protective clothing as "at least a hat or other suitable head covering, a long-sleeved shirt and long-legged trousers or a coverall type garment (all of closely woven fabric covering the body, including arms and legs), shoes and socks" (Federal Register, May 10, 1974).

Chemical manufacturers have certain obligations under this legislation, as well as a strong interest in the proper use and safety of their pesticides. In accordance with the Federal Environment Pesticide Control Act of 1972 extensive information is required on product labels (Federal Register, October 2, 1972). The regulating agencies having authority over product labeling can cite violators with civil and/or criminal penalties upon altering or knowingly violating label directions for certain restricted use pesticides. Besides providing the required product information manufacturers have added more information in an attempt to encourage caution in their use (but not to discourage the use).

In summary, the government's awareness of the pesticide hazard has led to legislation which attempts to protect the health and well-being of agricultural workers. Users of pesticides appear to have been unreceptive, at least in this regard, and have chosen to ignore protective garment suggestions (Henry, 1980). Research is needed to help determine ways to improve compliance.

Functional Designed Protective Garment

A protective garment for pesticide application must function in terms of the applicator's perception of need for such a garment. A functionally designed garment will meet these needs. Jones (1970) and other design process theorists have stated that designing to meet specific needs should be a primary objective of the entire design process.

In applying this process to the design of a functional garment for protection against pesticide exposure, critical areas were first identified which would impact the final design. Data was collected on pesticide penetration and deposition on fabrics (Orlando et al., 1981). A thermal analysis (Branson, 1982) combined data on the individual's subjective and physical comfort. This information plus data from a movement analysis (Orlando et al., 1980) comprised the physical component. A greater acceptance of the final prototype was encouraged through the inclusion of a sociological/psychological component. This consisted of surveys comparing garment and fabric preferences, pattern of use and attitude regarding pesticide protection (Henry, 1980). These variables were related to specific demographics such as farm size, education and age.

Component data contributed to a list of specifications which provided the basis for garment design and fabric selection of the final prototype. This final prototype has been distributed to selected pesticide applicators to use during actual spraying conditions. Results of this field test are currently being analyzed.

Work is also underway to determine recommendations for the launderability of garments exposed to pesticides. The appropriateness of home launderying techniques must be determined before a protective garment can be made commercially available.

In summary, a functionally designed protective garment has been well developed in an holistic fashion based on defined specifications but if applicators are not willing to use the garment, the design effort has not been worthwhile. A functionally designed product has its final test of success in its acceptance and adoption. An effective strategy for dissemination of product information must encourage this end result.

Acceptance of Innovation

The developed pesticide garment can be considered a product innovation. It is viewed by agricultural workers as a new product. It can be classified as a continuous innovation as it has little disrupting influence on established patterns. It is a modification of an existing product rather than the establishment of a totally new product (Robertson, 1967).

The study of rates of adoption for product innovations is a concern of manufacturers and marketers. Rates can vary widely from product to product, time to time, and group to group. Rogers and Shoemaker (1971) studied the perceived characteristics of innovations which contribute to the variation in acceptance. They suggest that how the potential user sees the new product in light of his own needs is of utmost importance. They classified innovations by five perceived attributes:

1. Relative advantage is the degree to which an innovation is perceived as better than the ideas it supercedes and is positively related to its rate of adoption.

2. Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of the receiver and is positively related to its rate of adoption.

3. Complexity is the degree to which an innovation is perceived as relatively difficult to understand and use and is negatively related to its rate of adoption.

4. Trialability is the degree to which an innovation may be experimented with on a limited basis and is positively related to its rate of adoption.

5. Observability is the degree to which the results of an innovation are visible to others and is positively related to its rate of adoption.

Past studies have examined characteristics of relative advantage which have affected the rate of adoption of innovative products among agricultural workers. Fliegel and Kivlin (1962) found that agricultural workers were most concerned with the saving of work time when considering new products. They were more likely to adopt time saving devices quickly. Practices which were designed to save on discomfort also tended to be adopted rapidly. Both of these product attributes are important characteristics of the developed protective garment.

Ryan and Gross (1943) found that when hybrid corn was first introduced in Iowa in 1928, there was an immediate 20 percent increase in yield. As the advantage of this corn became apparent, agricultural

workers increased use quickly. Full adoption of hybrid corn was achieved in less than fifteen years.

Relative advantage as leading to economic profitability was found to be a greater predictor of rate of adoption by large United States farmers than by small (Kivlin and Fliegel, 1967). Likewise, a crisis may emphasize the relative advantage of an innovation and speed its adoption (Wilkening, 1952).

Brander and Strauss (1959) suggested that the compatibility of the new product with existing products and techniques was of major significance to agricultural workers in southwestern Kansas. When hybrid sorghum was introduced, the sorghum growers of southwestern Kansas did not accept the new product as quickly as did the corn growers in the northeastern part of the state. The corn growers were already using hybrid corn and could easily identify with the new hybrid form of sorghum. The hybrid sorghum was not compatible with the preexisting agricultural ideas and practices of the sorghum growers. They had to be convinced of the advantage of the new hybrid concept before they were willing to accept the risks of trying the new form.

However, Apodaca (1952) found that when hybrid corn was introduced in New Mexico, over half the farmers planted the seed the following year with spectacular results. After two successful years with the hybrid, use declined. The relative advantage seemed apparent, but failure rested on technical shortcomings. The hybrid corn had a strange flavor and did not hold together when made into tortillas, a flat corn bread indispensable to the local diet. The new hybrid corn was incompatible with existing taste preferences and adoption failed.

How difficult a new product is to understand is also related to its rate of acceptance. Kivlin (1960) and Fliegel (1968) in separate studies of the acceptance of innovations by agricultural workers found that the complexity of a new product was highly correlated in a negative direction with the rate of acceptance. Erasmus (1952) concluded that innovations requiring specialized knowledge are especially difficult to diffuse to groups with low levels of literacy. He found that refinements in agricultural practices such as seed selection, crop rotation and soil conservation, met with little or no acceptance by Haitian farmers.

Some innovations are difficult to try before the decision to adopt must be made. Those that can be experimented with are generally adopted more quickly. Ryan and Gross (1943) found that having an opportunity to try a new product encouraged acceptance. Few agricultural workers planted their entire acreage in hybrid corn the first year. They minimized their potential risks by planting small acreage until they were convinced of the product's merits.

The observability of an innovation is also important to its rate of adoption. Results of some innovations are easily observed by and/or described to others. Ryan and Gross (1943) discovered that agricultural workers were most influenced by neighbors and friends as sources of information regarding new products. Similarly, Costa Rican farmers most frequently adopted a new and improved variety of sugar cane by simply observing the success of their neighbors using the new products (Alers-Montelvo, 1957).

One study has attempted to prioritize all of these attributes of innovation-decision making process. Rogers and Shoemaker (1971) have

concluded that an innovation's complexity and compatibility are the most important perceived attributes during the knowledge formation stage of decision making. During the persuasion stage, the innovation's relative advantage and observability become paramount. And finally, at the decision making stage of adoption or rejection, trialability becomes the major focus.

In summary, the rate of acceptance of an innovation may be attributed to the individual's perception of five attributes of that innovation: relative advantage, compatibility, complexity, trialability, and observability. An effective strategy for the dissemination of information regarding any innovation must consider these attributes.

Communications Theory

Communication forms the foundation of the innovation-decision process. Rogers and Shoemaker (1971) consider communications the transfer of an idea from a source to a receiver with the intention of modifying the behavior of the receiver. One type of persuasive communication is commonly known as advertising--one form of human communication. Wilbur Schramm (1961), a leader in communication theory, suggests that communication's goal is to develop an avenue of common exchange for ideas, information and attitudes. Advertising must target these goals in an environment filled with a wide array of complex cues, stimuli and contexts. These then become the basic concerns when developing copy and media strategies that will achieve the desired communication. The use of fear as an emotion producing technique can be

useful in some situations to aid in the degree of persuasiveness (Aaker, 1975).

Advertising can be explained in view of basic communication theory. A product firm or advertising agency acts as a source of the communiqué. Through the use of specific copy techniques, such as carefully chosen words or pictures, significant symbols are used for message encoding. This signal is then decoded by the receiving individual. He interprets the signal in terms of his own physical and mental system. A response or reaction is then made to the initiated message (Aaker, 1975).

The major hurdles to the advertising communication process take place in the decoding stage. These stem mainly from the psychological component of the receiver, since during any portion of the decoding process, the receiver can selectively focus attention and awareness in ways that are difficult to predict. William McGuire (1969) added a social psychological dimension to communication theory in an attempt to reconcile some of the operative receiver variables.

His approach views the receiver as a processor of information who passes information through a response hierarchy, each step of which is essential in the process of persuasion, as follows:

Presentation → Attention → Comprehension → Yielding →
→ Retention → Behavior

This reaction process can be stopped at any point, and each component has a probability factor of occurring or not occurring. The final probability of a desired outcome behavior is therefore a multiple function of all probabilities. It can be appreciated that the probability of expected behavior is indeed small. Advertising can,

however, focus on any aspect of the information process which is thought to be most likely to increase the probability of the desired outcome.

In attempting to maximize advertising effectiveness, McGuire (1969) has suggested a matrix of persuasion wherein the communication components (source, message, channel, receiver and destination) are blocked with the components of the information process described above. The information processing components, viewed as dependent variables, can be scored as to their contribution to the achievement of each step of the communication process of the independent variables. This would offer a scanning device for an advertising campaign's persuasiveness in a given situation (Aaker, 1975).

These models attempt to explain the process of communication involved in advertising. They do not try to account for receiver individual differences in perceptions and attitudes that facilitate or retard the process at each step. Other consumer behavior models (Engel et al., 1973) have considered the individual as being able to selectively filter information based on perceptions, attitudes and personality. Decisions as to strategy must consider receiver differences, and should reflect an effort to display the message in such a way as to accomplish the objectives defined for the target group or individual.

A common consideration in strategy development is whether the message should contain some type of emotional appeal. An advertiser will frequently attempt to change attitude or even behavior by the use of positive or negative appeals. Positive appeals stress the benefits and positive gains from compliance with a persuasive message. Negative

appeals focus on the losses possible with failure to comply. The underlying motivational force toward persuasiveness is dependent upon the degree of anxiety produced in the receiver by the appeal.

This anxiety level and its relationship to effective persuasion is complicated. Anxiety can act as a stimulus that evokes a negative response in the receiver in the sense that it leads away from assimilating the message content, exhibiting characteristics of hostility and withdrawal. Anxiety can also act as a driving force toward compliance and actually intensify the response. The current belief is that the level of anxiety and persuasive effectiveness of a given message is nonmonotonic in nature. Insufficient anxiety will reduce the response drive, whereas excessive anxiety tends to accentuate the negative stimulus response and can actually reduce persuasive effectiveness (Aaker, 1975).

Fear Appeal Effectiveness on Persuasion

Marketing advertisements have made limited use of fear appeals. There has been less emphasis on this strategy particularly in recent years. One reason is that advertising with negative appeals has received criticism of an ethical nature. It is not considered in "good taste" to use a fear appeal when there is but a tenuous relationship between the fears aroused and the solutions offered to remedy them.

Another reason that advertisers have been hesitant to use fear appeals is that studies of its effectiveness have shown conflicting results. The marketing practitioner has had little guidance upon which to base an effective strategy. Some findings support high fear as most

persuasive, whereas others report low fear levels as most effective. Recent concern has been with the identification of external variables which act as moderators on the original premise of "the more fear, the more persuasion." It is now recognized that there is a nonmonotonic relationship that exists between fear levels and the effectiveness of persuasion (Ray and Wilkie, 1970).

The first significant contribution to the research on fear appeal effectiveness was conducted by Janis and Feshbach in 1953. Their findings indicated that a strong fear appeal was less effective than moderate or mild fear appeals in producing reported adherence to recommended dental hygiene practices. This did a great deal to question the validity of the traditionally accepted fear drive model, which was the current belief at that time. It stated that there was a linear relationship between level of fear and degree of deterrence. Behavioral scientists had long exemplified the relationship by citing punishment as a deterrent to criminal acts. In fact, the earliest forms of such punishment were often public events.

Subsequent studies have been cited as having supported Janis and Feshbach results (Leventhal and Niles, 1965; Goldstein, 1959; Haefner, 1956); Janis and Feshbach, 1954; Janis and Terwilliger, 1962). Research continued during this time period and some resulted in conflicting relationships between fear and persuasion (Frandsen, 1963; Millman, 1968; Moore, 1965; Payne, 1963).

The more recent studies did indicate a positive relationship between fear level and degree of persuasion. These covered a wide range

of physical fear topics, such as dental hygiene (Haefner, 1965), smoking (Insko, Arkoff, and Insko, 1965), tetanus inoculations (Dabbs and Leventhal, 1966), safe-driving practices (Leventhal and Niles, 1965) and roundworms (Chu, 1966).

The research of the past decade has primarily focused on an attempt to reconcile the differences in past research. One method has been to examine some of the variables that have been identified as having an effect on the persuasiveness of fear appeals. Two results seem significant. First, few of the studied variables have been found to interact with fear level consistently enough to account for past variations in findings. And second, several of the findings are in contradiction to the traditional fear-drive model which considers fear as a force which motivates the receivers to reduce the fear (Higbee, 1969).

The general consensus seems to currently agree that a moderate level of fear is effective. Too weak an appeal goes unnoticed while too much seems to lead people to reject or ignore the entire message. An attempt has been made by several researchers to explain this nonmonotonic relationship. A model developed by Ray and Wilkie summarizes this relationship (Figure 1).

An explanation is offered in a model presented by McGuire (1968). He asserts that fear has two components. One component is the drive aspect which increases the probability of message acceptance or yielding. The other is a cue function which motivates avoidance tendencies which interferes with message reception and reduces the

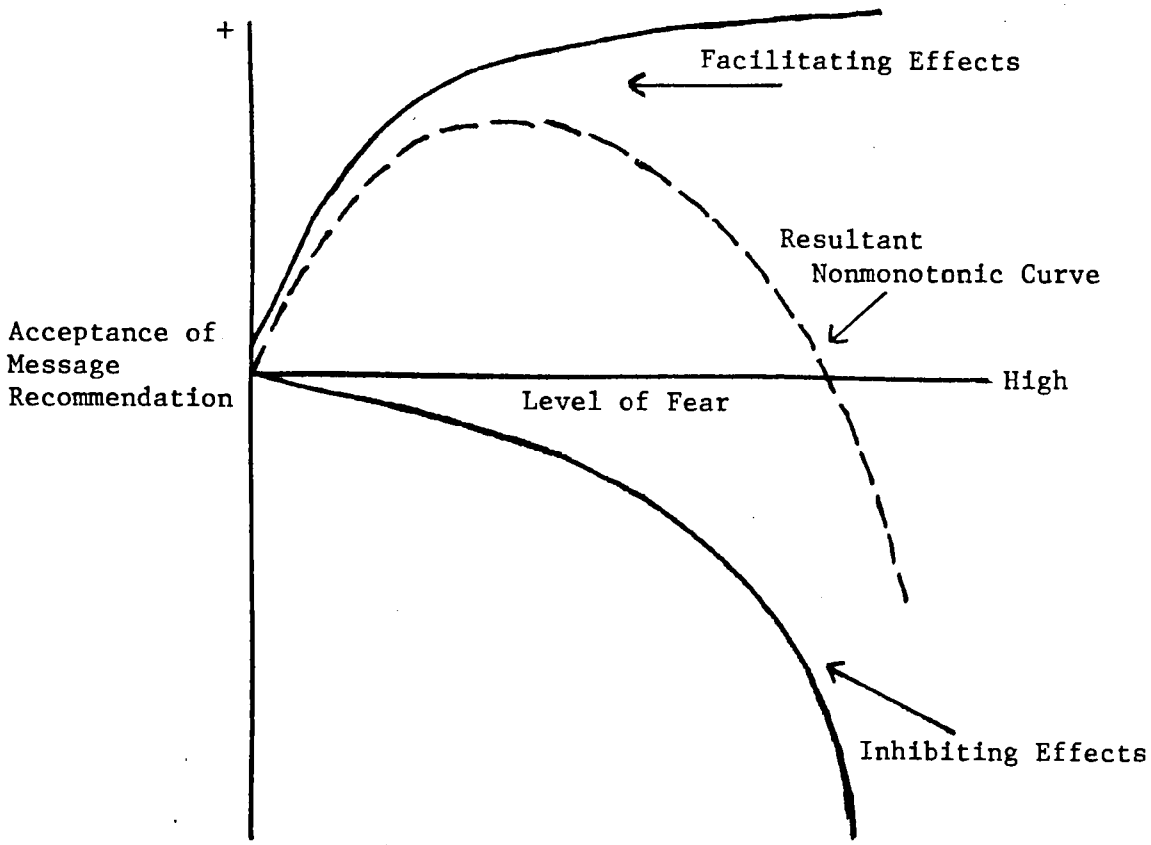


Figure 1. Facilitating and inhibiting effects leading to nonmonotonic curve (Ray and Wilkie, 1970).

likelihood of persuasion. The probability of a reduction in message reception is increasing at a greater degree than the probability of an increase in message acceptance and a nonmonotonic relationship results.

A somewhat different explanation of the nonmonotonic relationship is offered by Leventhal (1970). He proposes that the response to a fear producing message involves two parallel but independent processes. One is a danger control which guides an individual into appropriate problem solving decisions until fear reducing action is taken. The second

process is described as the fear control, deals with the emotional aspects. When confronted with high fear producing stimuli, this control tends to result in behavior in no way related to fear reduction. Though these processes are independent, they affect each other during a decision-making process and one may disrupt the operation of the other. Thus a resulting relationship between fear level and effective persuasion may be monotonic or nonmonotonic depending on the response at any given time.

One explanation for the discrepancy in results of past research is suggested by Ray and Wilkie (1970). Past studies may not have been measuring the same level of fear. What might be considered high fear level in a dental study may not be the same level for a topic of smoking. A major difficulty with fear research is a lack of common vocabulary and conceptual framework across disciplines.

Recent concern has been with this identification of moderating variables on the effectiveness of a fear appeal. Identification of these variables has lent support to the concept that the application of a market segmentation approach would be effective for the use of fear appeals at its various levels. In such an approach, variables critical to the effectiveness of persuasion at the various fear levels being considered would define the target market. If the specific target market as defined by a product matched the critical variable description, then that particular fear level would represent a reasonable advertising strategy. The most salient variables can be represented by the following categories: (1) personality, (2) usage, and (3) socioeconomic.

Personality was probably the first to be examined. Anxiety level, itself, proved not to be closely correlated to persuasion at the various fear levels. Perceived vulnerability can be viewed as a measure of anxiety as Niles (1964) examined smoking and lung cancer. It was found that fear had a positive effect with those who perceived themselves not very vulnerable, but had negative effects on those who perceived themselves as highly vulnerable. Stuteville (1970) cited a vivid example from 1962 when a good number of people bought expensive fallout shelters during the time when this country was in a period of missle confrontation with the Soviet Union. Very few have been purchased since then. He goes on to explain the psychodynamics of dealing with extreme fear may be dependent on whether there is an easy substitution for the product or activity receiving the fear focus.

Other personality characteristics have been examined. Goldstein (1959) reported that copers (those who make an effort to deal with danger) reacted more favorably to high fear appeals than did avoiders (those who deny danger's existence). Avoiders were more responsive under low fear conditions.

Self-esteem has been the focus of much discussion. Leventhal's (1970) results are most typical indicating that the higher a person's self-esteem, the higher is his optimal level of fear.

Usage as a category referring to the relevancy of the topic appears as the second most studied area. Most studies concluded that the greater the relevance of the message to the receiver, the lower the optimal level of fear. For example, Insko et al. (1965) found a

positive relation between antismoking messages and fear level when the receivers were nonsmokers. No such results were concluded for the smoking respondents, in fact the results were negative.

The common socioeconomic segmenting descriptions employed by marketers has received little study. Haefner (1965) reported findings similar to other studies indicating that fear appeals are more effective with lower than with higher socioeconomic classes. [The issue of source credibility may have clouded these findings. It has been shown repeatedly that high source reliability increased the effectiveness of fear appeals (Insko et al., 1965; Steruthal and Craig, 1974).] Generally, the marketing segmentation characteristics that best discriminate appear to have been those most related to the product or topic.

A recent study was conducted by Burnett and Oliver (1979) with the explicit purpose of examining moderator variables. This concept attempted to identify a class of factors which change the relationship between fear level and effectiveness. Variables were grouped by demographic, socioeconomic and attitudinal characteristics. An actual field study was conducted to determine the effectiveness of a health maintenance program. This subject area appeared to be a good candidate for a fear appeal promotional strategy. First, it dealt with physical well-being as has been typical in past research, and secondly, the health organization was faced with a pragmatic problem as to how to sell memberships to a segment of consumers who were apprehensive toward the health program.

Segmentation analysis was used on the moderator variable findings. Cluster analysis was applied to each variable group and univariate analysis was applied to each of the identified clusters to find those most receptive to fear. Results showed that what had originally been interpreted as a generally effective response to fear appeal could be accounted for by a small portion of the total sample. The original results were therefore misleading. The real effectiveness of a fear appeal approach would rest upon the degree that the responsive subject cluster represented the real market segment for the product.

Burnett and Oliver's conclusions support the value of a segmentation strategy. It appears to be a definite prerequisite in the use of fear appeals. It should be noted however, that the typical segmentation of fear research is not perfectly isomorphic with the typical concept of market segmentation. Market segmentation variables generally divide the market into homogeneous segments which are responsible to measurable promotional efforts. Fear moderation variables as a basis for segmentation divide a sample into segments with different response functions. They do not guarantee homogeneity across any of the relevant marketing dimensions. The moderator variables are useful in so much as they are meaningful and employable in the specific market place. Moderator variables should be chosen that have theoretical and empirical justification as well as segmentation utility.

Other Social Implications

Most past research on fear has dealt only with the physical consequences of noncompliance. The effectiveness of threatening social

consequences from failure to conform may have additional implications. In many advertising topics, the effect of physical injury is not realistic. Therefore, the effect of social disapproval is more relevant and warrants investigation.

The theoretical idea of an individual's social normative beliefs (Fishbein, 1967) has gained wide support. An individual's intentions and ultimate behavior can, in part, be explained by his perception of what behavior is expected of him by a specific salient social group, such as family or friends. On the basis of this concept, it would appear that strategies directed at altering these beliefs would result in attitude and behavior changes. The question might then become whether desire for social approval or fear of social disapproval would be most effective in producing changes.

Powell and Miller (1967) manipulated social approval and disapproval. They substantiated that social disapproval was more effective than social approval, but that social approval was more persuasive than no implied consequences.

Another study (Evans et al., 1970) suggests that social approval may be more effective as a basis for persuasion than physical threat since social consequences induced more compliant behavior than physical threat. These findings point out a need to measure actual behavioral change in future research rather than behavior intentions from measured attitude change.

Conclusions can be drawn for advertising. If the major emphasis of a strategy is awareness particularly in a new product area, fear appeal

may indeed be appropriate. It might be hypothesized, however, that threats of social consequences may actually produce more behavioral change resulting in product purchase.

There have been those who have questioned advertisers' use of fear on a social basis. As advertising has relied more heavily on fear appeals in the sale of personal products especially, some criticism has grown. The audience effect has come into question. The position and negative results of anxiety arousal on individuals has been discussed. Little concern has been given as to the long-term consequences of the deliberate arousal of anxiety. Ray and Wilkie (1970) have questioned the effectiveness of high fear appeals on the already anxious portion of the audience. Furthermore, one can only speculate on the effectiveness of such appeals after long-term exposure. Individuals may become insensitive to the fear producing stimuli.

The major ethical question seems to be the use of fear appeals when the proposed solution has an indeterminant effect on the actual cause of the feared situation (Spence and Moinpous, 1972). The consumer has very little recourse, either legally or otherwise, against unfulfilled promises. Positive appeals enhancing such nebulus things as status and beauty share much the same credibility problems. One could argue that if the consumer is not satisfied, he will simply not purchase the product again. While this appears to be true, they do not abandon the hopes of avoidance of consequences through the recommended measures. The consumer, instead, simply chooses among alternative brands within the product category looking for the promised results.

Stuteville (1970) offers the final suggestions for the use of fear appeals effectively in advertising: (1) the feared situation can be avoided by the use of the sponsored product, (2) there is no psychological investment in not using the product, and (3) what is feared is damage to the self's social image rather than physical harm. He further suggests that a concern for the consumer welfare should include an obligation to critically evaluate all marketing strategies that can produce psychological effects of an indeterminant nature.

Previous research has indicated that fear appeal has an important potential to contribute to advertising. With the identification and understanding of the variables which moderate fear effects on a target group, fear appeal could be an effective tool in persuasion. There appears to be some risk in approaching excessive fear levels, which may cause a negative response.

Preventive Health Behavior

Researchers, with developing expertise on ways to successfully communicate a fear message, have focused on methods of anticipating this resultant behavior of the individual. Those in the medical sciences and related product areas wish to be able to forecast health behavior to better meet the perceived needs of the target group. Models have been adopted in an attempt to study the activity undertaken by a seemingly healthy person for the purpose of preventing ill health.

The Health Belief Model, HBM (Becker, 1974; Rosenstock, 1966), has been widely applied and tested as a predictor and explanation of preventive health behavior (Figure 2). The HBM incorporates psychological and

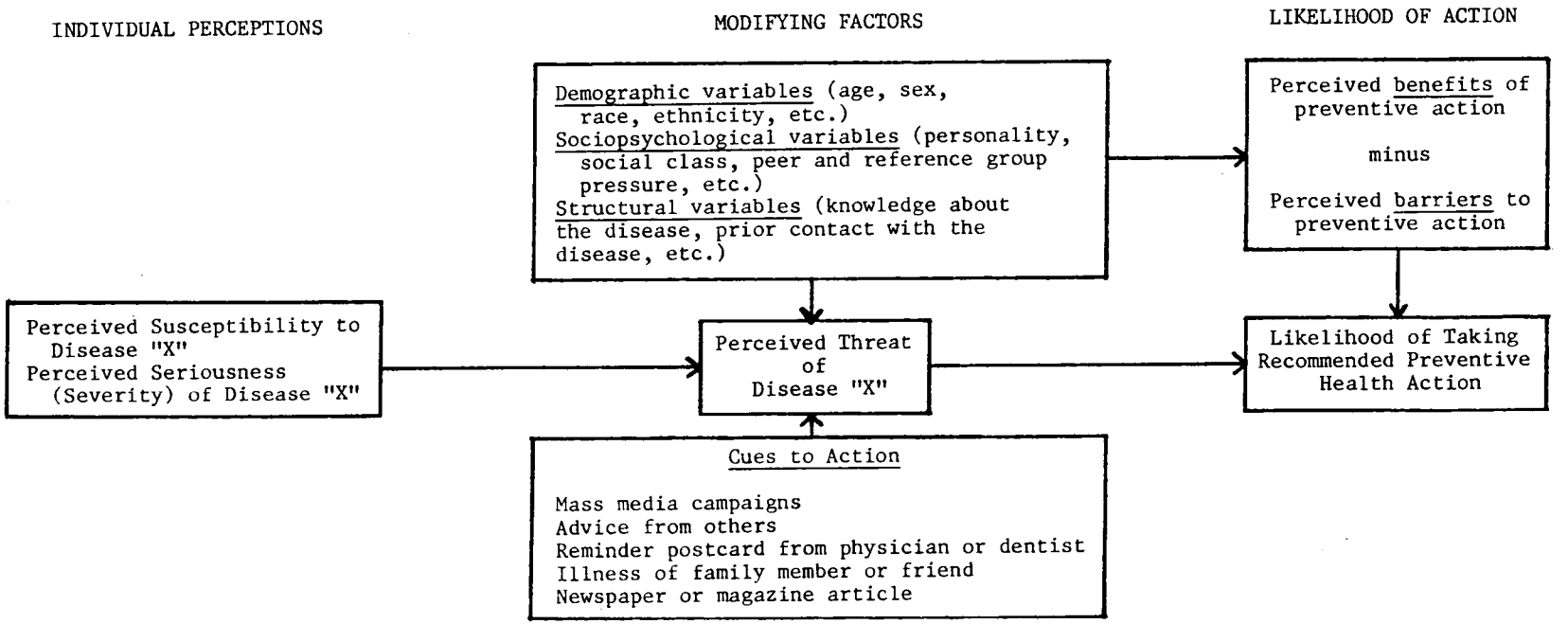


Figure 2. The "Health Belief Model" as predictor of preventive health behavior (Becker, 1974; Rosenstock, 1966).

behavioral theory. Behavior is viewed under conditions of uncertainty and becomes a decision making activity with a degree of risk. Activity is predicted based on the individual's evaluation of an outcome and the degree of expectation that a specified activity will result in the designated outcome (Becker and Maiman, 1975).

The HBM is thus derived from a value-expectation framework of behavioral motivation. It predicts that the probability of an individual engaging in preventive health care activities is a function of three factors (1) benefits-barriers, an analysis of the advantages and disadvantages of the suggested preventive health care activity, (2) perceived threat, what circumstances accompany the anticipated health threat, and (3) cues to action, including mass media and personal interactions. Two antecedents define perceived threat; perceptions of susceptibility and the expected severity of the hazard by the individual. These form the basis of the perception of threat (Rosenstock, 1966).

Individual perception of threat. The individual's personal conviction varies greatly regarding his own susceptibility to danger and its seriousness to him. Rosenstock (1966) states that susceptibility refers to the likelihood of obtaining any real physical injury from the inherent danger. Some individuals may deny any possibility of personal injury, while others may feel in grave danger to the point of actually refraining from engaging in threatening activity. A more moderate perception follows the thoughts of most people who admit a likelihood

of bodily harm, but prefer to believe it will not happen to them personally (Peltzman, 1975).

An individual's view of what injuries could befall him reflects his perception of the seriousness of the threat, including physical dehabilitation as well as emotion suffering. It may include attitudes of related effects on job and family as well as economic loss (Rosenstock, 1966).

Further, the individual's perception of threat of injury is influenced by many factors. One set of influences comes from demographic variables such as age, education, occupation or others. Sociopsychological factors could include such variables as personality, social class and reference group pressures. Structural or cognitive variables include prior knowledge regarding the perceived threat (Rosenstock, 1966). Also, research has shown that directed communication (advertising) can influence perception of threat.

Likelihood of action. An individual may view himself as susceptible to injury, may even regard it as a serious threat to his physical and emotional well being; but this perception of threat does not necessarily define or include any specific corrective action that would reduce the potential hazard. In fact, no action may be forthcoming at all.

Before deciding on a plan of preventive action, the individual must have an acceptable alternative available to him. However, he will view as a barrier to action any drawback associated with the alternative action. If the barriers are perceived to be more serious than the

advantages the action provides, then the alternative will not be seen as appropriate; indeed, not a viable alternative at all (Rosenstock, 1966).

Cue to action. A cue to action is considered by Rosenstock to be a modifying factor which can trigger activity. Advice given by friends or authorities, magazine or newspaper articles, radio or T.V. information all could function as cues to action. All of these may reinforce the perception of threat, and a specific alternative in the way of preventive action may be offered. The kind, quantity and quality of "cue" necessary to stimulate action can vary with the individuals readiness to take the prescribed action.

In summary, Becker and Rosenstock's HBM can help explain and predict the likelihood of an individual engaging in a recommended preventive health action. A strategy designed to encourage such activity should take individual perceptions and modifying factors into account in an attempt to increase the probability of effective persuasion. Measurement of an individuals present perceptions may provide some understanding of his "action threshold," and help in determining what cues to action to employ.

Attitude Measurement

In an attempt to determine the effectiveness of a fear appeal strategy on persuasion, the hypothetical construct called attitude must be measured. A working definition of attitude is necessary. As a concept attitude denotes the sum total of an individual's "inclinations and feelings, prejudice or bias, preconceived notions, ideas, fears,

threats, and convictions about any specific topic" (Thurstone, 1928, p. 529). Even as early as 1928 Thurstone recognized that opinions or beliefs were a verbal expression of attitude. Newcomb, Turner, and Converse (1965, p. 80) defined "attitude as a state of readiness for motive arousal." Within such a framework, attitude can be regarded as a subgroup of the construct motive, including both an affective and action component. It is distinguished from other subgroups of motives by the additional presence of a cognitive component.

Fishbein (1967) clearly recognizes three components of attitude. Affective (evaluation), cognitive (beliefs) and conative (action) are summed to provide a total attitude measure, though they are not always highly correlated. Jacob and Flink (1962) also considered that the object of focus is desirable or undesirable, independently of the person's own appraisal of it. It is customary to distinguish an attitude from a habit on the basis of the individual's awareness of his particular propensity.

Campbell (1963) continues to state that the dependence on attitudes to be related to or distinguished from other constructs depends on (1) convention with the discipline, (2) the user's own theoretical purposes, and (3) the outcome of empirical investigations. These determinants will vary with situation and no one definition of attitude will suffice.

Most attitude measurement, as currently practiced, makes little use of formal models of measurement. However, they are generally derived from earlier developed concepts about measurement. Psychometric theory

has had the most influence and is best developed. Much of the scaling theory has roots in psychophysics. Torgerson (1958) for example, is concerned with the development of subjective sensory scales that objectively correspond to definable dimensions of physical stimuli. Psychometrics are concerned with traits that have no obvious physical counterparts. Simple psychophysical techniques are used to construct objective dimensions based on consensus among judges. Of the many properties that have been theoretically attributed to attitudes, most concern has been in measuring only magnitude and direction.

Since an attitude is a hypothetical construct, it cannot be directly measured, but must be inferred from subjects' responses. Instruments for measuring attitudes are commonly classified according to the types of responses the subjects make. A summative scale is one example where a score is achieved by adding the response scores on its component items. Variations on the summative scoring procedure appear throughout psychological testing. In the Likert (1932) technique of attitude assessment, subjects respond to a series of items in a single stimulus format, indicating their degree of agreement or disagreement. The scale is frequently a five point scale represented by whole numbers. The direction and magnitude of the attitude is computed as the sum of item scores. Adding the item scores together implies that each item is a linear or at least monotonic function of the same attribute (Coombus, 1953). The relationship of any item to the common attribute is ordinarily established by correlational procedures. A simple method is to correlate each item with the total scale score. Items which show a

sufficiently high correlation with the total score are retained in the scale and items which do not are rejected. A new scale with higher validity is then constructed, comprised only of the remaining items.

It is impossible to arrive at a single index of validity for most psychological tests, so many psychometricians would prefer to concentrate on maximizing reliability. Reliability is ordinarily determined by considering a composite of tests all measuring the same attribute. If any random subset of items is assumed to be equivalent to any other random subset of the same length, then the total test reliability, that is, the degree to which it would correlate with an equivalent test, may be estimated. Cronbach (1951) suggests a coefficient alpha formula where the magnitude of the coefficient depends on the homogeneity of the test or average inter-item correlation and the length of the test.

Investigators who have used the Likert method seem to be in agreement that it is simpler for respondents to understand than other methods such as Thurstone's method of equal appearing intervals. Hall reports that he used the method of summated ratings in his survey of the attitudes of employed and unemployed men "because of its relative simplicity and because it yields scales of high reliability" (Hall, 1934, p. 6). Rundquist and Sletto used the Likert technique in constructing a Minnesota Survey of Opinions Scales, agree that "it is less laborious than the developed Thurstone" (Rundquist and Sletto, 1936, p. 5). Another advantage of the Likert scale is that its directions for use are the same as the directions employed to generate scores used to screen statements. Also, subjects generally find it

easier to respond because the response categories allow for an expression of intensity of feeling as well as a general direction.

One difficulty in score interpretation does exist. The raw scores developed assume meaning only when compared to some standard. The standard or developed norm is usually formalized in a clearly defined statement. Frequently, this norm is taken as the mean score for all subjects. Average may also be calculated for predefined subgroups. A respondent can then be compared against this norm to determine if he possesses a positive or negative attitude toward the subject investigated. When comparing respondents to determine which has a more favorable attitude, the raw scores of each can simply be compared with the use of a preestablished norm. Norms are also not necessary when attempting to determine whether a respondent's attitude has changed over time. The earlier and later raw scores are compared (Churchill, 1979).

In summary, the separate components of attitude can be indirectly inferred through responses on a summated rating scale, which can give an indication of direction and intensity of feeling. This technique would appear to provide a valid measure of an individuals attitude toward protective clothing, and a subsequent measurement of the persuasive effects of the fear appeal.

Implications for This Research

Government's concern with the problems related to pesticide use has led to increasing amounts of legislation in an attempt to minimize health hazard. Reports of pesticide accidents also suggest that there

is a real and present hazard. Even though protective garments have been available, they have generally been considered unacceptable, due mostly to lack of comfort and convenience. Now that a functionally designed protective garment has been developed, it is necessary to determine the best way to

1. measure user's attitude toward protective garments, and
2. increase their perception of the net benefit of using protective garments.

Since these protective garments are not complex and are compatible with the perceived function of clothing, and since trialability and observability are not immediately factors due to the present low availability of the garments, the project need only consider measuring and influencing the user's perception of relative advantage.

Examining the information processing hierarchy proposed in communication theory allows for a focusing of attention on the steps of the process that might be most effective. Of course, behavior is the desired outcome and it is felt that for this project effort should be focused on the comprehension stage.

One of the approaches used in modifying behavior has been an appeal to emotion. The physical hazard potential of pesticides suggested the use of a fear appeal for this project. Recent studies have shown a moderate fear appeal appears to be most effective, with too low a fear level being ignored and too high a fear level inhibiting the desired effect. A problem may lie in the subjective nature of fear measurement such that high fear in one situation is low fear in another.

Identifying the product target group as all being users of pesticides, only personality and socioeconomic factors are left as major modifying variables. A measure of demographic factors can be used to segment the user population into more nearly homogeneous groups. Personality remains as the major variable unaddressed in this study.

The Health Belief Model provides a paradigm for predicting preventive health behavior. It will provide a research framework for determining the probability of pesticide applicators engaging in the desired behavior--the adoption of protective clothing. This activity would be undertaken as a result of increased perceptions of hazard and cues to action delivered in the form of fear appeals.

The effectiveness of this fear appeal as a cue to attitude change and action can be measured by the Likert summated rating scale. The Likert technique allows for ease in administering and scoring. Pesticide user's responses will be measured as to the degree and direction of their attitude regarding pesticides and their use.

This is the basis upon which the research developed. The fear appeal strategy will be tested as to its effectiveness on persuasion in this research situation. Not only will the findings contribute to the body of imperical data but will evaluate one method for disseminating protective garment information to pesticide applicators, and thereby yielding better understanding of the process of adoption and use of protective clothing.

CHAPTER III

METHODOLOGY

The use of a fear appeal strategy in persuading agricultural workers to use protective garments during pesticide application is a form of emotional appeal. It specifically attempts to raise the level of anxiety in the audience to the point at which suggested action will be taken in the attempt to reduce this anxiety (Niles, 1964; Stuteville, 1970). This strategy is designed to increase the agricultural worker's perception of susceptibility to potential pesticide hazard and the seriousness of such an injury, whereby he will accept and use protective garments.

Research Design Framework

The present study is based upon the Health Belief Model (Becker, 1974; Rosenstock, 1966). It examines demographic variables and prior knowledge of pesticide danger and use as modifying factors. Demographic inferences have not been drawn from past fear appeal research. It does appear that high fear is more effective with audiences in the lower socioeconomic brackets (Haefner, 1965).

Cognitive variables include previous knowledge of the subject. It has been indicated that prior knowledge of the high fear subject tends to reduce appeal effectiveness (Hovland et al., 1953; Lewan and Stotland, 1961). A possible cause is that individuals have more interest in the unfamiliar. They are generally more receptive to the information being offered. Also, they are less likely to hold strong

personal attitudes which may be in conflict with the information being provided.

Demographic variables will provide an opportunity to identify significant sample characteristics. This will point out potential classifications for future market segmentation. These should highlight those demographic variables that appear to be most significantly correlated to the desired effects of the fear appeal.

The fear appeal will function as a cue to action, encouraging the pesticide applicator to accept the prescribed behavior. The induced level of anxiety from the high fear appeal could have the potential to act as a barrier against action. The perceived threat of injury from pesticide exposure could be rejected by the agricultural workers as a defense against possible hazard. There is a strong need, therefore, to stress the importance of the protective garment as a viable alternative to physical injury so that barriers to preventive health care action are overcome.

The likelihood of the agricultural worker taking the recommended preventive health care action will be measured by four factors: (1) perceptions of pesticide hazard, (2) perceived benefits of protective clothing, (3) reported behavior, and (4) intentions for future use. The perceptions of pesticide hazard and perceived benefits of protective garments will measure attitude change after the cue to action is supplied by the fear appeal strategy. Changes in behavior and intentions for future use of protective clothing will be a reported measure of activity and intended activity respectively (Figure 3).

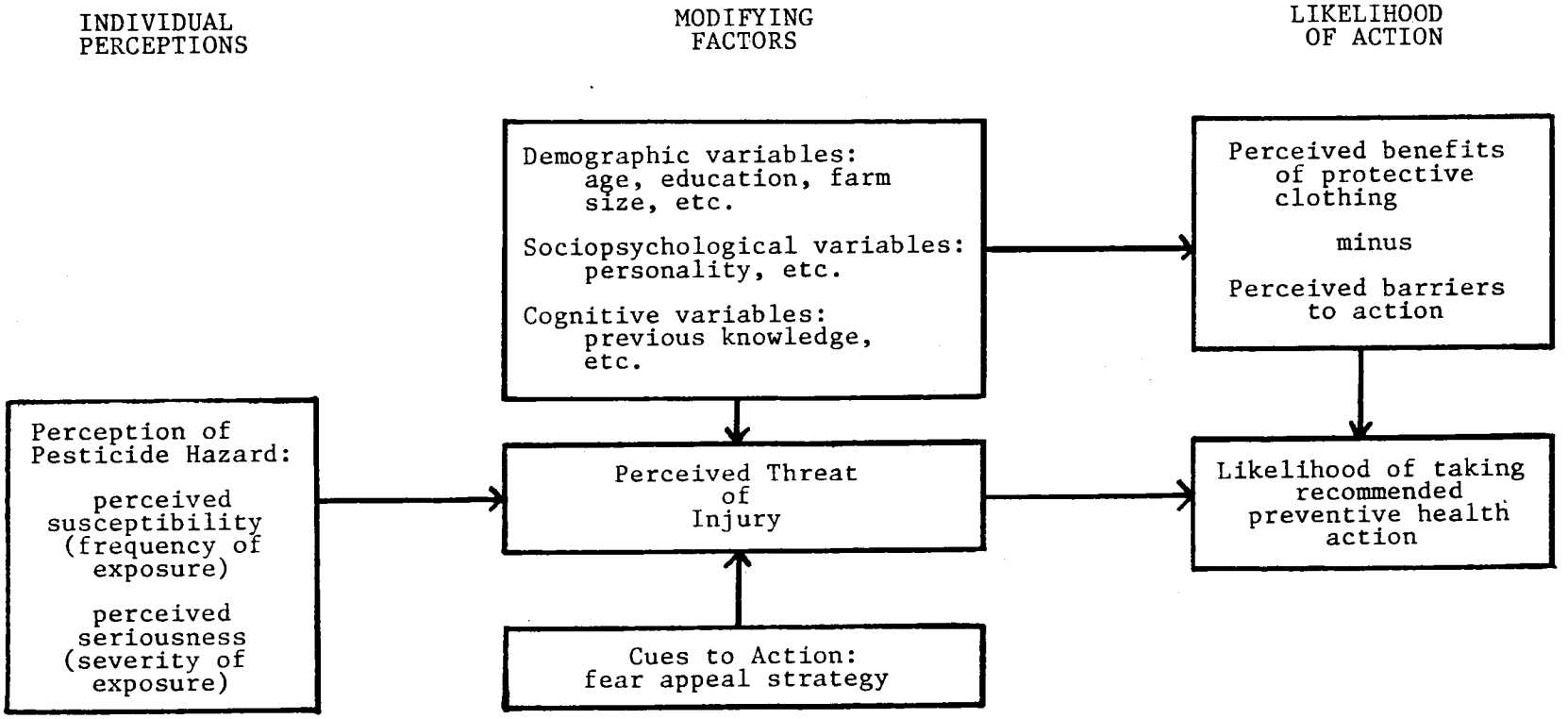


Figure 3. A model to explain and predict the effectiveness of a fear appeal strategy in promoting preventive health behavior.

Instrument

The questionnaire developed for pretest consisted of forty Likert scale questions, a set of ten demographic questions and a final check list of other media sources of pesticide information. The questions were divided into five variable areas to be investigated:

1. Individual Perceptions of Pesticide Hazard
2. Prior Knowledge of Pesticide Hazard
3. Perceived Benefits of Protective Clothing
4. Reported Behavior
5. Intentions for Future Use

Each category contained eight questions. Perceptions of Hazard, Prior Knowledge, and Perceived Benefits of Protective Clothing questions were all randomly ordered and grouped under a five scale response ranging from strongly agree to strongly disagree. Reported Behavior and Intentions for Future Use questions were randomly ordered and grouped under a five scale response ranging from always to never.

The pretest was sent to fifty certified pesticide applicators in Michigan who had responded to an attitude survey conducted by Michigan State two years before. Two questionnaires were undeliverable and returned. Twenty-one questionnaires were completed and returned which showed just under a 44 percent response rate. Two more subsequently were returned, but not included in the analysis.

The frequency of distribution of item response was examined in an attempt to establish construct validity or how well the items determine

the understanding appropriate to each conceptualized construct (Churchill, 1979).

The best item question will ilicit a range in distribution of responses from a hetergeneous sample, allowing for individual variations to appear. However, if the group is homogeneous in regard to the tested construct no such distribution will be possible. The validity of the items will not rest upon response distribution, but other measures such as intra-item correlations. Observations indicated that the response to questions in the categories of Reported Behavior and Intentions for Future Use were generally well distributed. However, the remaining three categories of questions showed less distribution in response. This indicated a relatively similar response for the sample questioned. The category of Prior Knowledge of Pesticide Hazard should have had little discriminating effect in response. The questions were designed to be either qualified true or false. The respondent's prior knowledge was tested by his ability to answer the question correctly. It is possible that this particular group of Michigan certified pesticide applicators did share similar views regarding (1) their perceptions of pesticide hazards, (2) prior knowledge of the subject, and (3) their perceived benefits of protective clothing. The response pattern did allow for subsequent change in either direction for the questions included in these categories. This was an important consideration since change is to be measured after the fear strategy is sent. Therefore, no attempt was made to modify the potential response distribution.

Intra-item correlations within categories was viewed in support of convergent validity. If correlations between questions are high, it

lends support to the fact that they are measuring the same basic construct (Churchill, 1979). Low intra-item correlations may suggest that the broad categories contain subgroups which are being measured. The Perception of Hazard category showed the most significant item correlations (over .5). Almost half of the possible item correlations were significant.

Intra-item correlation within categories of Intentions to Use, Reported Behavior, Perceived Benefits of Protective Clothing and Prior Knowledge were low, showing few significant correlations. An explanation of these low correlations may be that the broad general categories were not well covered with only eight questions per category. It is acknowledged that in several categories such as Intentions and Behavior, questions were deliberately varied with the hopes of obtaining a profile of protective clothing acceptance. For example, an applicator may be wearing gloves but not a respirator. Because of these considerations, no attempt was made to increase intra-item correlations in the categories of Intentions to Use, Reported Behavior, Perceived Benefits of Protective Clothing and Prior Knowledge.

The category of Prior Knowledge was also low in item correlation. It consisted of eight questions which could be rated as being true or false if the respondent possessed the appropriate prior knowledge of pesticide use. Again an agreement with one question should not constitute agreement with another. The purpose of these questions was to grade the respondent based upon correct response and determine a ranking scale of prior knowledge.

The reliability of the developed questions was also considered. The results from one homogeneous group to another or from the same group over time should be consistent (Peter, 1979). Reliability sets the upper limits on validity, for a measurement device can not be valid unless reliable. All categories except Prior Knowledge indicated high reliability with coefficient alpha levels above .7, showing a high level of internal consistency (Cronbach, 1951).

Prior Knowledge questions showed an alpha level of .46. These questions were designed to factually test the respondent's prior knowledge of the subject of pesticides and their use. Upon examining the frequency of distribution for these eight items, it was found that two questions had a significant spread in response. Response should have been either in agreement or disagreement, since the questions are either true or false. An examination of intra-item correlations showed one of the Prior Knowledge items was inversely correlated with most all others in the category. It was felt that these questions may have been confusing and, therefore, were reworded in an attempt to increase future alpha levels.

All revisions were made based upon this pretest. The questions were then placed on a reduced size, foldout, three page form in order to increase the ease of completion and to encourage greater response. The final set of questions by questionnaire number and category are found in Appendix A.

Sample

The research sample consisted of a random sample of six hundred certified applicators from Michigan and six hundred tobacco growers from Tennessee who use pesticides. The Michigan sample was selected by drawing every twenty-fifth name from a random starting point from a computer list of state certified applicators provided by the state of Michigan, Department of Agriculture. Tobacco growers from Tennessee were selected from respondents to a previous questionnaire sent out by The University of Tennessee Extension to assess pesticide use by Tennessee farmers. Certified applicators from Tennessee did not represent a good sample source since the available list was not current, nor was certification as tightly controlled as in the state of Michigan. It was felt that the response rate would be low using this group since neither addresses nor certification were up-to-date. It was also felt that there would be a much greater chance of drawing a sample of agricultural workers who were not actually applying pesticides themselves.

The Tennessee tobacco growers were chosen because they represented a large percentage of the farmers in Tennessee using pesticides. They are also more likely to be in danger of pesticide poisoning since they frequently go into the tobacco fields with hand held sprayers to administer the pesticide. They are in direct contact with the plants and pesticides. Tobacco growers are generally performing other types of farming as well and would have an opportunity to be involved with many kinds of agricultural chemicals.

There are many types of agriculture carried out in Michigan which require the use of pesticides. It was expected that a significant portion of the sample from Michigan would be fruit farmers. This group also is in a high risk bracket from pesticide poisoning. They use air blast spraying techniques which places a mist of spray throughout the area which can land on the applicator as well the trees. The incidence of dermal exposure is high.

Treatment

The first questionnaire was sent to all of the selected group in both states (Figure 4). The subjects in each state were then divided into three equal groups: 200 in a control group, 200 in a low fear appeal group, and 200 in a high fear appeal group. Upon receipt of completed questionnaires each respondent was then sent the flyers appropriate to that group, the control group receiving none. Approximately one month after the first questionnaire, a second questionnaire was sent to determine any changes in attitude, intentions or behavior.

Fear Appeal Materials

Available literature on the subject of pesticides is generally low-key and informational in nature. Sources are factual and positive in tone while down-playing emotional aspects. Such low fear publications are readily available from USDA and/or local university extensions. Three University of Tennessee Extension publications were chosen

Item Mailed	Day 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
First Questionnaire	x																																										
Reminder Postcard					x																																						
First Fear Appeal Flyer																					x																						
Second Fear Appeal Flyer																												x															
Third Fear Appeal Flyer																																		x									
Second Questionnaire																																					x						
Reminder Postcard																																											x

Figure 4. Schedule of mailings.

as the low fear mailings. These pointed out the hazards of pesticides and suggested proper use of pesticides, equipment and clothing.

Few publications currently existed which could be classified as using a high fear appeal, therefore these materials were developed by the researcher. The materials are designed to stress the negative aspects of pesticide poisoning, and potential losses were elaborated on from a personal standpoint. Newspaper articles and reported case studies graphically explaining individual cases of past occupational pesticide poisonings of agricultural workers were used. Situations wherein increased care and the use of protective garments could have prevented or lessened the consequences were described.

Publication design was evaluated by a panel of experts in the field of agricultural pesticides. The six flyers were rated on a 10-point scale (1--lowest fear, 10--highest fear) as to their fear generating potential. All five reviewers rated the high fear flyers above scores of six without exception. Likewise, all reviewers scored the low fear flyers five or below. It was clearly felt that the high fear flyers represented a greater potential for generating fear in the reader than did the low fear mailings.

Administration of the First Questionnaire

The first questionnaire (Appendix B) was sent to 1200 applicators (600 from Michigan and 600 from Tennessee). Five days later, a reminder postcard was sent to encourage additional response. After three weeks the daily response had dropped to a low rate, and it was decided to use those individuals returning questionnaires by that date as the appeal

sample. Data was collected from 224 questionnaires, representing 18.7 percent of the mailing (Appendix C). Thirty-two were returned undeliverable and 19 were rejected for incomplete responses. Thirteen more were returned after analysis was begun and were not included.

Administration of the Appeal

The fear appeal (Appendix D) was then administered to the respondents from each group in both states. The high appeal groups were sent a different high fear appeal flyer each week for a period of 3 weeks. The low fear appeal groups were sent 3 different low fear appeal flyers over the same 3 weeks. The control groups received no further literature.

This weekly contact was an attempt to ensure reader awareness and cognition. Three opportunities were available to gain reader attention and comprehension, thereby encouraging persuasion.

Administration of the Final Questionnaire

A final questionnaire was sent the following week after the final fear appeals (Appendix E). It did not contain the demographic variable questions nor the questions from the Prior Knowledge category since these responses had been gathered from the first questionnaire. There was also a great concern that the second questionnaire not be ignored by the respondents as having been answered once before. It was recognized that the respondents needed to answer these questions if the research was to draw conclusions. Therefore, it was decided to simplify the questionnaire and shorten its format. Four questions were randomly

chosen from each of the item categories. This decreased the total number of questions from thirty to sixteen (Appendix A).

In order to secure insight into other possible sources of information which might have been cues to action for the respondent, a media question was added. It asked the respondent to name the type of media which had supplied him pesticide information during the period of the research project. It was thought that these extraneous information sources could compound or weaken the effect of the fear appeal strategy.

A reminder postcard was also sent following the second questionnaire and again an increase in the response rate was seen. After three weeks the daily response rate had dropped to an insignificant level. One hundred twenty-four second questionnaires had been returned showing a 55.4 percent response (Appendix C). Eight more questionnaires were later returned, but were not included for data analysis.

Analysis

The following working hypothesis was developed to test the overall research objectives:

1. Attitudes (Perceptions of Pesticide Hazard and Benefits of Protective Clothing), Intentions for Future Use and Reported Behavior will be significantly more positive after administering a fear appeal strategy.

$$\Delta M_A > \Delta M_C$$

$$\Delta T_A > \Delta T_C$$

Changes will be significantly greater for the high fear appeal group than for the low fear appeal group for both Michigan and Tennessee.

$\Delta M_H > \Delta M_L$

$\Delta T_H > \Delta T_L$

A three-way analysis of variance (ANOVA) with two levels of one independent variable (State), two levels of the second independent variable (Time), and three levels of the third independent variable (Appeal) was used to determine the effects of these variables upon Perception, Benefits, Intentions, and Behavior. Estimated mean differences were used to identify the independent specific sources contributing to the significance of a main effect or interaction. In addition, an analysis of covariance was used to determine the effect of Prior Knowledge as a covariate on each dependent variable. Appropriate statistical methods were used to evaluate the other modifying factors (media and demographics).

CHAPTER IV

RESULTS AND DISCUSSION

Results

The purpose of this study was to evaluate the effectiveness of a fear appeal strategy in persuading pesticide applicators to accept pesticide protective garments. The intent of the emotional appeal strategy was to increase agricultural workers awareness of potential hazard to where he would accept the protective garment as a viable alternative to injury. The degree of persuasive ability of the fear appeal strategy was measured by changes in attitudes (Perception of Hazard and Benefits of Protective Clothing), Intentions for Future Use, and Reported Behavior. Prior Knowledge of pesticides, demographic variables and other media as source of pesticide information were examined as possible modifying factors in the effects of the fear appeal strategy.

Model

Subjects from Tennessee and Michigan were randomly assigned to one of the three fear appeal groups. Thus, the two main independent variables were state and appeal group. Since a first and later a second questionnaire were administered another independent variable, time, was included in the model. The inclusion of this variable necessitated that the design be viewed as a split-plot-in-time design (often referred to as a repeated measures design). The subsequent data analysis reflected

the appropriateness of this model. Dependent variables included Perception of Hazard, Benefits of Protective Clothing, Intentions for Future Use, and Reported Behavior. Three levels of appeal were defined, high fear, low fear, and control (no fear). All independent variables were considered to be fixed effects. That is, inferences were to be drawn only from the differences among the treatments of these variables actually administered (Neter and Wasserman, 1974). Conclusions were drawn only about the effects of time, state, and appeal level as specifically used in this study. Conclusions were not extrapolated to other possible treatments.

Person was also considered as an independent variable. Person, a random effects variable, was nested in state and appeal. Person was a random sample chosen from a total population of pesticide applicators. Inferences can therefore be extrapolated beyond the selected sample, to the general population (Neter and Wasserman, 1974). Neter and Wasserman further explain that a nested variable has levels of one factor occurring only within levels of another factor. In this study, it is not possible to examine person without considering state and appeal level at the same time, since person occurs only in association with state and appeal level. The combination of these random and fixed effects caused the resulting model to be considered a mixed effects model.

To determine the effects of the independent variables, time, state, and appeal level on the dependent variables Perception of

Hazard, Benefits of Protective Clothing, Intentions for Use, and Reported Behavior, a three-way mixed effects least squares analysis of variance was performed. An alpha level of 0.05 was established to test the model. The model used for the analysis was:

$$Y_{i1}, Y_{i2}, Y_{i3}, Y_{i4} = U_{1,2,3,4} + \alpha_j + B_k + \gamma_{\ell(jk)} + \rho_m + (\rho\alpha)_{mj} + (\rho\beta)_{mk} + (\rho\alpha\beta)_{mjk} + e_{ijk\ell m} ,$$

$$\begin{aligned} j &= 1,2 \\ k &= 1,2,3 \\ \ell &= 1,2,\ldots,224 \\ m &= 1,2 \end{aligned}$$

where:

Y_{i1} = Perceptions of Hazard,

Y_{i2} = Benefits of Protective Clothing,

Y_{i3} = Intentions for Future Use,

Y_{i4} = Reported Behavior,

$U_{1,2,3,4}$ = overall mean,

α_j = effect of state,

B_k = effect of appeal level,

$\gamma_{\ell(jk)}$ = effect of person nested in state and appeal level,

ρ_m = effect of time,

$(\rho\alpha)_{mj}$ = time and state interaction,

$(\rho\beta)_{mk}$ = time and appeal interaction,

$(\rho\alpha\beta)_{mjk}$ = time, state, and appeal interaction, and

$e_{ijk\ell m}$ = random error.

Validity and Reliability of the Instruments

Validity or how well the instrument measured the constructs designed to test was examined through comparisons of inter-item correlations within dependent categories. In general, correlations between the items within each of the areas measured was not high for both the first and second questionnaire. This suggests that perhaps a better job could have been done framing the group of questions within each of the constructs. Correlations would be expected to be higher if each item within the group was measuring the same thing.

Reliability or the likelihood of finding the same results from a repeated measure with the same instrument was high (above .5 alpha level) for both first and second questionnaire (Table I). Coefficient alpha is a statistical measure of internal homogeneity and an indication of scale reliability.

Table I. Coefficient Alpha Level of Test Reliability

Dependent Category	First Questionnaire	Second Questionnaire
Perception of Hazard	0.70	0.50
Benefits of Protective Clothing	0.67	0.74
Intentions for Future Use	0.53	0.40
Reported Behavior	0.67	0.74
Prior Knowledge	0.55	

Ranges and Means of Response

Arithmetic means from the smallest variable subgroup will be close approximations of the true means of a nonorthogonal design containing

unequal cell frequencies. Therefore, a review of these will provide a respondent profile for the dependent variable.

The potential range of mean response was from 8 to 40 with a median of 24 on the first questionnaire and 4 to 20 with a median of 12 for the second questionnaire. A response of 8 (4) was the most positive and 40 (20) the least. A negative change in response reflected a more positive attitude, intention or behavior.

The arithmetic means for Perception of Hazard by variable subgroup are reported in Table II. The response ranged from 11.6 for the Michigan low fear appeal group on the first questionnaire to 8.5 for Michigan control group on the second questionnaire. Both groups had a high perception of hazard from pesticides, Michigan slightly less than Tennessee. That perception increased over time, more so for Michigan than for Tennessee for both levels of fear appeal. The same relationship held for the control group receiving no appeal.

The response arithmetic mean range for the dependent variable Benefits of Protective Clothing ranged from 10.1 for the Tennessee low fear appeal group for the first questionnaire to 7.2 for the Michigan control group for the second questionnaire. The sample had a positive attitude regarding the benefits of protective clothing, slightly higher than their perception of pesticide hazard. Michigan respondents had generally a higher regard for the benefits of protective clothing than did Tennessee respondents. The Michigan group did not change their attitude as much as the Tennessee group over time for all levels of appeal including control.

Table II. Arithmetic Means as Descriptors of Variable Subgroups

	Michigan									Tennessee								
	Control			Low			High			Control			Low			High		
	T1	T2	ΔT^a	T1	T2	ΔT^a	T1	T2	ΔT^a	T1	T2	ΔT^a	T1	T2	ΔT^a	T1	T2	ΔT^a
Perception of Hazard	10.0	8.5	1.5	11.2	10.1	1.1	10.9	9.4	1.5	10.2	9.4	0.8	9.7	9.3	0.4	9.8	9.2	0.6
Benefits of Protective Clothing	8.2	7.2	1.0	8.9	8.1	0.8	8.7	8.3	0.4	9.7	7.9	1.8	10.1	8.7	1.4	9.3	8.8	0.5
Intentions for Future Use	9.3	8.0	0.7	9.2	8.4	0.8	9.1	7.7	1.4	10.3	9.4	0.9	10.4	9.0	1.4	10.0	7.5	2.5
Reported Behavior	13.0	13.9	-0.9	13.1	13.7	-0.6	14.4	13.4	1.0	16.4	15.9	0.5	14.7	14.9	-0.2	15.4	15.7	-0.3

[a] ΔT = T1 - T2.

Arithmetic means for the dependent variable Intentions for Future Use ranged from 10.0 for the Tennessee high fear appeal group on the first questionnaire to 7.5 for the same group on the second questionnaire, showing a positive intention to use protective clothing. There was a large change to an even more positive intention on the second questionnaire. Michigan respondents expressed a positive intention to use protective clothing with a change to a more positive intention over time. Tennessee did not have as positive nor as great a change as Michigan. The low appeal level and control followed similar change patterns in both states with the change being somewhat greater for the Tennessee group.

Arithmetic means for the dependent variable Reported Behavior ranged from 16.4 for the Tennessee control group on the first questionnaire to 13.1 for the Michigan low appeal group on the first questionnaire. Both groups reported a low use of protective garments. Tennessee respondents were less inclined to use protective garments than Michigan. Both state groups indicated a random pattern of change in protective garment use from the first questionnaire to the second, not related to fear appeal level.

Least Squares Analysis of Variance by Dependent Variable

A least squares analysis of variance was the method chosen to analyze the data. Unequal cell frequencies in the split plot design caused the different variable effects to be nonorthogonal and not directly separated. Therefore, all the effects must be considered simultaneously when attempting to draw inferences regarding these

effects. Least squares analysis of variance is a statistical method which can appropriately analyze data having unequal cell frequencies (Neter and Wasserman, 1974). Least squares means are statistics which have the same expectation for nonorthogonal designs as do arithmatic means for balanced designs.

The calculated F-statistic for Perception of Hazard was 4.75 which was significant at the predetermined 0.05 alpha level. Since the F-test was significant, it was appropriate to examine those main effects and interactions which contributed to this significance.

Results show that the main effect of time was significant with an F value of 16.31 (Table III). Perceptions of Hazard changed from a mean of 10.28 for Time 1 (first questionnaire) to 9.31 for Time 2 (second questionnaire) (Table IV). This indicated that the total sample significantly increased their perceptions of hazard from the first questionnaire to the second, though their perceptions were high initially.

Interaction between time and state (T × S) was also significant with an F value of 10.63 (Table III). Michigan obtained a mean response of 10.67 on the first questionnaire, while Tennessee received 9.89 (Table V). Tennessee had a significantly greater perception of hazard at the time of the first questionnaire than did Michigan. Michigan received a mean score of 9.32 on the second questionnaire, while Tennessee received 9.30. Both experienced significant increases in perception of hazard. Michigan's increase was greater to the extent that those individuals had a higher perception of hazard during T2.

Table III. Least Squares Analysis of Variance for Perception of Hazard

Source	df	MS	F Value
State	1	12.2755	1.46
Appeal	2	7.3813	1.75
S × A	2	20.9927	2.44*
Person (S × A)	212	8.5821	4.65*
Time	1	30.0912	16.31*
T × S	1	19.6109	10.63*
T × A	2	1.4759	0.80
T × S × A	2	0.9575	0.52
Error	115	1.8448	

*Significant at the 0.05 level.

Table IV. Least Squares Means of Significant Main Effects by Dependent Variable

		Perceptions of Hazard[a]	Benefits of Protective Clothing	Intentions for Future Use	Reported Behavior
Time	1	10.28	9.15	9.72	
	2	9.31	8.17	8.32	
	ΔT[b]	0.97	0.98	1.40	
State	M		8.23	8.62	13.59
	T		9.09	9.43	15.50

[a]Interaction of time × state and state × appeal also significant for this variable, refer to Tables III and V.

[b]$\Delta T = T1 - T2$.

Table V. Least Squares Means of Significant Interactions for Perception of Hazard

	Michigan	Tennessee
T1	10.67	9.89
T2	9.32	9.30
ΔT^a	1.35	0.59
H	10.16	9.49
L	10.60	9.50
C	9.23	9.79

[a] $\Delta T = T1 - T2$.

Interaction between state and appeal (S × A) was significant with an F value of 2.44 (Table III). The high and low fear appeal groups from Michigan had significantly lower perceptions of hazard than did the same two appeal groups from Tennessee. The control group from Tennessee had a significantly lower perception of hazard than did the control group from Michigan. Michigan groups obtained mean responses of 10.16, 10.60 and 9.23 for the high fear appeal, low fear appeal and control respectively. The Tennessee groups received mean responses of 9.49, 9.50 and 9.79 for the high fear appeal, low fear appeal and control respectively (Table V).

The main effects for state and appeal approached significance with F values of 1.46 and 1.75 respectively.

The calculated F-statistic for Benefits of Protective Clothing was 4.83 which was significant at the 0.05 alpha level. The main effects of time and state are significant with an F-value for time of 18.11 and for state of 6.98 (Table VI). The mean response for Benefits of Protective Clothing for T1 is 9.15 and 8.17 for T2. This showed an increase in

awareness of the Benefits of Protective Clothing from the first questionnaire to the second (Table IV).

Table VI. Least Squares Analysis of Variance for Benefits of Protective Clothing

Source	df	MS	F Value
State	1	56.7432	6.98*
Appeal	2	12.4656	1.53
S × A	2	4.2515	0.50
Person (S × A)	214	8.3613	0.46
Time	1	32.3610	18.11*
T × S	1	4.1384	2.32
T × A	2	1.3306	0.74
T × S × A	2	0.2805	0.16
Error	332	18.2108	

*Significant at the 0.05 level.

Michigan's attitude toward the Benefits of Protective Clothing was significantly different from Tennessee. Michigan expressed a greater awareness of the Benefits of Protective Clothing with a mean response of 8.23 than did Tennessee with a mean response of 9.09.

The main effect of appeal and the interaction of time × state approached significance with F values of 1.53 and 2.32 respectively.

The calculated F-statistic for Intentions for Future Use was 2.39 which was significant at the 0.05 alpha level.

The two main effects of time and state were again significant, the F value for time being 19.07 and 7.08 for state (Table VII). The Intentions for Future Use response mean was 9.72 for T1 and 8.32 for T2 (Table IV). The sample's intentions to use protective garments was high

for the first questionnaire and increased significantly more for the second.

Table VII. Least Squares Analysis of Variance for Intentions for Future Use

Source	df	MS	F Value
State	1	64.7485	7.08*
Appeal	2	8.8206	0.96
S × A	2	3.7240	0.41
Person (S × A)	208	9.1492	0.40
Time	1	78.4839	19.07*
T × S	1	1.0435	0.25
T × A	2	6.8938	1.68
T × S × A	2	1.6555	0.40
Error	315	23.0113	

*Significant at the 0.05 level.

Michigan's Intentions for Future Use was greater than Tennessee's with a mean response of 8.62 and 9.43 respectively (Table IV). Both states expressed high intentions to use protective garments in the future.

The interaction of time × appeal approached significance with an F value of 1.68.

The calculated F-statistic for Reported Behavior was 5.13 which was significant at the 0.05 alpha level.

Once again the main effect of state was significant with an F value of 13.86 (Table VIII). Michigan received a mean response of 13.59 while Tennessee received 15.50 (Table IV). These were significantly different from each other, but both expressed a low level of reported wearing of

protective garments. The interaction of time × state × appeal approached significance with an F value of 1.92.

Table VIII. Least Squares Analysis of Variance for Reported Behavior

Source	df	MS	F Value
State	1	274.2997	13.86*
Appeal	2	15.0941	0.76
S × A	2	18.4486	0.93
Person (S × A)	211	19.7894	0.53
Time	1	3.7792	0.94
T × S	1	0.1356	0.03
T × A	2	2.7374	0.68
T × S × A	2	7.7358	1.98
Error	322	37.3919	

*Significant at the 0.05 level.

Dependent Variable Correlation

A Pearson Product Moment Correlation was calculated between the dependent variables Reported Behavior and Intentions for Future Use. The resulting r^2 value of 0.09 was not significant at the 0.05 alpha level. Respondent's intentions to use protective clothing was not significantly related to their wearing of the clothing.

Estimated Mean Differences

Since the F-test indicates significance, it was appropriate to examine further those effects which approached significance with more than one degree of freedom. It was possible that one of these degrees of freedom could be significant. Estimated mean differences were obtained via use of the estimate statement PROC GLM, SAS 79.5, and reported in Table IX.

Table IX. Estimated Mean Differences of Appeal Level by Time for Dependent Variables

	Perceptions of Hazard		Benefits of Protective Clothing		Intentions for Future Use		Reported Behavior	
	EST	T for $H_o = 0$	EST	T for $H_o = 0$	EST	T for $H_o = 0$	EST	T for $H_o = 0$
ΔL vs. ΔH over T	0.096	0.90	-0.055	-0.53	0.039	0.23	-0.167	-1.03
Δ Appeal vs. ΔC over T	0.082	2.46*	0.061	1.89*	0.152	2.92*	0.006	0.12

*Significant at the 0.05 level.

The calculated estimated mean differences compared the level of appeal [low versus high, appeal (low + high) versus control] for the two dependent variables Perception of Hazard and Benefits of Protective Clothing. The mean difference for the change in the low appeal response group was found not to be significantly different from the change in the high appeal response group from the first to the second questionnaire. However, when both appeal groups were compared to the control group (no appeal) a significant difference was seen. The t-statistic for Perceptions of Hazard, 2.46, and Benefits of Protective Clothing, 1.89, were significant. This indicated a significant difference between the appeal versus no appeal response group.

The estimated difference for Perceptions of Hazard was 0.082 indicating a slightly greater increase in perceptions of hazard for the appeal group than for the control. Benefits of Protective Clothing showed an estimated difference of 0.061. This showed a slight increase in appreciation for the benefits of protective clothing for the appeal group than for the control.

Mean differences were compared for the interaction of time × appeal by appeal level for the dependent variables Intention for Future Use. Results showed that there was again no significant difference between the change in response for the low appeal group compared to the change in response for the high appeal group from first to second questionnaire. The t-statistic, 2.92, for the change in appeal (low + high) versus the control (no appeal) was significant. The estimated mean difference for Intentions for Future Use was 0.152. This again

indicated a slightly greater increase in intentions to use protective clothing in the future for the appeal group than for the control.

Mean differences for the final dependent variable, Reported Behavior, compared the interaction of time × state × appeal with the level of appeal. No significant differences were found.

Least Squares Analysis of Covariance

The category of Prior Knowledge included in the first questionnaire was added to determine a level of previous knowledge on the subject of pesticides. A high level of prior knowledge has been found to modify the effects of a high fear appeal on past research.

The least squares analysis of variance model was again used adding Prior Knowledge as a covariate. The calculated F-statistic for all dependent variable categories indicated no significance, except in the category of Perceptions of Hazard where a value of 2.47 was significant at the 0.05 alpha level. The covariate, Prior Knowledge, was significant with an F value of 9.94. There was a significant relationship between Perception of Hazard and Prior Knowledge. The amount of previous knowledge on the subject was related to one's perception of the hazard of pesticides. The mean for Prior Knowledge was 15.5 for Michigan respondents and 17.9 for Tennessee. This would suggest a relatively high degree of previous knowledge on the subject of pesticides.

Demographic Characteristics

The demographic characteristics of the respondents was reviewed to determine if any variables were more represented than others and thus

contributing to variation in response. The response to these questions were generally low and incomplete. The discussion of the demographic characteristics (Tables X-XIII) will be presented in reference to the total sample. Of the total sample, response by state showed that 23.6 percent of the Michigan respondents grew fruit (Table X). The acreage farmed was generally quite large with more than seventy-five acres of fruit. No Michigan respondent reported farming of tobacco. However, there were other types of farming reported in that state. Field crops and livestock/dairy were reported by 18.6 percent and field crops alone were reported by another 13.7 percent. These farming operations consisted of 100 to over 500 acres by 34.4 percent of the sample.

Of the total sample, 14.7 percent of Tennessee respondents reported growing some fruit, but 32.4 percent stated it was primarily in small quantities of under five acres. Forty-five percent said they farmed tobacco. Sixty-five percent of the growers farmed large plots for tobacco of one to five acres. Tennessee respondents also farmed field crops and livestock/dairy (18 percent). Livestock/dairy exclusively was the second most common choice represented by 14.9 percent.

The use of pesticides (Table XI) by agricultural workers was also an area examined. Of the total sample 20 percent of the Michigan farmers reported using air blast pesticide application techniques more than 25 percent of the time, with 13.5 percent of that group using the method more than 75 percent of the time. Similarly, 44.6 percent stated they used hand held spraying equipment not at all or less than

Table X. Demographic Characteristics of Type of Farming by State

	Michigan		Tennessee	
	Frequency	Percent of N_T	Frequency	Percent of N_T
1. Do you grow fruit?				
yes	45	23.6	28	14.7
no	57	29.8	61	31.9
If yes, how many acres are farmed?				
under 5	7	9.5	24	32.4
5-10	5	6.8	2	2.7
11-25	11	14.9	0	0
26-50	5	6.8	0	0
51-75	3	4.1	2	2.7
over 75	14	18.9	1	1.4
2. Do you grow tobacco?				
yes	0	0	86	45.0
no	102	53.4	3	1.6
If yes, how many acres are farmed?				
under 1	0	0	16	18.0
1-2	0	0	27	30.3
3-5	0	0	31	34.8
6-10	0	0	9	10.1
11-15	0	0	0	0
over 15	0	0	4	4.5
3. What is the major type of farming done by you if other than fruit or tobacco?				
vegetable	10	6.2	7	4.4
field crops	22	13.7	7	4.4
nursery stock	5	3.1	0	0
livestock/dairy	2	1.2	24	14.9
field crops and livestock/dairy	30	18.6	29	18.0
vegetable and livestock/dairy	1	0.6	5	3.1
vegetable and field crop	5	3.1	5	3.1
other	9	5.6	0	0
How many acres of these are farmed?				
under 50	17	11.0	27	17.5
50-99	9	5.8	26	16.9
100-250	16	10.4	11	7.1
250-500	18	11.7	7	4.6
over 500	19	12.3	4	2.6

$N_T = 191$; $N_M = 102$; $N_{TN} = 89$.

Table XI. Demographic Characteristics of Pesticide Use by State

	Michigan		Tennessee	
	Frequency	Percent of N_T	Frequency	Percent of N_T
4. What would you estimate is the percent of your production that requires air blast spraying?				
none	56	30.3	42	22.7
less than 25%	7	3.8	28	15.1
25-49%	3	1.6	7	3.8
50-75%	9	4.9	4	2.2
more than 75%	25	13.5	4	2.2
5. What would you estimate is the percentage of your production that requires hand held spraying equipment?				
none	37	19.9	8	4.3
less than 25%	46	24.7	55	29.6
25-49%	7	3.9	6	3.2
50-75%	0	0	3	1.6
more than 75%	9	4.8	15	8.1
6. Who is the principal person involved in pesticide application on your farm?				
myself	87	45.8	77	40.5
a relative	5	2.6	10	5.3
farm employee	6	3.2	1	0.5
commercial applicator	2	1.1	1	0.5
other	1	0.5	0	0

$N_T = 191$; $N_M = 102$; $N_{TN} = 89$.

Table XII. Demographic Characteristics of Respondent by State

	Michigan		Tennessee	
	Frequency	Percent of N_T	Frequency	Percent of N_T
7. What is your age?				
under 25 years	8	4.2	0	0
25-34 years	24	12.6	11	5.8
35-44 years	20	10.5	19	10.0
45-54 years	23	12.0	14	7.3
55-64 years	18	9.4	31	16.2
65 and over	8	4.2	15	7.9
8. Check the highest level of education completed.				
eighth grade	3	1.6	27	14.4
high school	42	22.3	31	16.5
some college or business school	29	15.4	15	8.0
associate or 2-year degree	13	6.9	2	1.1
4-year college degree	10	5.3	6	3.2
attended graduate school	4	2.1	6	3.2

$N_T = 191$; $N_M = 102$; $N_{TN} = 89$.

Table XIII. Media Choices of Respondent by State

	Michigan		Tennessee	
	Frequency	Percent of N_T	Frequency	Percent of N_T
Where have you gotten new information about pesticides in the last month?				
University Extension	21	16.9	16	12.9
Growers Associations	0	0	0	0
Agricultural Reference Books	0	0	3	0
Agricultural Magazines	10	8.1	7	
TV	1	0	0	0
Radio	0	0	0	0
Newspapers	2	0	4	0
Pesticide Manufacturers	13	0.1	8	0.1
Pesticide Lables	5	0.1	7	0.1
U.T. Protective Garment Project	11	0.1	13	0.1
No New Information	4	0	3	0
Other	1	0	2	0

$N_T = 124$; $N_M = 67$; $N_{TN} = 57$.

25 percent of the time. Of the total sample, Tennessee farmers reported using air blast methods less than 25 percent of the time or not at all by 37.8 percent of the respondents. Tennessee did not make large use of hand held equipment either, 29.6 percent reported less than 25 percent use. Since the growers were working large quantities of tobacco, they most likely were using other methods of pesticide application such as boom or hi-boy equipment techniques. Only 4.3 percent reported no use of hand held equipment. Tennessee generally made more use of this method than Michigan.

The principal applicator of the pesticides was consistent across states. Of the total sample, 45.8 percent of the Michigan respondents and 40.5 percent of the Tennessee respondents stated that they themselves were the principal applicator.

Respondent personal characteristics (Table XII) were examined to determine variation across state. Michigan respondent's age was somewhat lower than Tennessee. Of the total sample 44.5 percent of the Michigan respondents were from 25 to 64 years of age, whereas 41.4 percent of Tennessee respondents were from 35 to over 65 years of age. The average age of Michigan respondents was 44 and 53 for Tennessee.

There were differences in the educational background of the respondents from both states. Michigan farmers had experienced higher levels of education than those from Tennessee. Of the total sample, respondents from Michigan having completed high school and some college or business school was 37.7 percent, while 30.9 percent of Tennessee

respondents completed eighth grade or high school. Fourteen percent of those from Michigan had some type of college degree, whereas only 7.5 percent of those from Tennessee had earned such degrees. The average number of years of education completed was 13 for Michigan respondents and 12 for Tennessee.

It can be seen that the demographic characteristics were quite uniform for the sample. The largest variation taking place between states in the form of farm type and method of pesticide application.

Media as Information Sources

Media used to supply new pesticide information to respondents during the testing period was considered as a potential source of variation in results. A profile of those media sources that were used by respondents was examined to determine if any effects appeared to be outstanding. Results were consistent across states. University extention sources were most commonly mentioned. Of the total sample, 16.9 percent of Michigan respondents and 12.9 percent of Tennessee indicated this as their primary source of new pesticide information (Table XIII). Pesticide manufacturers, The University of Tennessee Protective Garment Project, and agricultural magazines placed second, third, and fourth respectively for those in Michigan and third, second and fourth respectively for respondents from Tennessee.

Discussion

The fear appeal strategy was administered to test its effectiveness in changing attitude, intentions, and behavior. Several findings are significant.

The major conclusion drawn regarding the sample was that there was a significant difference among the dependent variables by state. Michigan pesticide applicators are different in their attitudes, intentions and behavior from those in Tennessee. Michigan respondents had a higher sensitivity to the benefits of protective clothing with greater intentions for future use than did Tennessee respondents. However, the Michigan group had a lower perception of hazard than did the group from Tennessee, but reported using protective clothing more frequently.

Demographic characteristics suggests some reasons for the difference. Michigan applicators were primarily fruit farmers using air blast spraying techniques. They experience greater hazard from dermal absorption, the number one cause of pesticide poisoning. Tobacco growers, the major group from Tennessee, experience potential pesticide poisoning from direct contact with the sprayed plants as they walk through the fields with hand held equipment, or from dermal exposure when using boom or hi-boy spray equipment. The fruit grower also sprays more frequently than tobacco growers and uses more highly toxic chemicals. Michigan farmers though not perceiving the magnitude of the problem as seriously as those from Tennessee were taking protective measures to a greater degree.

The appeal strategy did significantly alter the attitudes and intentions of the sample. The sample's perception of hazard from pesticides, their awareness of the benefits of protective clothing and their intentions to use the clothing in the future significantly

increased. The reported wearing of garments was also slightly higher after administering the appeal. The level of appeal did not significantly affect the change of attitude.

Several factors could have modified the effects of appeal. Past research on fear appeal effects on persuasion have suggested that high fear appeals are less effective than low when addressing an audience with a high degree of prior knowledge regarding the subject. Both Michigan and Tennessee indicated a relatively high level of previous knowledge on the subject of pesticides.

It has also been suggested from previous research that high fear appeals are more effective where the audience is representative of a lower socioeconomic background. Applicators from both states farmed large tracts for their respective operations and the largest single percent of respondents from both states had completed high school. This suggests that these farmers were not subsistence farmers and had a reasonable level of education which would justify not placing them in the lower socioeconomic category.

The media question which asked for sources of new information concerning pesticides might also provide insight. Approximately 75 percent of the respondents to this question from each state reported receiving new pesticide information from some source other than this project during the test period. Any one of all of these could have had significant effects on the impact of the administered fear appeal at any level.

Summary

Findings can be used to test the null form of the research hypotheses.

Null Hypothesis One

Attitudes regarding pesticide protection during application will not change with the introduction of pesticide information and alternatives. Analysis indicated that attitude as measured by the dependent variables Perception of Hazard, Benefits of Protective Clothing (and Intentions for Future Use) had positively and significantly changed after the administration of the fear appeal strategy. Therefore, null hypothesis one was rejected.

Null Hypothesis One A

Those workers exposed to a high fear appeal strategy will not experience greater attitude change than those exposed to a low fear appeal strategy. Analysis indicted that attitude as measured by the dependent variables Perception of Hazard and Benefits of Protective Clothing had not significantly changed from the high fear appeal group to the low fear appeal group over time. Null hypothesis one A can not be rejected.

Null Hypothesis One B

Those workers exposed to a high fear appeal strategy will not experience greater change in attitudes concerning future use than those exposed to a low fear appeal strategy. Analysis showed that Intentions

for Future Use as a dependent variable had not changed significantly. Null hypothesis one B can not be rejected.

Null Hypothesis Two

Actual behavior will not change with the introduction of pesticide protection information and alternatives. Analysis showed that Reported Behavior as a dependent variable had not changed significantly after the administration of the fear appeal. Null hypothesis two can not be rejected.

Null Hypothesis Two A

Those workers exposed to the high fear appeal strategy will not experience greater behavior change than those exposed to the low fear appeal strategy. Analysis indicated that the change in reported behavior had not significantly changed from the high fear appeal group to the low fear appeal group over time. Null hypothesis two A can not be rejected.

Null Hypothesis Two B

There will not be a high positive relationship between intentions to use and actual behavioral change. Analysis showed that there was no significant relationship between intentions and behavior. Null hypothesis two B can not be rejected.

It can be concluded that the fear appeal strategy as a whole was effective in changing attitudes, including intentions, but not behavior. There was no significant difference, however, between the level of fear appeal administered.

CHAPTER V

SUMMARY OF RESULTS

Summary, Results and Conclusions

This research evaluated the effectiveness of a fear appeal strategy on persuasion. Three levels of an emotional appeal strategy were administered to pesticide applicators from Michigan and Tennessee. The strategy attempted to raise the level of respondent anxiety to a point where they would accept and use protective garments as a preventive health measure.

A questionnaire indicated attitude and behavior before the fear appeal strategy. The strategy was then administered in three levels, high, low and control (receiving no appeal). A second questionnaire was then given which measured any change in attitude or behavior. A $2 \times 2 \times 3$ factorial split plot design was used to test the effects of time, state and fear appeal on the dependent variables, Perception of Hazard, Benefits of Protective Clothing, Intentions for Future Use and Reported Behavior.

Results indicated that there was a significant difference between Michigan and Tennessee in response and there was a significant change from first to second questionnaire on the attitude measures. Examination of the differences in response over time showed that the fear appeal was significant in change of attitude, but not behavior. Differences between the groups receiving the different fear appeal levels was not significant. Several factors were considered as potential modifiers of the effectiveness of the fear appeal.

Other situations may have affected the degree of persuasion. The nonmonotonic curve of high fear appeal effectiveness illustrated by Ray and Wilkie (Figure 1, p. 21), suggests that a moderate level of fear may prove most effective. It is recognized that the three fear appeal levels in this research may not have achieved the ideal level for this type of fear with this particular audience. The low fear appeal may have been too low while the high appeal was too high. Perhaps, neither level was sufficiently high to illicit the desired response.

Pesticide applicators have long been confronted by the potential hazards of pesticide use. Individuals tend to discount future events particularly if they have a vector of probability of occurrence to justify such actions. Potential risk can also be internalized and screened out. Pesticide applicators can overcome dissonance by choosing what they wish and ignoring that which they do not wish to hear. These situations could have interfered with processing of information anywhere along the hierarchy of response. As McGuire has pointed out, the probability of achieving the desired expectant behavior is indeed, quite small.

The degree of previous knowledge of pesticides was high for the sample. Demographic characteristics showed respondents from Michigan were primarily fruit growers and those from Tennessee tobacco growers. Both groups reported large agricultural operations. The Michigan group reported use of air blast spraying more frequently than Tennessee. Tennessee more frequently used hand held spray equipment. Both state groups reported most often applying pesticides themselves. The Tennessee group was somewhat older and less well educated than the group from Michigan, though the largest response from both states indicated

they had at least a high school education. The majority of the sample from both states indicated receiving new pesticide information from some other source during the testing period.

The findings led to the conclusion that the dissemination of pesticide information in the form of a fear appeal can have a significant effect on attitude persuasion, but less on behavior. The level of fear contained within the appeal did not appear to be significant for the groups sampled. Factors such as previous knowledge of the subject, demographic characteristics, and other information sources may have modified the actual effectiveness of the appeal.

Limitations

The acceptance of protective garments as an innovative product by pesticide applicators is a complicated process. This study examined only a small segment of this process. Therefore, some limitations must be kept in mind when considering conclusions.

Conclusions regarding pesticide applicators from Michigan and Tennessee can be inferred, but extrapolation to other groups in other regions is difficult because of the geographic differences in response indicated in this study. Respondents also represented only 20 percent of the initial sample sent questionnaires in both states. It is possible that this participating group may have some unique and unidentified characteristic not possessed by the nonparticipating pesticide applicators that may have contributed to the results of the research.

The potential interference of other media sources of new information about pesticides during the testing period was not

controlled. An attempt was made to acknowledge their presence and potential modifying effects. Any one or all of these outside information sources could have compounded or modified the effects of the fear appeal and thereby altered the true effectiveness of the strategy on persuasion. In a similar consideration, there was no control of potential respondent interaction. Past research has shown that agricultural workers are very sensitive to the feelings, activities and suggestions of neighbors and friends. This effect could have influence on attitude and behavior which has been attributed to the fear appeal strategy.

A further limitation on the results of reported use of pesticide clothing was the choices of protective garments available. The forms of protective clothing which could be used may not be considered a viable alternative and therefore discounted. This might explain the discrepancy in results for behavior and the attitude measure. It is also possible that a sufficient passage of time was not allowed for actual behavior change to occur.

The fear appeal did not show significance by level. It is considered that the optimum degree of anxiety was not attained. An insufficient amount or an excessive amount of anxiety would have negated the effects of the high fear appeal.

There was also no real check on whether the appeals had been read and comprehended. This was one reason for using three flyers on different occasions in each appeal to help encourage cognition, but there was no guarantee that this did occur.

Also, results may have been more significant with further refinement of the instrument. Intra-item correlations with dependent

variable categories were not high for either the first or second questionnaire. A better job of framing the category questions may have yielded more significant results.

Finally, it must be kept in mind that the significant effects of the fear appeal may not have been attributed to the actual appeal, but rather the repeated contact and focus of attention on the subject of pesticides and their potential risk to health.

Contributions

The objectives of this research were to evaluate a strategy for the dissemination of pesticide garment information that would encourage product adoption, to contribute to the theoretical background by adding empirical support to fear appeals as communication strategies, and to better understand the behavior underlying applicator adoption and use of protective clothing.

Research results have implications for those individuals in organizations or agencies who are in a position to modify attitudes and behavior of a segment of the population. Findings may provide marketers or those striving for innovative product adoption with practical guidelines for implementing a persuasive fear appeal strategy.

The importance of target market segmentation and identification of potential modifying variables cannot be over stressed. Government agencies and others concerned with public health and safety can draw from these findings in developing an effective method to encourage preventive health behavior.

Recommendations for Future Research

The appropriateness of a particular appeal is based heavily upon the communication choices used to convey the chosen message. Future research would benefit from varying the media and method of dissemination. An appeal presented to an audience using various sources of media should be investigated. This arrangement would overcome some of the difficulties experienced with the mailed appeals.

A major concern with any mailed survey is size of the response. Maximum cooperation is sought from the sample selected. However, returns are generally low. An audience presentation offers the researcher a captive sample where maximum response can be expected. Response is also immediate with no delays experienced as in mailed surveys. There would be built-in controls on respondent interaction and influence from other information sources.

Actual behavior could be investigated after a longer period of time lapsed. The logistics of the current mailed survey required reported wearing of the garments to be examined simultaneously with the other attitude measures. Past research has suggested that more time is necessary to alter behavior than attitude (Rogers and Shoemaker, 1971).

It is also recommended that the mailed fear appeal strategy and others be tested when the innovative garment is available for use. It is difficult for applicators to change behavior in the direction suggested when the appropriate garment solution is not obtainable.

An examination of the most appropriate time to administer an appeal for maximizing effectiveness should be undertaken. The present appeal

was sent during the spraying season. It was expected that applicators would be most receptive then because they were actually engaged in applying the potential poison. An argument for another occasion might rest upon the notion that applicators are actually too busy during the peak of the spraying season to cooperate in surveys regardless of their nature.

Future research should focus on the identification of a target market most responsive to the innovative protective garment. It is necessary to test effective strategies with various groups of potential users. Agricultural workers in different regions and performing different types of operations should be investigated. Research should address the differences between private and commercial applicators in regard to garment acceptance. Commercial applicators spend more time spraying and may perceive a greater need for preventive health behavior.

The Health Belief Model which formed the present research framework suggests that individual personality factors might tend to modify the likelihood of taking the recommended preventive health action. The objectives of this research did not include examining these factors. Past research on fear appeal effectiveness has found that individuals who can cope with anxiety are less affected by fear appeals. Future research might identify those personality characteristics possessed most commonly by agricultural workers and test their interaction effect on the administered fear appeal strategy.

Lastly, research should examine the effectiveness of other types of fear besides the fear of physical consequences upon the pesticide

applicators. The fear of social disapproval may actually constitute a larger threat to agricultural workers than the fear of physical poisoning. They may have become callus to the repeated warnings of physical injury from protection agencies and their sensitivity to neighbors and friends may propose a more real threat to them personally.

Many avenues of investigation remain open in this research area. It has been shown that fear appeals can be an effective means of persuasion. It remains to be examined which groups would respond most favorably to this strategy and which type of fear would elicit the greatest response. Other media and dissemination methods should be tested. Fear appeals were shown to be a significant effect on change of attitude in this research, but further work is needed to determine if these appeals are able to encourage actual behavior change resulting in the final test of product adoption.

REFERENCES

REFERENCES

Advertising Management, ed. D. Aaker, Englewood Cliffs: Prentice-Hall, Inc., 1975.

Aler-Mantalvo, M. Cultural change in a Costa Rican village. Human Organization, 1957, 15, 2-7.

Apodaca, A. Corn and custom: Introduction of hybrid corn to Spanish American farmers in New Mexico. Human Problems in Technological Change. ed. E. H. Spicer. New York: Russell Sage Foundation, 1952.

Becker, G. A theory of allocation of time. Economic Journal, 1965, 75, 493-517.

Becker, M. H., Drachman, R. H., and Kirscht, J. P. A new approach to explaining sick-role behavior in low-income populations. American Journal of Public Health, 1974, 64, 205-16.

Becker, M. H., and Maiman, L. A. Sociobehavioral determinants of compliance with health and medical care recommendations. Medical Care, 1975, 13, 10-24.

Brander, L., and Strauss, M. A. Congruence versus profitability in the diffusion of hybrid sorghum. Rural Sociology, 1959, 24, 381-383.

Branson, D. H. Assessment of thermal response of subjects wearing functionally designed protective clothing. Unpublished doctoral dissertation, Michigan State University, 1982.

Burnett, J., and Oliver, R. Fear appeal effects in the field: a segmentation approach. Journal of Marketing Research, May 1979, 16, 181-190.

Burnett, J., and Wilkes, R. Fear appeals to segments only. Journal of Advertising Research, October 1980, 20, 21-4.

Calebresi. The Cost of Accidents. New Haven: Yale University Press, 1970.

Campbell, D. T. Social attitudes and other acquired behavioral dispositions. Psychology: A Study of a Science, ed. S. Koch. New York: McGraw-Hill, 1963, vol. 6.

Chu, G. Fear arousal, efficacy, and imminency. Journal of Personality and Social Psychology, 1966, 4, 517-524.

Churchill, G. A., Jr. Marketing Research: Methodology Foundations. Hinsdale: Dryden Press, 1979.

Coombs, C. H. Theory and methods of social measurement. Research Methods in the Behavioral Sciences. ed. Festigner and Katz. New York: Dryden, 1953.

Cronbach, L. J. Coefficient alpha and the internal structures of tests. Psychometrika, September 1951, 16(3), 297-334.

Dabbs, J. M., and Leventhal, H. Effects of varying the recommendations in a fear-arousing communication. Journal of Personality and Social Psychology, 1966, 4, 525-531.

Engel, J. F., Kollet, D. T., and Blackwell, R. D. Consumer Behavior. New York: Holt, Rinehart and Winston, Inc., 1973.

Eramus, C. J. Agricultural change in Haiti: Patterns of resistance and acceptance. Human Organization, 1952, 11, 20-26.

Evans, R., Rozelle, R., Lasater, T., Dembroski, T., and Allen, B. Fear arousal persuasion and actual versus implied behavioral change. Journal of Personality and Social Psychology, October 1970, 16, 220-7.

Farm workers dealing with pesticides: Proposed health and safety standards. Federal Register, May 10, 1974, 39, 9457-9460.

Federal working group on pest management. Proceedings of the National Conference on Protective Clothing and Safety Equipment for Pesticide Workers. Washington, D.C., 1972.

Fishbein, M. Attitude and the prediction of behavior. Attitude Theory and Measurement. ed. M. Fishbein. New York: Wiley, 1967.

Fliegel, F. C., and Kivlin, J. E. Farm practice attributes and adoption rates. Social Force, 1962, 40, 364-370.

Fliegel, F. C. et al. A crossnational comparison of farmers' perceptions of innovations as related to adoptive behavior. Rural Sociology, 1968, 33, 437-449.

Frandsen, K. Effects of threat appeals and media of transmission. Speech Monographs, 1963, 30, 101-104.

Friedman, Milton. Capitalism and Freedom. Chicago: University of Chicago Press, 1962, Chap. IX.

Goldstein, M. The relationship between coping and avoiding behavior and response to fear-arousing propaganda. Journal of Abnormal Social Psychology, 1959, 11, 359 (abstract).

Haefner, D. D. Arousing fear in dental health education. Journal of Public Health Dentistry, 1965, 25, 140-146.

Henry, M. S. Users' perceptions of attributes of functional apparel. Unpublished master's thesis, Michigan State University, 1980.

Higbee, K. L. Fifteen years of fear arousal: Research on threat appeals: 1953-1968. Psychology Bulletin, 1969, 72, 426-444.

Hovland, C. I., Janis, I. L., and Kelley, H. H. Communication and Persuasion. New Haven: Yale University Press, 1953.

Insko, C., Arkoff, A., and Insko, V. Effects of high and low fear-arousing communications upon opinions toward smoking. Journal of Experimental Social Psychology, 1965, 1, 256-266.

Jackob, P. E., and Flink, J. J. Values and their function in decision-making. American Behavioral Scientist, Suppl., 1962, 9, 1-38.

Janis, I., and Feshbach, S. Effects of fear-arousing communications. Journal of Abnormal and Social Psychology, January 1953, 48, 78-92.

Janis, I., and Terwilliger, R. An experimental study of psychological resistances to fear-arousing communications. Journal of Abnormal and Social Psychology, 1962, 65, 403-410.

Jones, J. C. Design Methods: Seeds of Human Futures. New York: Wiley-Interscience, 1970.

Kivlin, J. F. Characteristics of farm practices associated with rate of adoption. Unpublished doctoral dissertation, Pennsylvania State University, 1960.

Kivlin, J. F., and Fliegel, F. C. Differential perceptions of innovations and rate of adoption. Rural Sociology, 1967, 32, 78-91.

Leventhal, H. Findings and theory in the study of fear communications. Advances in Experimental Social Psychology. ed. L. Berkowitz. New York: Academic Press, 1970, vol. 5, 119-187.

Leventhal, H., and Niles, P. Persistence of influence for varying durations of exposure to threat stimuli. Psychological Reports, 1965, 16, 223-233.

Lewan, P. C., and Stotland, E. The effects of prior knowledge on susceptibility to an emotional appeal. Journal of Abnormal and Social Psychology, 1961, 62, 450-453.

Likert, R. A technique for the measurement of attitude. Archives of Psychology, 1932, 140, 1-55.

Maibach, H. I., Feldmann, R. J., Milby, T. H., and Serat, W. F. Regional variation in percutaneous penetration in man. Archives of Environmental Health, 1971, 23, 208-211.

McGuire, William. An information-processing model of advertising effectiveness. Paper presented at the Behavioral and Management Science in Marketing Symposium, University of Chicago, June 29-July 1, 1969.

Millman, S. Anxiety, comprehension, and susceptibility to social influence. Journal of Personality and Social Psychology, 1968, 9, 251-256.

Moore, H. Effects of fear-arousing communications on driving safety attitudes and driving behavior. Unpublished doctoral dissertation, University of Florida, 1965.

Neter, J., and Wasserman, W. Applied Linear Statistical Models. Homewood, Ill.: Richard D. Irwin, 1974.

Newcomb, T. M., Turner, R. H., and Converse, P. E. Social Psychology. New York: Holt, Rinehart, and Winston, 1965.

Niles, P. The relationship of susceptibility and anxiety to acceptance of fear-arousing communications. Unpublished doctoral dissertation, Yale University, 1964.

Occupational safety requirements for pesticides: 1973 hearings and proposed generic standards. Federal Register, 38, 20632-20364.

Orlando, J., Branson, D., Ayers, G., and Leavitt, R. The penetration of formulated guithion spray through selected fabrics. Journal of Environmental Science and Health, May 1981, 617-28.

Orlando, J., Branson, D., and Henry, M. Development and evaluation of protective apparel for pesticide applicators. Proceedings from the Determination and Assessment of Pesticide Exposure National Workshop. Hershey, Penn., October 1980.

Payne, I. Persuasibility and its relationship to affect, sex and type of persuasive appeal. Unpublished doctoral dissertaiton, Pennsylvania State University, 1963.

Peltzman, S. The effects of automobile safety regulations. Journal of Political Economy, August 1975, 83, 677-725.

Peter, J. P. Reliability: A review of psychometric basics and recent marketing practices. Journal of Marketing Research, February 1979, 16, 6-17.

Powell, F., and Miller, C. Social approval and disapproval cues in anxiety-arousing communications. Speech Monographs. June 1967, 152-159.

Ray, M., and Wilkie, W. Fear: The potential of an appeal neglected by marketing. Journal of Marketing, January 1970, 34, 54-62.

Readings in Attitude Theory and Measurement. ed. M. Fishbein. New York: John Wiley and Sons, 1967, 257-266.

Robertson, T. S. The process of innovation and the diffusion of innovation. Journal of Marketing, 1967, 31, 14-19.

Rogers, E. M., and Shoemaker, F. F. Communication of Innovations. New York: The Free Press, 1971.

Rosenstock, I. M. Why people use health services. Milbank Memorial Fund Quarterly, 1966, 44, 94-121.

Ryan, B., and Gross, N. C. The diffusion of hybrid seed corn in two Iowa communities. Rural Sociology, 1943, 8, 15-24.

Schramm, Wilbur. How communication works. The Process and Effects of Mass Communication. ed. W. Schramm, Urbana, Ill.: University of Illinois Press, 1961, 3-26.

Spence, H., and Moinpous, R. Fear appeals in marketing--a social perspective. Journal of Marketing, July 1972, 36, 39-43.

Staelin, Richard. The effects of consumer education on consumer product safety behavior. Journal of Consumer Research, June 1978, 5, 30-40.

Sternthal, B., and Craig, C. S. Fear appeals: Revisited and revised. Journal of Consumer Research, December 1974, 1, 22-34.

Stuteville, J. Psychic defenses against high fear appeals: A key marketing variable. Journal of Marketing, April 1970, 34, 39-45.

Thurstone, L. L. Attitudes can be measured. American Journal of Sociology, January 1928, 33, 529-54.

Torgerson, W. S. Theory and Methods of Scaling. New York: John Wiley and Sons, 1958.

Wilkening, E. A. Informal leaders and innovators in farm practices. Rural Sociology, 1952, 17, 272-275.

APPENDIXES

APPENDIX A

Table A-1

Item Number by Questionnaire for Dependent Variable Category

Behavior		Intentions		Benefits of Protective Clothing		Perception of Pesticide Hazard		Prior Knowledge of Pesticide
first	sec	first	sec	first	sec	first	sec	first
25	*	29	11	2	1*	1		6
26	9*	30	*	7	4	3	2*	10*
27	10*	31	12	8	5	4	3*	12*
28		33	14	9	*	5	*	14*
32	13	34	*	11		13		15
36	15*	35		17	6*	22	7	16*
37	*	38	16	19		23	*	18
39	*	40		21	*	24	8	20

*Polarity reversed.

APPENDIX B

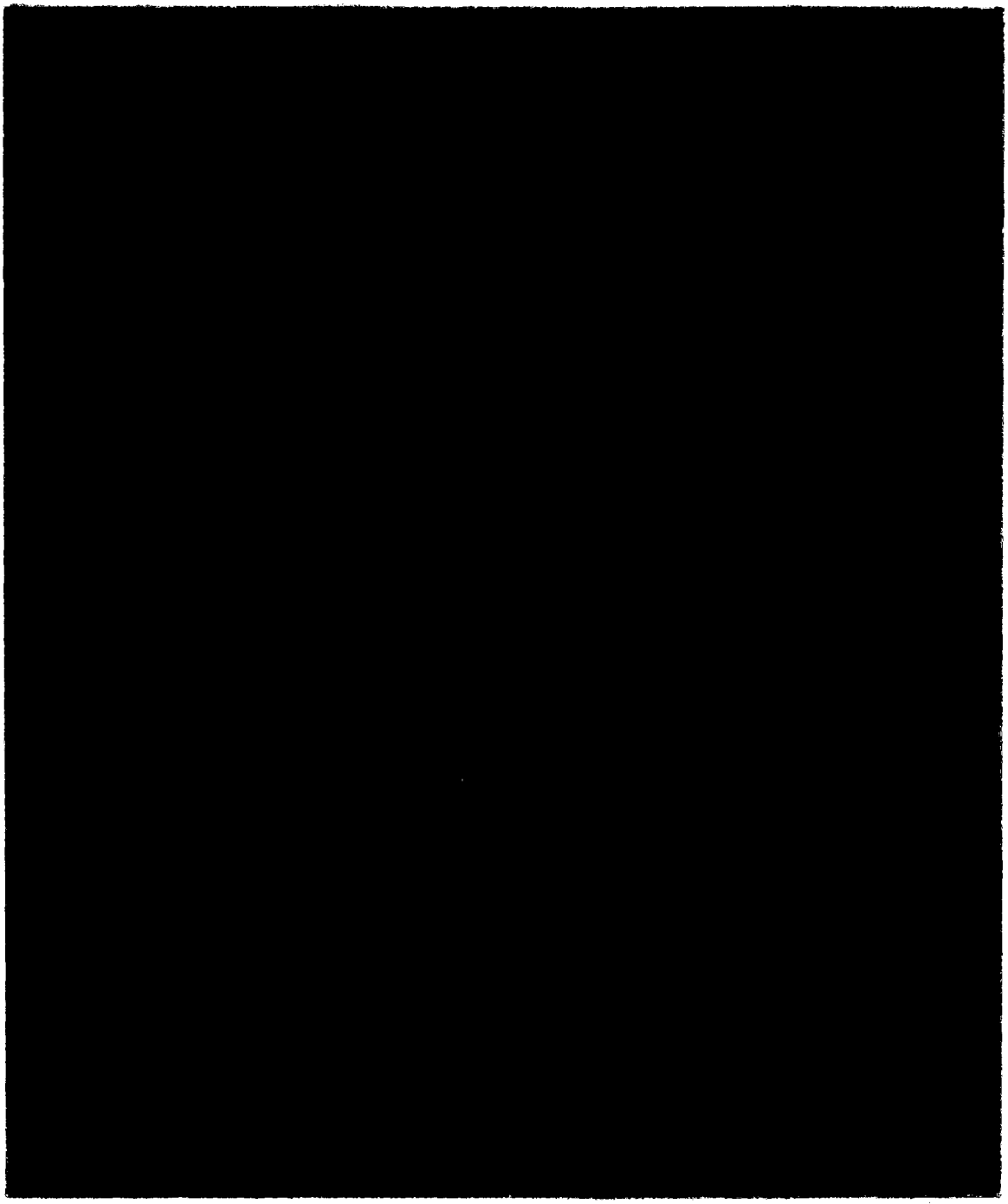


Figure B-1. First questionnaire.

	always	usually	sometimes	hardly ever	never
36. I would not use special clothing in the future because the time involved in changing clothes would interfere with my farm work.	1	2	3	4	5
37. I will use a protective garment in the future, only if I am convinced it is comfortable.	1	2	3	4	5
38. During the past spraying season, I purchased special protective garments for the sole purpose of pesticide protection.	1	2	3	4	5
39. In the future, when I spray in extremely hot weather, I will wear only cool summer weight clothing.	1	2	3	4	5
40. During the past spraying season, I changed my clothes immediately after applying pesticides.	1	2	3	4	5

CHECK THE APPROPRIATE RESPONSE.

1. Do you grow fruit? _____ yes _____ no

   If yes, how many acres are farmed?
   _____ under 5 _____ 11-25 _____ 51-75
   _____ 5-10 _____ 26-50 _____ over 75

2. Do you grow tobacco? _____ yes _____ no

   If yes, how many acres are farmed?
   _____ under 1 _____ 3-5 _____ 11-15
   _____ 1-2 _____ 6-10 _____ over 15

3. What is the major type of farming done by you if other than fruit or tobacco?
   _____vegetable _____livestock/dairy
   _____field crops _____field crops & livestock/dairy
   _____nursery stock _____other specify

   How many acres of these are farmed?
   _____ under 50 _____ 100-250 _____ over 500
   _____ 50-99 _____ 250-500

4. What would you estimate is the percentage of your production that requires air blast spraying?
   _____none _____25-49% _____more than 75%
   _____less than 25% _____50-75%

5. What would you estimate is the percentage of your production that requires hand held spraying equipment?
   _____none _____25-49% _____ more than 75%
   _____less than 25% _____50-75%

6. Who is the principal person involved in pesticide application on your farm?
   _____myself _____farm employee
   _____a relative _____commercial applicator
   _____other (specify)

7. What is your age?
   _____under 25 yrs. _____35-44 _____55-64 yrs.
   _____25-34 yrs. _____45-54 _____65 and over

8. Check the highest level of education completed.
   _____eighth grade _____associate or 2-yr. degree
   _____high school _____4-yr. college degree
   _____some college or business school _____attended graduate school

PROTECTIVE CLOTHING PROJECT
UNIVERSITY OF TENNESSEE
COLLEGE OF HOME ECONOMICS
DEPT. TMD
KNOXVILLE, TN 37916

We need to know how you feel about pesticides and their use. We are trying to determine the best way to inform farmers like yourself about a new and improved protective garment to be worn during pesticide spraying. Your response to this questionaire will be of great help.

In responding consider:
1. A tractor cab is not available.
2. The pesticides referred to are highly toxic.
3. A protective garment is meant to be a body covering, not hats, gloves or goggles.
4. A pesticide is considered to be any chemical used to control unwanted pests, including insecticides, herbicides, fungicides, etc.

Your speedy return of the questionnaire in the postage paid envelope would be greatly appreciated.

Thank you.

Sincerely,

Jacquelyn DeJonge
Department Head

Shally Carlson
Graduate Assistant

CIRCLE THE NUMBER WHICH BEST DESCRIBES THE WAY YOU FEEL.

	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree
1. Every time I spray I am exposed to harmful levels of pesticides.	1	2	3	4	5
2. It is <u>not</u> necessary for me to use any special protective clothing while I am applying pesticides.	1	2	3	4	5
3. I think authorities have overstated the hazards of pesticide exposure.	1	2	3	4	5
4. My past repeated spraying of pesticides is <u>not</u> harmful to my future health.	1	2	3	4	5
5. I am more concerned with pesticide hazards during mixing and handling than during spraying.	1	2	3	4	5
6. Pesticide manufacturers are required by law to provide on their label information needed to use the product safely.	1	2	3	4	5
7. A long-sleeve shirt and jeans do not provide as much protection as needed from pesticide exposure.	1	2	3	4	5
8. The extra time necessary to put on and take off special protective garments is overcome by the increased protection they offer.	1	2	3	4	5
9. Protective garments <u>cannot</u> provide protection from pesticide accidents.	1	2	3	4	5
10. Severe illness will <u>not</u> result from repeated exposure to pesticides if it is in small amounts only.	1	2	3	4	5
11. Purchasing special protective garments is a necessary financial expenditure.	1	2	3	4	5
12. It is <u>not</u> necessary to launder clothes worn while applying pesticides after every use. It's best to wait until the end of the season.	1	2	3	4	5
13. I am concerned with emotional suffering that a pesticide injury to me would place on my family and loved ones.	1	2	3	4	5

	strongly agree	agree	neither agree nor disagree	disagree	strongly disagree
14. Pesticides can enter the body by absorption through the skin, by breathing and by swallowing, but only the latter is serious.	1	2	3	4	5
15. For increased safety, it is recommended never to smoke, eat or drink while spraying pesticides.	1	2	3	4	5
16. Many of the newest and most used pesticides interfere with the central nervous system of the insects contacted, but have little effect on something as large as a man.	1	2	3	4	5
17. A special set of everyday work clothes does an adequate job of protecting me while I am applying pesticides.	1	2	3	4	5
18. If a pesticide poisoning victim complains of severe pain and shows signs of mouth and throat burns, the container label will state that vomiting should <u>not</u> be induced.	1	2	3	4	5
19. The extra protection provided by protective garments makes up for any discomfort they may cause.	1	2	3	4	5
20. Operators of air blast sprayers can receive hazardous amounts of pesticide fall-out on the head, upper torso, and on arms and the fronts of the lower legs.	1	2	3	4	5
21. No special protective garment can do an adequate job of eliminating the absorption of pesticide through the skin.	1	2	3	4	5
22. I am concerned that a pesticide injury would result in lost time from my job and high medical bills.	1	2	3	4	5
23. If hazard from pesticides was really a serious issue, pesticides would <u>not</u> be available for use.	1	2	3	4	5
24. I am so convinced that spraying pesticides is a health hazard that I would <u>not</u> spray the fields myself if I had that choice.	1	2	3	4	5

CIRCLE THE NUMBER WHICH BEST DESCRIBES YOUR ACTIONS.

	always	usually	sometimes	hardly ever	never
25. I will <u>not</u> buy a special protective garment in the future because the cost will be too high.	1	2	3	4	5
26. I will wear protective clothing in the future, only if I see other pesticide applicators wearing it.	1	2	3	4	5
27. In the future, I plan to wear regular work clothes rather than a special protective garment when applying pesticides.	1	2	3	4	5
28. If an improved protective garment is available in the future, I plan to try it.	1	2	3	4	5
29. During the past spraying season, I laundered the garments I wore while spraying pesticides separately from my other clothing.	1	2	3	4	5
30. During the past spraying season, I did <u>not</u> wear a respirator when applying pesticides.	1	2	3	4	5
31. During the past spraying season, I used a special protective garment.	1	2	3	4	5
32. If pesticide manufacturers were to provide free protective garments, I will wear them in the future.	1	2	3	4	5
33. During the past spraying season, I looked for more information on the types of protective garments available for pesticide application.	1	2	3	4	5
34. During the past spraying season, I did <u>not</u> wear gloves when spraying pesticides.	1	2	3	4	5
35. During the past spraying season, I wore a long sleeved shirt and long pants when applying pesticides.	1	2	3	4	5

APPENDIX C

Table C-1

Response Rate to Questionnaire by
Time and State

First		Second	
M_H = 41	T_H = 30	M_H = 25	T_H = 18
M_L = 33	T_L = 36	M_L = 19	T_L = 24
M_C = 47	T_C = 37	M_C = 23	T_C = 15
M = 121	T = 103	M = 67	T = 57
N = 224		N = 124	

APPENDIX D

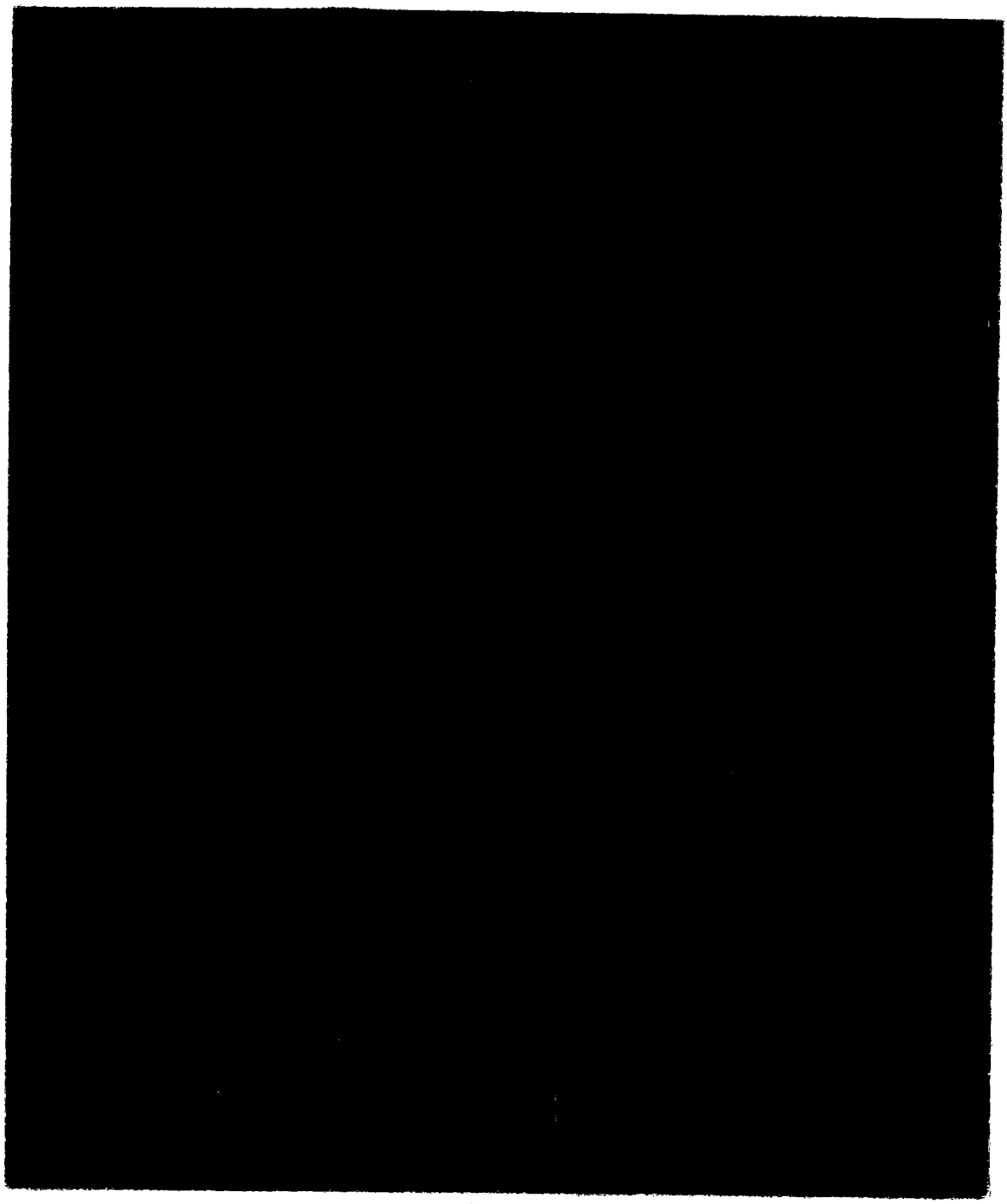


Figure D-1. Low fear appeal flyers.

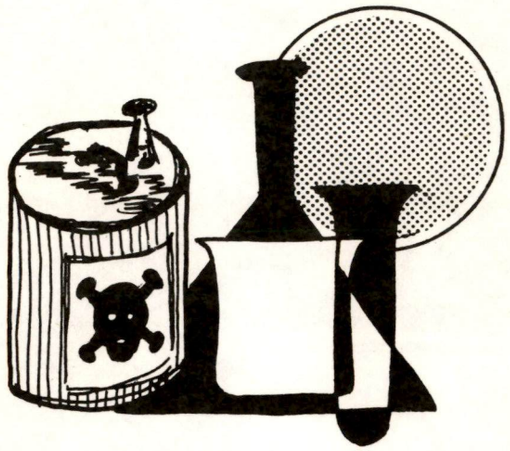
"If possible sterility is the main problem, couldn't workers who were old enough that they no longer wanted to have children accept such positions voluntarily? Or could workers be advised of the situation, and some might volunteer for such work posts as an alternative to planned surgery for a vasectomy or tubal ligation, or as a means of getting around religious bans on birth control when they want no more children."

"We do believe in safety in the work place," he added, "but there can be good as well as bad sides to a situation."

Or, perhaps your thoughts are on having a family.

Will you be able to fulfill these dreams?



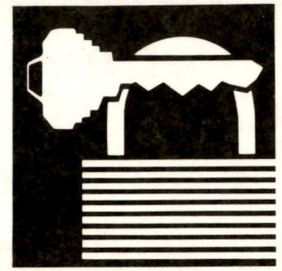


Chemicals proven to be carcinogenic have been banned from use. But that doesn't protect those agricultural workers already afflicted. Nor does it protect those like yourself who may be working with new chemicals where sufficient research has not been completed to substantiate their hazard. It can take decades for the harmful affects of cancer causing agents to appear. Will the chemicals considered safe today be proven to be **killers** ten years from now?

If you work with pesticides — remember,

Protective Clothing
Can
Protect Your Future
Health And Happiness!

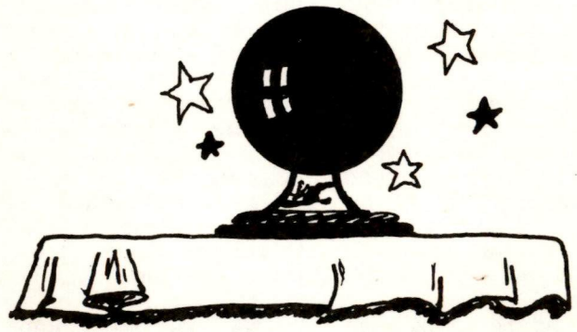
YOUR KEY TO PESTICIDE PROTECTION



THREE OF THREE

Prepared by UNIVERSITY OF TENNESSEE
DEPT. TEXTILES, MERCHANDISING AND DESIGN

What's In YOUR FUTURE?



Some pesticide applicators who have had no direct signs of poisoning during spraying have found **permanent physical disabilities** in their later lives!

One person out of every five will experience some form of cancer.

If you had a parent die of cancer,

of if you smoke cigarettes,

or if you receive excessive exposure to the sun,

your chances of developing cancer are increased.

Spraying pesticides and doing any of the above could increase your chances even more. . .

The New York Times, March 11, 1976 reports:

Wisconsin Liver Cancer Cases Linked to Use of an Insecticide

By JANE E. BRODY

An unusual cluster of cases of a rare liver cancer among residents of Wisconsin has suggested that farmers exposed to arsenic-based insecticides may be at risk of developing this cancer.

The cancer, called angiosarcoma of the liver, is the same disease that two years ago was found to be caused by occupational exposure to vinyl chloride, a chemical widely used in plastics manufacturing.

Prior to this discovery, the rare, fatal cancer had been associated with medical exposure to now-abandoned substances called Thorotrast and Fowler's solution. The cancer had also been reported among workers in Alsatian vineyards where arsenic insecticides were used.

The new finding in Wisconsin stems from an inquiry made by representative David R. Obey about several men in his central Wisconsin district who died recently of angiosarcoma.

Dr. Henry A. Anderson, who works with Dr. Irving Selikoff in the laboratory of environmental sciences at Mount Sinai Hospital here, went to Wisconsin to investigate. He found that since July 1974, four men had died of angiosarcoma at the Marshfield Clinic in Marshfield, Wis.

Dr. Anderson's investigation showed that all four had been raised on dairy and potato farms where, until about a decade ago, the insecticide calcium arsenate was widely used. In several cases, the families recalled mixing arsenic powders by hand to spray on barns and potato crops, Dr. Selikoff said.

Dr. Selikoff added that the Allied Chemical plant in Baltimore, where much of this insecticide was manufactured, recently was found to have an unexpectedly large number of lung cancer cases among its workers. In addition, he said, the cancer incidence among residents living near the plant is considerably higher than expected.

What is your chance of getting CANCER

Protective Clothing A Life Saver!!



Would you volunteer to be STERILIZED? Pesticide exposure could provide you the opportunity with no medical or moral obligation.

The New York Times, Sept. 27, 1977 reports:

Pesticide Work Suggested for Those Seeking Sterility

By DAVID BURNHAM

Special to The New York Times

WASHINGTON, Sept. 26 — A national agricultural group has suggested that older workers who do not want children and persons who would like to get around religious bans against birth control be allowed to handle a pesticide that has been known to cause sterility.

In addition to causing sterility, the widely used pesticide, called DBCP, or dibromochloropropane, has been shown to cause stomach and mammary cancer in rats. Also, according to health officials, a worker in Magnolia, Ark., with two years' exposure to the pesticide has recently developed cancer.

. . . "While involuntary sterility caused by a manufactured chemical may be bad, it is not necessarily so. After all, there are many people now paying to have themselves sterilized to assure they will no longer be able to become parents."

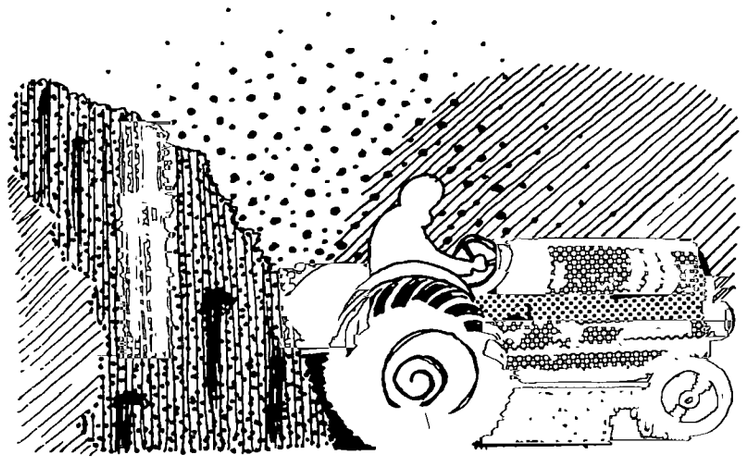
Sterility Found in Workers

The strong concern about the pesticide, a soil fumigant used since the 1950's to kill a tiny worm that destroys root crops, was set off by the discovery in July that 14 of 27 men handling the substance in California were sterile or had low sperm counts.

Skin exposure to these herbicides in a number of reported cases resulted in immediate disorders to the peripheral nervous system.
Symptoms include:

- **vomiting**
- **headache**
- **stomach pains**
- **reduced sensory perception including numbness to fingers and toes**
- **limb paralysis**

Symptoms last for weeks and months, and in some cases recovery is incomplete even after several years.



Protective clothing can save YOU from immediate and long-term suffering!!

The New York Times, March 19, 1980 reports:

Genetic Problems Linked To 2 Vietnam Defoliants

WASHINGTON, March 18 — Two Congressmen, both veterans of the Vietnam War, today released copies of what they said was a Veterans Administration memorandum describing the carcinogenic and genetics-altering aspects of the herbicides Agent Orange and Agent Blue, defoliants used by American troops in Vietnam to destroy enemy ground cover.

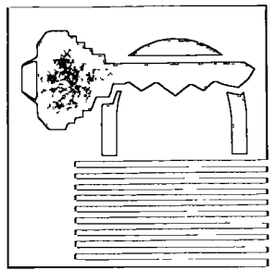
The memorandum, dated Oct. 12, 1977, described Agent Orange and Agent Blue, then said: "They are mutagens and tetratogenics. This means that they intercept the genetic DNA message process to an unborn fetus, thereby resulting in deformed children being born. Therefore, the veteran would appear to have no ill effects from exposure but he would produce deformed children due to this breakage in his genetic chain."

Veterans' groups have long maintained that Agent Orange has caused a variety of illnesses and cancer among servicemen exposed to the defoliants, as well as genetic defects in their offspring.

If you work with these dangerous herbicides . . .

Let Protective Clothing be your Health Insurance!!

YOUR KEY TO PESTICIDE PROTECTION



ONE OF THREE

Prepared by UNIVERSITY OF TENNESSEE
DEPT. TEXTILES, MERCHANDISING AND DESIGN

Pesticide Poisoning

Over 70% of all occupationally related pesticide poisonings are caused by ORGANOPHOSPHATES!

These poisons:

- **are acutely toxic to MAN**
- **can KILL on contact**
- **are a fast acting NERVE GAS**
- **ACCUMULATE in the body with repeated exposure**

Do YOU use these organophosphates?

Parathion **TEPP** **Diazinon**
Vapona **Dasanit**
Ethion **Malathion** **Guthion**

YOU could fall victim to these symptoms:

- **nausea & vomiting**
- **abdominal cramps & diarrhea**
- **muscular twitches & contraction of the pupil of the eye**
- **inability to walk & generalized weakness**

and even:

- **Unconsciousness!**
- **Respiratory Failure!**
- **DEATH!!!**



Carelessness and misuse can create problems as it did for . . .

John R. was unprepared to deal with applying an organophosphate compound.

In late July, 1969, a 24-year-old farm laborer became ill while applying a mixture of Phosdrin and naled (dibrom), to cabbage with ground spray equipment. He wore a respirator and gloves, but was unaware of the necessity for protecting his skin from contact with the spray material. He did not wear protective clothing on the arms and torso. Approximately two hours after starting work the man complained of headache and nausea. He continued to work with the spray material, however, and by late afternoon he experienced onset of marked muscular weakness. He was treated with atropine sulfate by a physician. The next morning severe headache, nausea and muscular weakness still persisted and the physician ordered hospitalization.

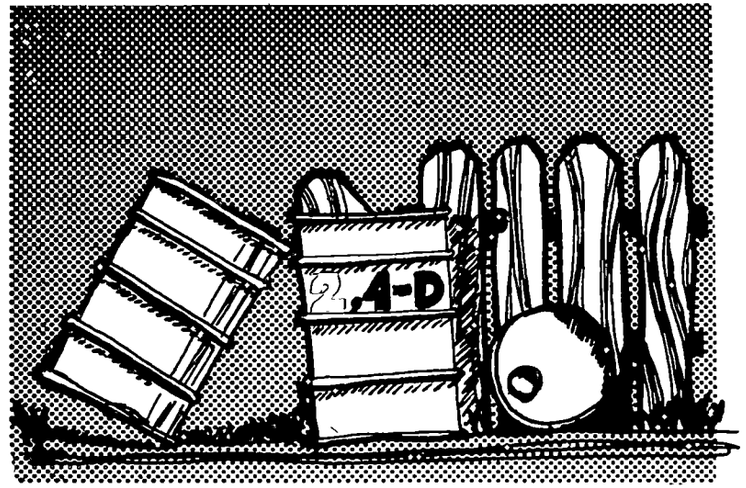
No follow-up was recorded for John. He could have experienced the same disaster that befell Joe S. after he was released from hospital treatment after parathion poisoning.

Joe was warned to take care with pesticides, but despite warning was again accidently sprayed with the organophosphate mixture he had previously been applying. He was found unconscious and died before any type of treatment could be administered.

Do You Wear Protective Clothing?

Herbicides can be dangerous, too!

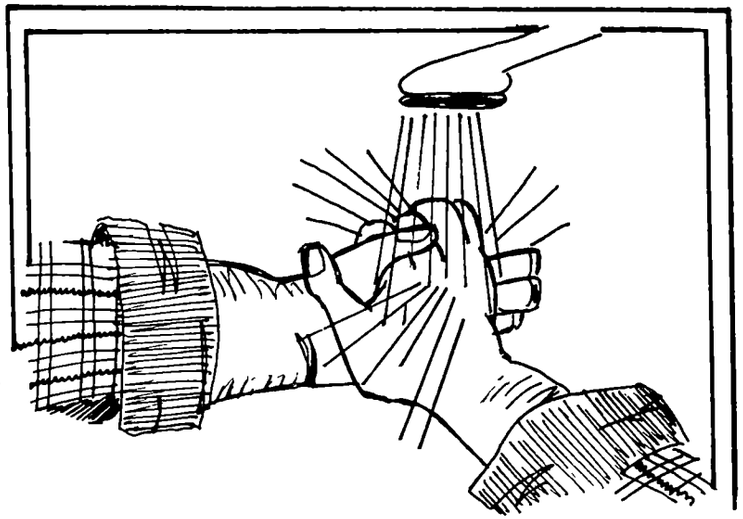
Do you use Paraquat?



Remember the defoliation attempts in Southeast Asia using herbicides and their resulting affects on the people. Those that lived experienced devastating effects ranging from cancer to sterility to deformed children, including:

- **Chromosomal changes leading to possible mutations in future generations**
- **Fetal wastage (stillbirths and miscarriages)**
- **Congenital malformations including**
  - **Cleft lip**
  - **Cleft palate**
  - **Spina bifida (open spine)**
  - **Down's syndrome (mongolism)**

Agent orange was contaminated with TC-DD and is not used for agricultural purposes in this country. But, PARAQUAT is . . .



Do you take the necessary precautions in clean-up after application?

Jane S. thought she was finished when she put down her sprayer. **Finished** . . . . . she may well have been.

A 27-year-old housewife was hospitalized during August, 1967, for treatment from over-exposure to malathion. She had applied the insecticide to a field crop a few hours earlier and had not bathed after the application. She required three days of hospitalization before being released.

Rose W. wasn't as lucky.

She was admitted to a rural Florida hospital on May 3, 1979 complaining of weakness, nausea and swelling. The previous day she had been transferred from her usual work detail and assigned to a crew spraying parathion in a sugar cane field. She died on May 4, 1979. She was 29 years old.

How do you clean your contaminated garments?

Jack T. didn't worry about it!

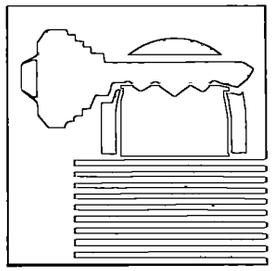
During early May, 1970, a 35-year-old farmer became so weakened, fatigued, and cyanotic (turned blue) that he was hospitalized the day after his symptoms first developed. Epidemiologic investigation revealed that he had worn work gloves for several days that were soaked with liquid Di-Syston which he had been incorporating into the soil.

On April 9, 1979 Edward C. was found lying unconscious on the ground beneath the spray rig he had been operating. He was admitted to a local hospital and treated for parathion poisoning. He was released on April 28, 1979. He died four days later, at home. He was 50 years old.

He no longer needs protective clothing!

Protect Your Life With *Clean Protective Clothing* And A Mind That Is *Thinking Safety!*

YOUR KEY TO PESTICIDE PROTECTION



TWO OF THREE

Prepared by UNIVERSITY OF TENNESSEE
DEPT. TEXTILES, MERCHANDISING AND DESIGN

Could You Be A Pesticide Statistic?

Pesticide poisonings occur primarily in July and August.

- 96% of all the occupational pesticide poisonings occur to **men.**
- The majority of occupational pesticide poisonings take place around **mid-afternoon.**
- Agricultural laborers from **25 to 44 years of age** represent the group with the highest number of occupational pesticide poisonings.

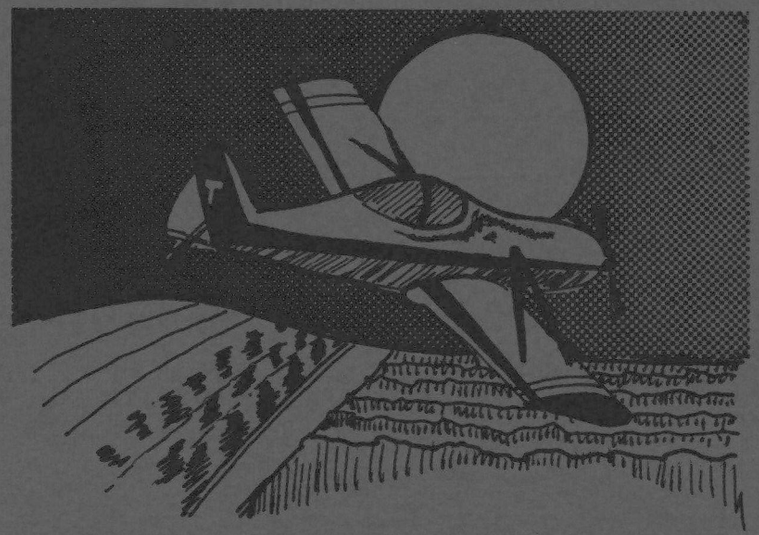
Do you fit into these categories?

Tony B., a 32-year-old commercial pesticide applicator was poisoned one afternoon in July.

He was employed as a pesticide mixer and loader for a fixed-wing crop dusting firm. He loaded the aircraft with a mixture of parathion 6-3 and toxaphene. Rubber gloves were the only protective clothing worn, and he was a heavy smoker.

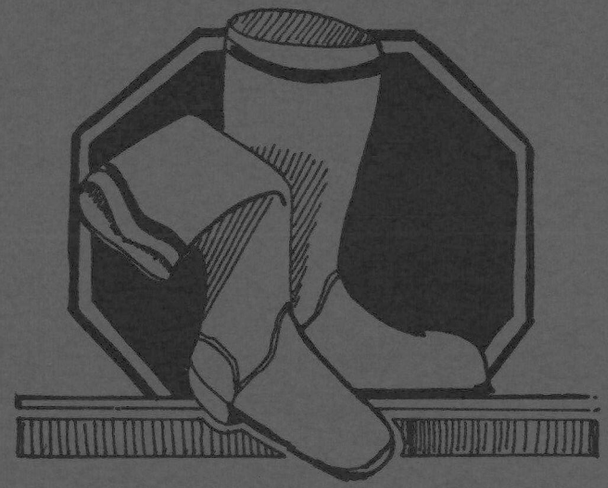
Even though there was no incidence of spillage or direct contact, Tony soon began to feel unwell. He was admitted during the afternoon to the emergency room of a local hospital. He complained of nausea, vomiting, weakness, and blurred vision. His pupils were constricted and there was profuse perspiration. After being put in a shower and scrubbed all over, he was given atrophine intravenously and he was transferred to the medical ward where he remained for several days.

Subsequent laboratory studies confirmed that the poisoning was due to an exposure to ethyl and methyl parathion.



Do YOU wear protective clothing?

It Can Save YOUR LIFE!

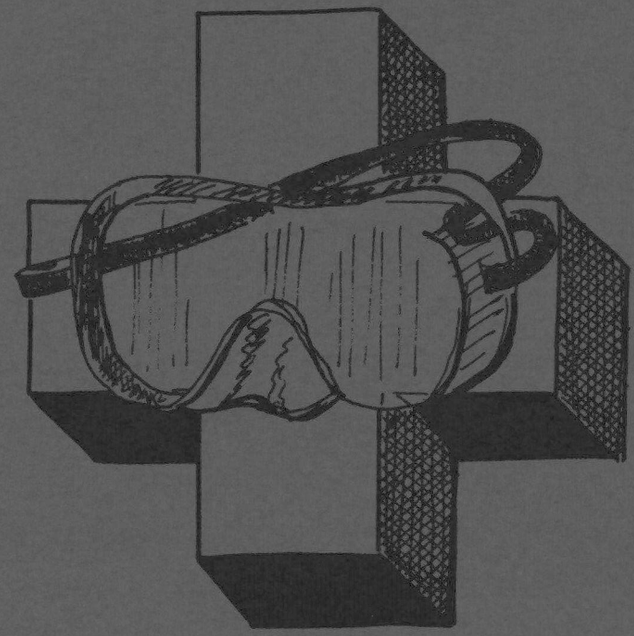


Do YOU use —

- **a RESPIRATOR?**
- **GLOVES?**
- **PROTECTIVE CLOTHING?**

Tom B. may have been properly clothed, but he wasn't thinking . . . SAFETY.

On July 14, 1971, a young man was helping his father apply parathion dust on a crop. The pesticide was being forced through a hose and nozzle at 60 pounds of pressure. When the nozzle became clogged with dust, he blew into the nozzle to clean it. The nozzle cleared so quickly that the youth received a blast of the dust in his face and mouth, thereby being exposed orally, dermally, and via the respiratory tract to parathion. He exhibited the following symptoms: constricted pupils, difficulty in breathing, tremor, fasciculations (muscular twitching), and weakness. He also developed acute pulmonary edema and paralysis. Hospitalization was required to save his life.



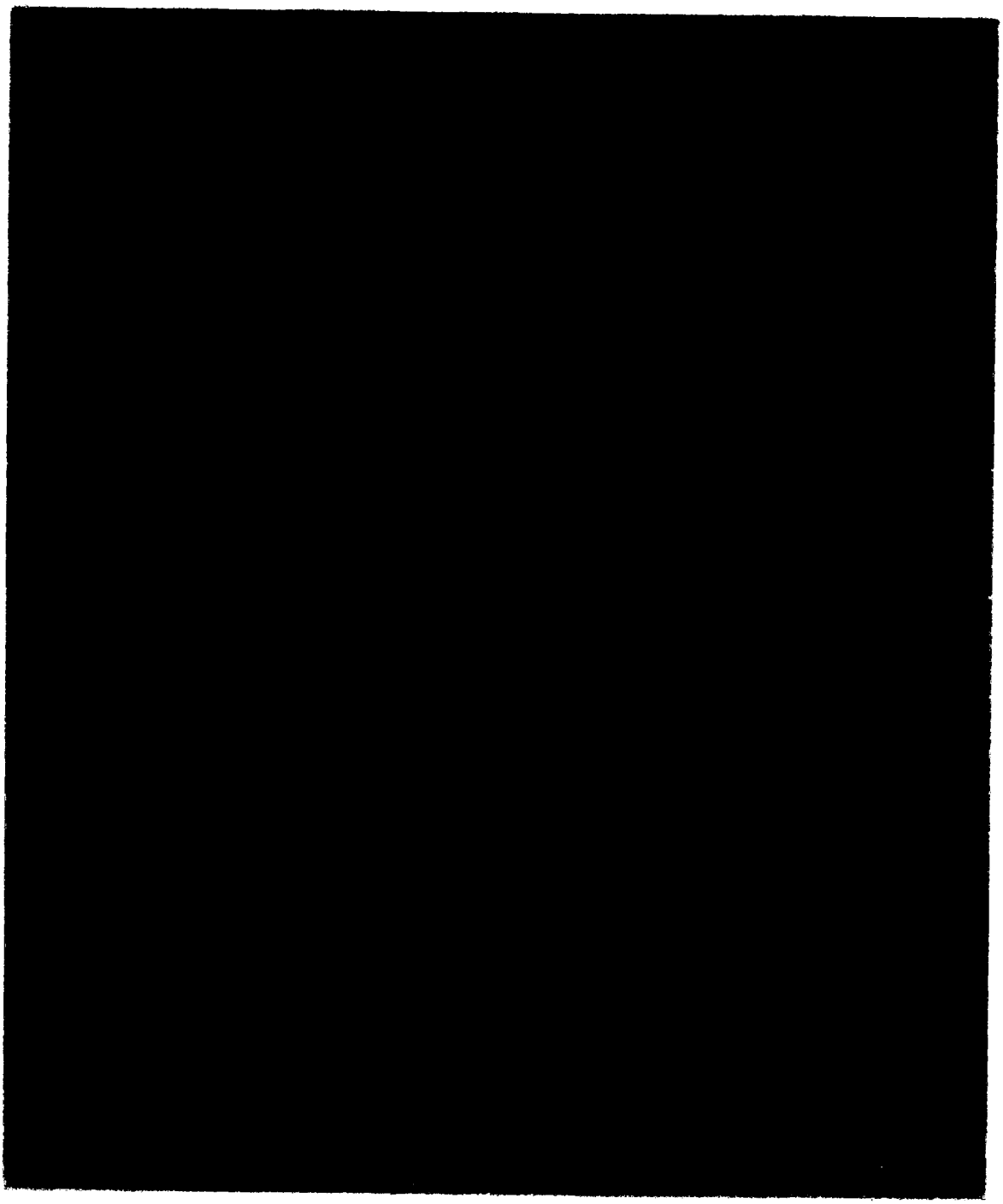


Figure D-2. High fear appeal flyers.

PROTECTIVE
CLOTHING
PROJECT
UNIVERSITY OF TENNESSEE
COLLEGE OF HOME ECONOMICS
DEPT. TMD
KNOXVILLE, TN. 37916

June, 1982

This is the final survey of your current feelings about pesticides and their use. Your response is very important in helping us to know how best to tell farmers like yourself about our new protective garment.

In responding consider:

1. A tractor cab is <u>not</u> available.
2. The pesticides referred to are <u>highly</u> <u>toxic</u>.
3. A protective garment is meant to be a <u>body</u> <u>covering</u>, not hats, gloves or goggles.
4. A pesticide is considered to be any chemical used to control unwanted pests, including insecticides, herbicides, fungicides, etc.

Your speedy return of the questionnaire in the postage paid envelope would be greatly appreciated.

Thank you.

Sincerely,

Jacquelyn DeJonge
Department Head

Shally Carlson
Graduate Assistant

P.S.

Where have you gotten new information about pesticides in the past month? (For example: university extension, newspapers, product manufacturers, etc.)

Please specify _____

CIRCLE THE NUMBER WHICH BEST DESCRIBES THE WAY YOU FEEL.

		strongly agree	agree	neither agree nor disagree	disagree	strongly disagree
1.	It is <u>not</u> necessary for me to use any special protective clothing while I am applying pesticides.	1	2	3	4	5
2.	I think authorities have overstated the hazards of pesticide exposure.	1	2	3	4	5
3.	My past repeated spraying of pesticides is <u>not</u> harmful to my future health.	1	2	3	4	5
4.	A long-sleeve shirt and jeans do not provide as much protection as needed from pesticide exposure.	1	2	3	4	5
5.	The extra time necessary to put on and take off special protective garments is overcome by the increased protection they offer.	1	2	3	4	5
6.	A special set of everyday work clothes does an adequate job of protecting me while I am applying pesticides.	1	2	3	4	5
7.	I am concerned that a pesticide injury would result in lost time from my job and high medical bills.	1	2	3	4	5
8.	I am so convinced that spraying pesticides is a health hazard that I would <u>not</u> spray the fields myself if I had that choice.	1	2	3	4	5

CIRCLE THE NUMBER WHICH BEST DESCRIBES YOUR ACTIONS.

		always	usually	sometimes	hardly ever	never
9.	I will wear protective clothing in the future, only if I see other pesticide applicators wearing it.	1	2	3	4	5
10.	In the future, I plan to wear regular work clothes rather than a special protective garment when applying pesticides.	1	2	3	4	5
11.	During the past month, I laundered the garments I wore while spraying pesticides separately from my other clothing.	1	2	3	4	5
12.	During the past month when spraying, I used a special protective garment.	1	2	3	4	5
13.	If pesticide manufacturers were to provide free protective garments, I will wear them in the future.	1	2	3	4	5
14.	During the past month, I looked for more information on the types of protective garments available for pesticide application.	1	2	3	4	5
15.	I would <u>not</u> use special clothing in the future because the time involved in changing clothes would interfere with my farm work.	1	2	3	4	5
16.	During the past month, I purchased special protective garments for the sole purpose of pesticide protection.	1	2	3	4	5

APPENDIX E

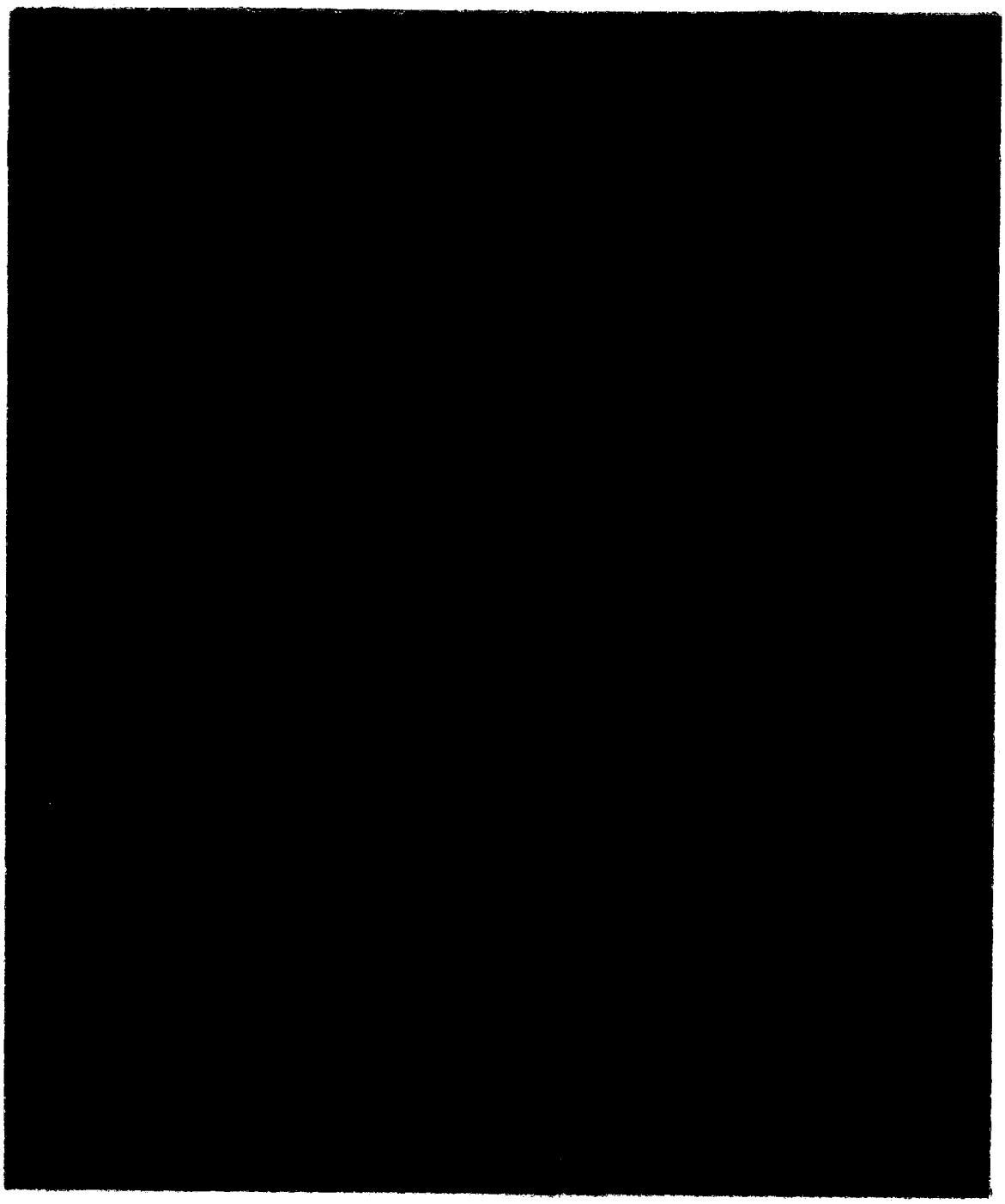
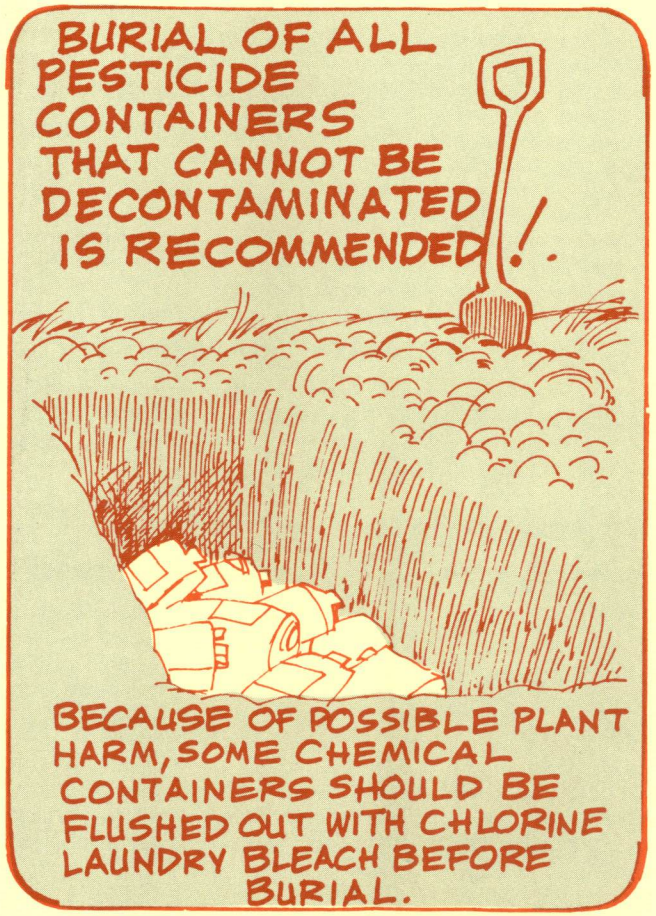


Figure E-1. Second questionnaire.

DITHIOCARBAMATES:

This group of pesticides, mostly fungicides (Maneb, Zineb, etc.) does not present the hazard of some other pesticides. Burial or decontamination as recommended for organic phosphates and carbamates is suggested.



BOTANICALS AND INORGANICS:

Botanicals (rotenone, pyrethrins, etc.) decompose rapidly in the soil. The inorganics (arsenicals, mercurials, other heavy metals, etc.) are relatively insoluble in water. Burial is therefore a suitable method for disposal.

PHENOXY AND OTHER HERBICIDES:

The main problem with phenoxy herbicides is plant toxicity rather than danger to humans. Typical phenoxy herbicide (2, 4-D; 2, 4, 5-T; MCPA; selvex; Sesone; 2, 4-DB; erbon; etc.) containers should not be burned or any attempt made to decontaminate them for reuse. As an additional precaution to avoid contamination, it is suggested that a strong chlorine solution (chlorine laundry bleach) be used to flush the containers prior to burial.

Herbicides such as Treflan, Randox, Vegadex, etc. break down fairly rapidly in the soil and burial of these containers is suitable. Substituted ureas (diuron type herbicides e.g., Cotoran, Karmex, Caparol, Lorox, etc.) are relatively insoluble in water and can be safely disposed of by burial.

Note: Herbicide containers should not be re-used or reclaimed under any conditions for farm or other uses.



Publication 684 1P10-10M-.028 March 1974

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

The University of Tennessee Institute of Agriculture and U.S. Department of Agriculture cooperating in furtherance of Acts of May 8 and June 30, 1914.

Agricultural Extension Service
William D. Bishop, Dean

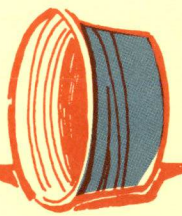
Publication 684
March 1974



Decontamination of Empty PESTICIDE Containers

Edward E. Burgess

Assistant Professor, Agricultural Biology

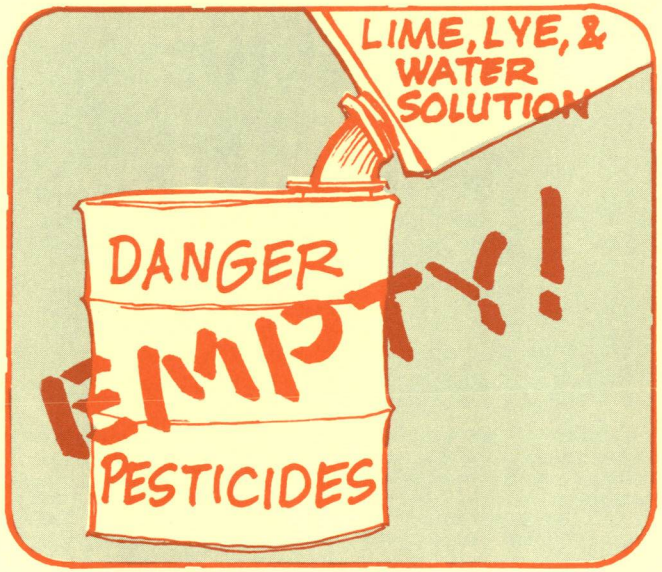


AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF TENNESSEE

GENERAL COMMENTS:

It is recommended that residues remaining in used pesticide containers be decomposed or removed whenever feasible before further steps for disposing are taken. This should be done the same day the containers are emptied.

Most pesticides will break down under alkaline conditions. Examples of materials to assist in decomposition are hydrated lime, caustic soda (common lye), and sodium carbonate (soda ash). Some pesticides such as the chlorinated cyclopentadiene complex (endrin, dieldrin, aldrin, chlordane, heptachlor) resist decomposition under alkaline conditions.

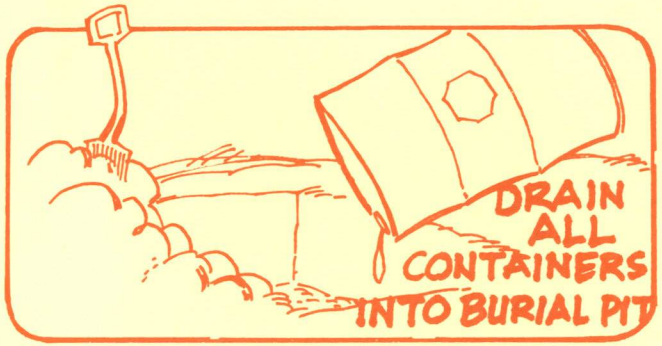


CHLORINATED HYDROCARBON PESTICIDES:

With the exception of the above mentioned chemicals, most chlorinated hydrocarbons will break down under alkaline conditions. Drums which have contained chlorinated hydrocarbons are hard to decontaminate because sludge or "salted out" crystals of technical insecticide are adhering to the sides and bottoms of the drums.

ORGANIC PHOSPHATE AND CARBAMATE INSECTICIDES:

Organic phosphates (parathion, guthion, etc.) and carbamates (carbaryl or Sevin) are easily decomposed by alkaline materials. Caustic soda (common lye), hydrated lime, or soda ash are typical alkalis and are available for decontamination.



DECONTAMINATION PROCEDURES:

The following precautions are recommended for the decontamination operation:

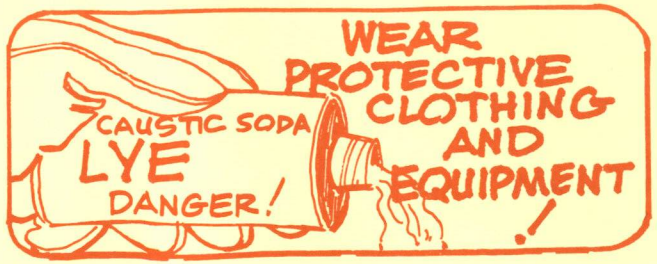
1. Persons involved in the decontamination operations should wear suitable protective clothing and equipment. (See Pub. 685)
2. Drain all used containers into a pit not less than 18 inches deep. Dry formulations should be similarly emptied by standing upwind while gently shaking out the residual contents into the pit. (See Pub. 682)
3. All non-combustible containers should be washed with water and detergent, and then rinsed several times with water. The washings and rinsings are then poured into a burial pit.
4. For a more thorough decontamination of containers having organophosphates, an alkaline decomposition of the residual pesticide may be made. If a drum must be re-used on the farm, select one which contained either organic phosphates or carbamates and decontaminate as follows:

   a. Drain container completely (at least 30 seconds), into burial pit.
   b. Carefully add water, detergent, and caustic soda (lye) according to quantities needed.
   c. Close the containers and rotate carefully to wet all inner surfaces with caustic solution. Allow the containers to stand for at least 15 minutes with occasional agitation.
   d. Remove closures and drain the wash solution into a burial pit.
   e. Thoroughly rinse outside and inside of the container three times and dispose of rinsings in a burial pit. The quantities of lye, detergent and water for various size containers are given in the following table.

Caustic Rinse Solution for Organic Phosphate Containers

Container Size	Water	Detergent	Caustic Soda (lye)
Less than 5 gal.	1 pt.	1 tablespoon	1-2 tablespoons
5 - gal.	2 qts.	2 tablespoons	1/2 cup
15 - gal.	1½ gal.	1/4 cup	1/2 lb.
30 - gal.	3 gal.	1/2 cup	1 lb.
55 - gal.	5 gal.	1 cup	2 lb.

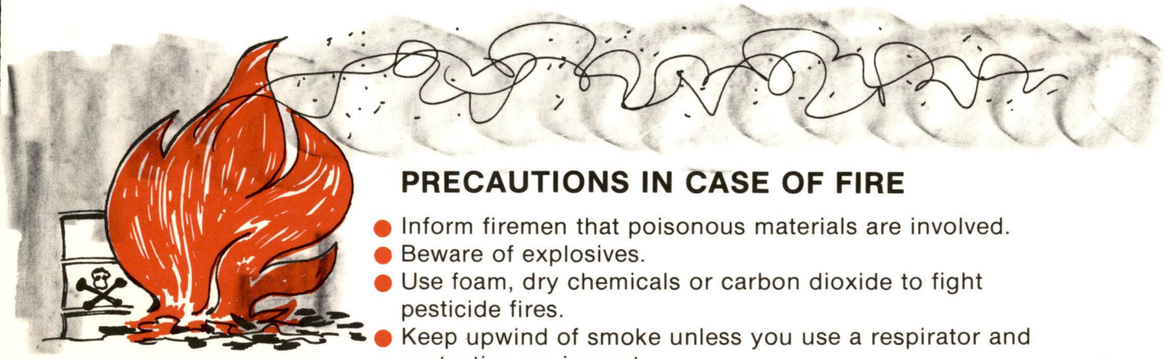
Note: Containers of less than 5 gal. capacity should not be decontaminated for any farm use. Dispose of them by the proper method (rinse three times, drain in vertical position 30 seconds after each rinse, puncture, crush, and bury).



EMERGENCY PROCEDURES FOR SPILLS & FIRES



- Wash up or rinse off immediately - then get to a doctor. Take the label or poison container with you to the doctor.
- Protect yourself from exposure and clean up chemical.
- Only allow those helping in cleanup into contaminated area.
- Wear protective clothing - at least waterproof gloves, clothes and footwear; in some cases, respirator and other equipment.
- Use cat litter, clay, sawdust, soda ash or an absorbent cleaning compound to soak up spilled poison.
- Sweep and shovel all contaminated material into a fiber container and cover the container.
- Wash contaminated area with full-strength liquid chlorine bleach. Use long-handled brush or broom.
- Thoroughly flush poisoned area with water.
- Bury container 18″ under the surface, away from groundwater, or incinerate.



PRECAUTIONS IN CASE OF FIRE

- Inform firemen that poisonous materials are involved.
- Beware of explosives.
- Use foam, dry chemicals or carbon dioxide to fight pesticide fires.
- Keep upwind of smoke unless you use a respirator and protective equipment.
- Warn people downwind.



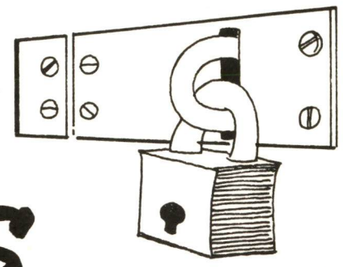
DEVELOPED & IMPLEMENTED BY:
Environmental Protection Agency, Washington, D.C.
Cooperative Extension Service, Department of Agricultural Biology, The University of Tennessee
Extension Service, USDA, Washington, D.C.
Division of Plant Industries, State of Tennessee

PUBLICATION 654 **2P20-40M-.028** **(Reprint) JUNE 1973**

COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS
The University of Tennessee Institute of Agriculture and U.S. Department of Agriculture cooperating in furtherance of Acts of May 8 and June 30, 1914
Agricultural Extension Service
William D. Bishop, Dean

PUBLICATION 654 **(REPRINT) JUNE 1973**

SAFE PESTICIDE PRACTICES



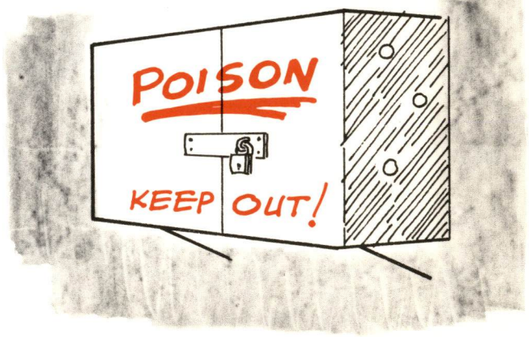
AGRICULTURAL EXTENSION SERVICE ● UNIVERSITY OF TENNESSEE

Edward E. Burgess
Assistant Professor, Agricultural Biology

Safe use of pesticides is everyone's responsibility. As the user, however, **you** have the major responsibility. Your attitude and actions may save someone from a tragic or fatal poisoning. The following topics cover the basic points of pesticide safety.

SAFE STORAGE OF PESTICIDES

- Provide exhaust fan and/or vents.
- Store in cool, dry, well-ventilated and secure area.
- Keep deteriorating packages off floor.
- Keep containers tightly closed.
- Know type, formulation, and potential dangers of pesticides.
- Do not store clothing, respirators, lunches, cigarettes or drinks with pesticides.
- Keep decontamination supplies available.

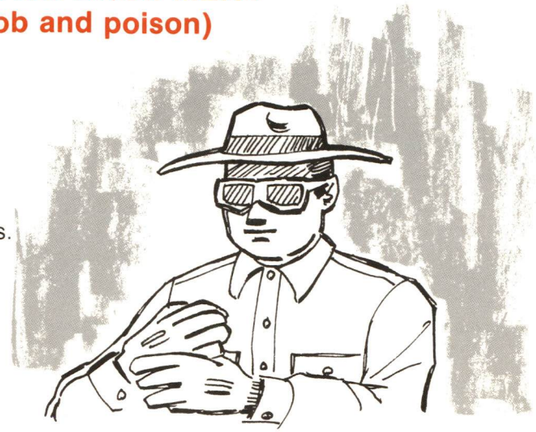




SAFE TRANSPORTATION OF PESTICIDES

- Do not carry near groceries.
- Do not allow children to ride near pesticides.
- Do not allow pesticide containers to shift or roll in transit.
- Do not carry pesticides with feed or mash for livestock.
- Do not carry poisons inside truck cab or car.
- In case of spill, clean up immediately.

PERSONAL PROTECTIVE EQUIPMENT
(Depends on the job and poison)



For Protection During Mixing, Wear:

- Clean clothing—full skin coverage, closed at neck and wrists and pant legs outside boots.
- Waterproof gloves with long, tight-fitting wrists.
- Wide-brimmed hat.
- Waterproof boots.
- Approved respirator with the right cartridge, when mixing dust or wettable powder (WP).
- Safety goggles.
- Rubber or plastic apron.



For Protection During Application, wear:

- Clean clothing—full skin coverage, closed at neck, wrists, and pant legs outside boots. (waterproof clothing should be worn when using extremely toxic materials).
- Waterproof gloves with long, tight-fitting wrists.
- Wide-brimmed hat.
- Waterproof boots (no canvas or leather shoes).
- Approved respirator with right cartridges and safety goggles.



SAFE MIXING PROCEDURES

- Protect your skin with proper clothing and equipment.
- Weigh or measure materials accurately.
- Fill tank with water until about 1/2 full.
- Add concentrate gradually while water is swirling; do not spill or splash. Put measuring cup in a large container.
- Always stand well above fill hole to keep splashing off face and eyes.
- Store remaining chemical in original labeled container,
- Place poison cans and bags back in storage building and lock.
- Empty concentrate container—rinse and drain three times and pour rinses into mixing tank.
- Rinse measuring containers three times.
- Dispose of empty container properly.
- In case of spill—remove contaminated clothing, wash chemical from skin with soap and water, and clean up area. Launder contaminated area.
- Finished mixing—follow recommended cleanup and sanitation procedures.
- Always have someone with you in case of an accident.

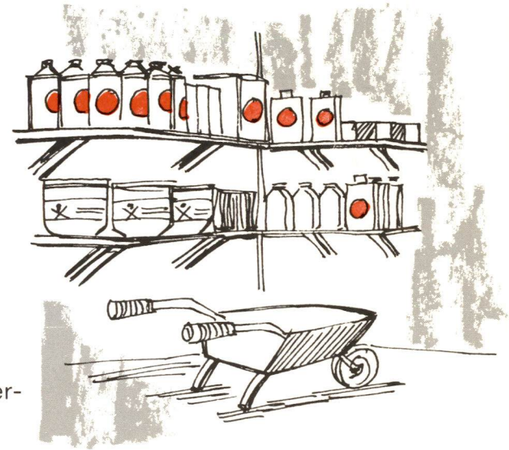
SAFE APPLICATION PROCEDURES



- Wait until poison is needed.
- Read all labels.
- Wear clean full coverage protection.
- Change clothing after leaving field and bathe before doing other chores.
- Never smoke, eat, or drink while applying pesticides.
- Accidental spill—wash skin immediately (soap & water).
- Keep trouser legs outside boots.
- Never apply highly toxic pesticides while alone.
- Avoid breathing dust or fumes.
- Know poisoning symptoms of pesticide used and know where to get medical help. Take pesticide label or container with you to the doctor.
- Calibrate equipment.
- Use spray rather than dust, to reduce drift.
- Carry a jug of water, soap, and paper towels on spray rig.
- Observe minimum days from application to harvest or slaughter.

RE-ENTRY PRECAUTIONS

- Read the label.
- Observe safe re-entry period.
- Wear protective clothing on premature entry.



CLEAN UP AND GOOD HOUSEKEEPING

- Provide washing facilities.
- Correct disorders—leaky containers, damp spots, loose caps, etc.
- Dispose of empty pesticide containers safely.
- Wear protective clothing for handling routine and emergency situations.



PESTICIDE DISPOSAL

- Buy only the amount of pesticide you need for the season.
- Mix only as much pesticide as needed. If too much is mixed, apply left-over material to open field, or a border row.
- Rinsing - Rinse 3 times with about a quart of water and pour rinse into spray tank before bringing to desired level.
- Small containers - punctured, crushed or broken, buried 18" in a well-drained location away from streams and water supplies. Return 30 and 55 gal. drums to a drum reconditioner.
- Leftover pesticides - Bury in an approved sanitary landfill, incinerator, or store until the following year in a locked storage building.



when recommended on the label. Also these should be worn to avoid breathing wettable powder or fumes and to protect your eyes.

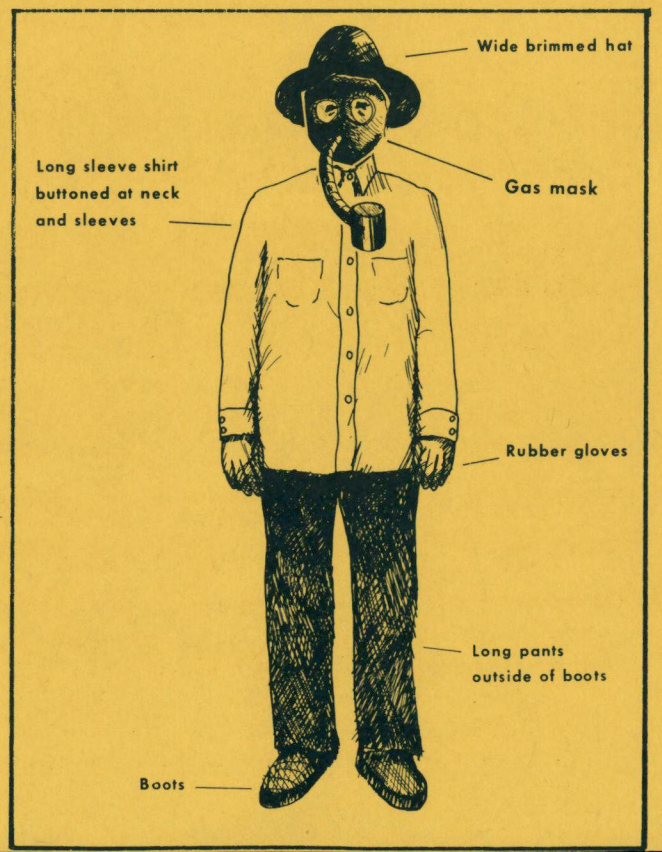
6. An apron helps protect from absorption of materials into clothing and onto skin.
7. Mix pesticides outdoors and stay upwind.

PRECAUTIONS AND SAFETY EQUIPMENT FOR FUMIGATION

General Comments

Insecticides used in the gaseous form are known as fumigants. Two serious hazards of fumigation are the flammability of certain gases and the danger of accidental poisoning of man.

All fumigants (gaseous, liquid, or solid) used in grain fumigation are poisonous to human beings and animals. In handling them, the operator should take all necessary precautions and follow all directions given on the manufacturer's label. After the first breath of a grain fumigant, the sensory nerves may be paralyzed to varying degrees and the sense of smell reduced so that the fumigator may be unaware that he is breathing fumigants.



Fumigation Precautions:

The following precautions should be taken in handling fumigants:

1. Do not breathe vapors or spill the liquids on skin or clothing.
2. In handling and applying fumigants, wear an approved full-faced gas mask equipped with an approved black canister labeled "for organic vapors."
3. Never work alone. Always work with another adult when applying fumigants.

MAINTENANCE OF EQUIPMENT

1. Always wash clothing after each day's use.
2. Always wash boots and gloves after each use.
3. Change filters in cartridge-type respirators after eight hours or sooner if breathing becomes difficult or if pesticide poison odor can be detected when mask is properly worn.
4. With gas masks the canister should be replaced with a fresh one after a 30-minute exposure to the fumes.
5. Clean all equipment used in mixing and applying pesticides. (Neutralizing agents such as caustic soda may be used). Pour rinse materials into burial pit or spray on border rows if within limits of dosage rate recommendations.

For additional information on protective clothing and equipment refer to

Pub. 654 Safe Pesticide Practices

Publication 685 1P10-10M-.025 February 1974

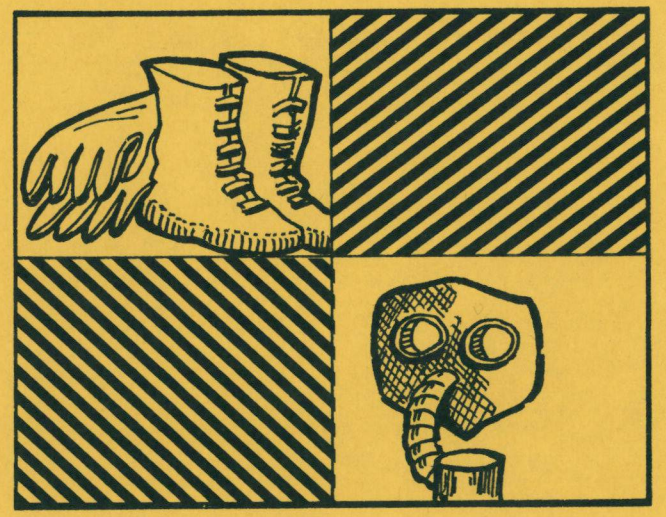
COOPERATIVE EXTENSION WORK IN AGRICULTURE AND HOME ECONOMICS

The University of Tennessee Institute of Agriculture and U.S. Department of Agriculture cooperating in furtherance of Acts of May 8 and June 30, 1914.

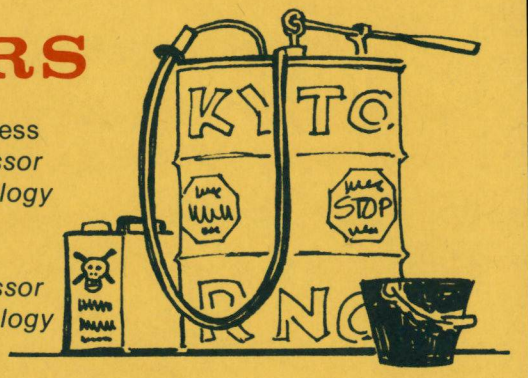
Agricultural Extension Service
William D. Bishop, Dean

Publication 685
February 1974

PERSONAL PROTECTIVE CLOTHING and EQUIPMENT for PESTICIDE USERS



Edward E. Burgess
Assistant Professor
Agricultural Biology
and
Harry Williams
Assistant Professor
Agricultural Biology



AGRICULTURAL EXTENSION SERVICE
UNIVERSITY OF TENNESSEE

GENERAL COMMENTS:

Protective clothing and safety equipment will help to keep you from being poisoned. The type of protective clothing and equipment needed depends on the job being done and the type of poison being used.

ROUTES OF ENTRY

Pesticides enter the body by three different routes:

1. Dermal exposure (skin)
2. Respiratory exposure (breathing)
3. Oral exposure (mouth)

Therefore you must be very careful not to breathe the poison, swallow it, get it on your skin, or in your eyes. In order to prevent entry of pesticides, these routes must be protected.

TYPE OF PROTECTION

Personal protective equipment depends on the job and the poison used. There are two main types of protection:

1. Moderate Protection

In most cases some form of moderate protection is adequate for a farmer in applying pesticides. This type of protection would include:

a. Natural rubber gloves

b. Natural rubber boots

c. Long sleeve shirt closed at neck and wrist (sleeves over gloves).

d. Long pants (pant legs over boots)

e. Goggles

f. Respirator

g. Broad brimmed hat

2. Maximum Protection

For maximum protection from highly toxic pesticides, such as Temik, parathion, and Phosdrin, the following items are necessary:

a. Waterproof suit (worn with sleeves over gloves and pant legs over boots).

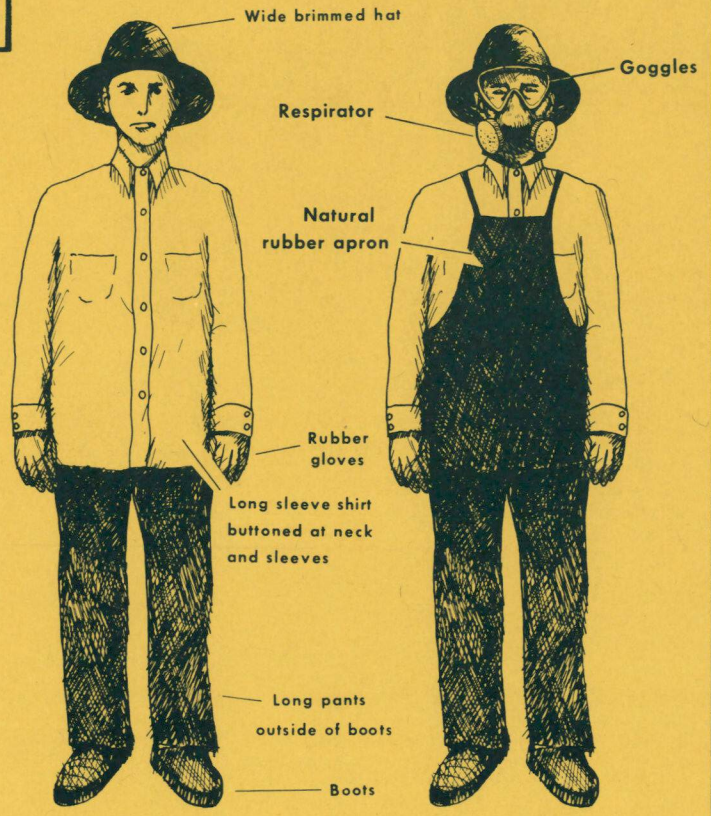
b. Broad brimmed waterproof hat

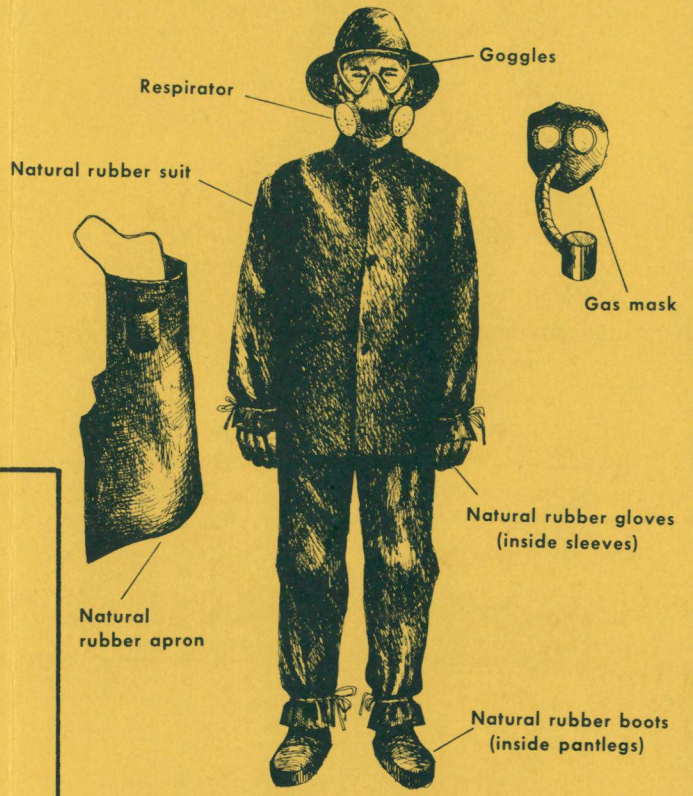
c. Natural rubber gloves

d. Natural rubber boots

e. Approved respirator

f. Goggles





PROTECTIVE CLOTHING DURING MIXING AND APPLICATION

1. Moderate to maximum protection should be worn when mixing or applying pesticides depending on how toxic the material is.
2. Always read the label and wear as much protective clothing and equipment as is recommended.
3. Full skin coverage should be used especially when highly toxic pesticides are being mixed or applied.
4. Sleeves should extend over your gloves and pant legs over your boots to prevent concentrate from running into them in case of spillage.
5. Goggles and respirator should be worn

VITA

Shally Lynne Carlson was born and raised in Castleton-on-Hudson, New York. She attended Maple Hill High School and graduated in 1963.

In 1967, she received a Bachelor of Science degree in Home Economics Education from the New York State University College at Oneonta. She received a Master of Science degree in Clothing and Textiles from Purdue University, West Lafayette, Indiana in 1968.

Mrs. Carlson taught Home Economics at Marlboro High School, Marlboro, New York until 1979, when she enrolled in the inter-disciplinary doctoral program at The University of Tennessee, Knoxville. While she was enrolled there, she was a graduate teaching assistant. She was awarded the Ida Anders Scholarship in 1980 and received grants for research from the College of Home Economics and from Southern Region Pesticide Impact Assessment Program.

Memberships held by Mrs. Carlson include: American Home Economics Association, Tennessee Home Economics Association, Knox Area Home Economics Association, Association of College Professors of Textiles and Clothing, American Association of Textile Chemists and Colorists and Omicron Nu.

In August 1982, Mrs. Carlson will begin employment as a faculty member at the University of Texas, Austin in the Division of Textiles and Clothing, Department of Home Economics.

Shally is married to Elwood Carl Carlson of Narrowsburgh, New York.