TechLine

Information for Noxious Weed Control Professionals

April, 1989

"False facts are highly injurious to the progress of science, for they often endure long; but false views, if supported by some evidence, do little harm, for everyone takes a salutary pleasure in proving their falseness."
...Charles Darwin

In This Issue:

TORDON 22K And STINGER Herbicides

Evaluation Of Herbicide On Forb Density And Diversity

By C.A. Lacey, M.B. McKone, and D. Bedunah

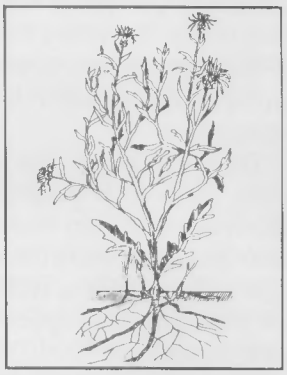
Spotted knapweed is an introduced perennial that infests over 4.7 million acres of rangeland and grazable woodland in Montana. An estimated 33 million acres are highly susceptible to invasion by this weed in the state. When managing spotted knapweed infestations, successful land managers determine that different control methods and materials should be utilized on various types of land sites. Plant and tree species at individual sites are important factors to consider when using herbicides to control spotted knapweed. For instance, many forbs contain significant value for livestock and wildlife forage and there is concern about the effect of herbicide on these forb species.

A recent study tested two herbicides to determine their effect on spotted knapweed control and forb density and diversity. Results of these studies help answer several weed management questions. Although complete answers to these questions are not yet possible, further studies conducted in 1989 will build upon the data collected in 1988.

Experiments conducted in 1988 evaluated:

1. TORDON* 22K herbicide (picloram at 2 lb. acid equivalent per gallon) impact on forb density and diversity.
2. STINGER* herbicide (clopyralid at 3 lb. acid equivalent per gallon) rates on spotted knapweed.
3. STINGER herbicide impact on forb density and diversity.

Additional field studies are underway this summer to evaluate correct application timing for this new compound.



Spotted Knapweed

STINGER herbicide, a newly labeled product, provides land managers with another option for spotted knapweed control. This herbicide's important characteristics, such as high selectivity and a short soil residual, means it has little impact on many other species. However, data from 1988 test sites indicate that TORDON 22K continues to provide the highest control of spotted knapweed without significantly reducing native forb diversity and has minimal impact on native forb density.

Materials and Methods:

Herbicide Rate and Timing Study: Two locations were established on gravely range sites in southwestern

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DOW CHEMICAL, U.S.A. -- 1001 S. 24th St. West, #115 -- Billings, MT 59102 -- (406) 652-4977

Dean Gaiser
Spokane, WA

Mary McKone
Billings, MT

Mark Peterson
Brookings, SD

Welcome to another issue of TechLine. As Technical Service and Development (TS&D) representatives for The Dow Chemical Company, we serve a vast geography. We enjoy the opportunity of coordinating scores of projects with an expanding number of scientists and researchers.

Thus, we begin this newsletter to more efficiently supply information about our common work and explore your questions more thoroughly. TechLine will provide a refreshing forum for your successes specific to you and your region.

We want to answer your particular technical questions about our products and other aspects of well-planned weed control programs. Are there certain questions that always come up about our products that we should address? Also, if you have a research project or successful weed control project you would like to share with our readers — your colleagues —we welcome them.

This issue contains a return card. Please pass along the names and addresses of others whom you feel would be interested in recevinging Techline. Also use the card to let us know what information should be included in a future issue, or to inform us about your work so we might share it in a future issue.

If you have additional questions for TechLine or questions relating to subjects covered in its contents, please call (406) 652-4977. Again, Welcome to TechLine. ◆

Increasing concerns about groundwater protection have prompted recent inquiries about environmental risks associated with all pesticides, including the use of TORDON herbicides. TechLine editors asked some of the leading scientists at The Dow Chemical Company to address the questions you've asked.*

Understanding Herbicides and Your Environment

Environmental Considerations With TORDON Herbicides

By John Troth

John Troth is product development manager for forestry and rights-of-way markets. Before joining Dow he was with the Weyerhauser Company's Southern Forest Research Division for 10 years where his work included development of herbicicde use programs. John has a PhD in Forest Science, with emphasis in silvaculture and forest soils.

Troth explains that in 1986, an environmental hazards advisory statement was added to labels of TORDON* herbicides, which contain the active ingredient picloram, as part of an Environmental Protection Agency (EPA) process of reregistering agricultural and industrial pesticides. Most recent questions about TORDON* 22K and groundwater pertain to this advisory.

John Troth

"The purpose of the label statement is to inform users that TORDON* 22K should not be applied in areas where certain types of soil and groundwater conditions are present," Troth says.

The precautions concerning herbicide use, however, are not unique to TORDON herbicides containing picloram.

"The risk involved with these particular soil and environmental conditions should be considered when applying any herbicide used in forestry and right-of-way treatments," Troth adds. "Most professionals who are familiar with TORDON 22K and TORDON herbicides realize that when they are used properly and according to label specifications, they are not any more likely to cause environmental problems than most other products.

"The label statement does not reflect any new research findings or scientific data pertaining to TORDON 22K or Tordon herbicides. Rather, it's a precautionary measure intended to help ensure that the products are used properly to avoid environmental problems. With TORDON 22K or any herbicide, the key is how the material is handled and applied in the field."

There are two specific types of soil conditions cited in the environment hazards advisory statement on labels for TORDON herbicides. One involves areas where a shallow water table is covered by sand or loamy sand soil which allows rapid movement of water down through the entire soil profile. The other includes areas

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where the landscape contains sinkholes, highly fractured bedrock at or near the surface, or other conditions where there is a direct route of water movement from the surface to the water table.

"It's a matter of knowing what kind of soil conditions you're working with and whether the type of application you want to make is acceptable under those conditions," Troth adds. "Again, the key factor is to use TORDON 22K or any other herbicide properly and according to the label."

"It's a matter of knowing what kind of soil conditions you're working with and whether the type of application you want to make is acceptable under those conditions..."

Restricted Use

The restricted use classification of TORDON 22K is an area which continues to prompt questions from people within the industry and the general public, Troth says.

"TORDON 22K is a restricted use product because it is highly active against susceptible species of plants at very low rates," Troth explains. "It's important to understand that restricted use is not due to human health hazards or worker exposure. In fact, from a toxicology standpoint, TORDON 22K actually ranks among some of the least hazardous herbicide ingredients.

"TORDON 22K was one of the first products developed by the chemical industry with a high level of herbicide activity at rates as low as a few ounces or grams per acre," he adds. "Now, most manufacturers are concentrating their product development efforts on materials that are also effective at ounces or grams per acre, whereas TORDON 22K has been available for nearly 25 years."

Troth adds that an applicator using TORDON 22K, or any other restricted use pesticide, must be trained and certified to ensure proper handling and use of the products. ◆

Understanding Herbicides and Your Environment

Effects of TORDON 22K In Water And Soil

Wendell Mullison

By Wendell Mullison

Wendell Mullison is a consultant to Dow in herbicide related research and public affairs. Before consulting, he was employed with Dow for 32 years, specializing in agricultural research, development, and registration. Wendell has a PhD in botany, is a charter member of the Weed Science Society of America, is a life member of the American Society of Plant Physiologists and the Botanical Society of America, and a member of the Society of Toxicology.

Mullison notes that TORDON* 22K movement downward or upward in soils is dependent on the movement of water in the soil. Downward movement or leaching is more likely in sandy or gravely soils low in organic matter. In sandy or loamy sand soils receiving heavy and prolonged rains, TORDON 22K occasionally has moved downward three feet or more.

"Classical columnar laboratory leaching experiments have shown that picloram has the potential to move readily in certain types of soil," Mullison says. "Nonetheless, in most of the numerous field experiments conducted, residual TORDON 22K has only been found within the top one-foot layer of soil. There has been no authenticated report of groundwater contamination from leaching of labeled rates of TORDON 22K through undisturbed soil profiles.

"Well contamination has not been a problem with TORDON 22K," Mullison adds. "For example, studies in Texas have shown that TORDON 22K was not detected in shallow domestic water wells during a two-year sampling program following application of TORDON 22K to surrounding areas at rates of 1 lb/acre".

Dissipation In Soil

TORDON 22K applied to the soil dissipates in time due to microbial degradation. The rate of disappearance is dependent on the chemical application rate, soil type, soil temperature, soil moisture, soil organic matter, and soil microbial population.

"Temperature and moisture conditions favorable for plant growth are the two most important climatic factors that determine the rate of degradation of TORDON 22K in the soil," Mullison says.

Degradation In Soil And Water

Degradation of TORDON 22K is due largely to two phenomena: photodegradation from exposure to sunlight, and microbial degradation in soil which is primarily caused by numerous indigenous soil microorganisms.

"TORDON 22K is rapidly degraded in water by sunlight and often completely disappears within 5-20 days," Mullison explains. "The rate of loss in water depends not only on the amount and intensity of sunlight but also on the water depth and the presence of extraneous particulate matter that obscures sunlight. Photodegradation, however, can occur even under hazy sunlight and in cloudy water.

"TORDON 22K in the soil has very minimal, if any, measurable effects on numbers and kinds of soil microorganisms, microbial metabolism, carbon dioxide evolution, or nitrogen transformations," Mullison says. "TORDON 22K is decomposed in both soil and water and the resulting degradation products are harmless to living organisms and the environment. Many studies have shown the importance of soil organisms such as bacteria and fungi in degrading TORDON 22K in the soil." ◆

"Rate"

Continued from page 1

Montana. Site 1 was located near Emigrant and Site 2 was near Bozeman. Spotted knapweed, bluebunch wheatgrass, junegrass, sandberg bluegrass, and Kentucky bluegrass are common species at both locations.

Herbicides were applied in mid-June, July, and September of 1987. Timing of application corresponded to spotted knapweed bolt, flower, and seed dispersal growth stage respectively. STINGER herbicide was applied at 1/6, 1/3, 2/3, and 1 pt/acre. (Figure 1)

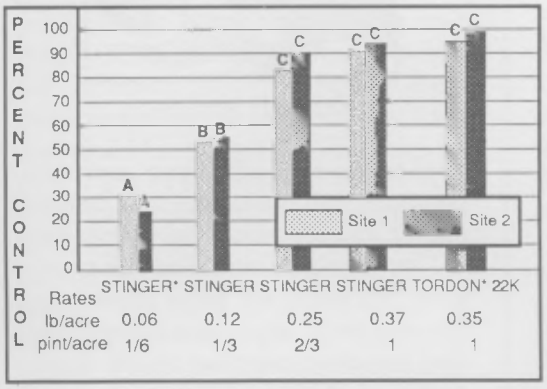

FIGURE 1: Percent spotted knapweed control with STINGER* and TORDON* herbicides one year after application at two locations. Means within sites followed by the same letter do not differ significantly at the 5% level.

TORDON 22K was applied at the rate of 1 pt/acre as a comparative treatment. Herbicides were applied with a CO_2 pressurized backpack sprayer in 20 gal/acre of spray solution. Plot design was a randomized complete block with three replications. Individual plots measured 10x40 ft. Spotted knapweed control was determined by visual estimates one year following application. Data were analyzed using analysis of variance.

Forb Diversity Study: Two locations were established in western Montana to study the effect of 2/3 pt/acre of STINGER herbicide and 1 pt/acre of TORDON 22K on forb diversity and density. Site 1 was located near Townsend and Site 2 was located near Missoula. Western yarrow, lupine, prairiesmoke, pussytoes, fleabane daisy and miscellaneous composites were found at both sites. Sticky geranium was a significant component of the plant community at Site 1. Sulfur cinquefoil and spotted knapweed were present at Site 2.

Herbicides were applied on May 15, 1987 with a CO_2 backpack sprayer in 18 gal/acre of spray solution. Plot design was a randomized complete block with three replications. Individual plots measured 7 by 25 ft. Each plot was divided into five equal segments and forb density was measured in four of the segments by using two systematically placed 5.2 ft.^{2} plots per segment. Measurements were taken in June, 1988. Data were analyzed using analyses of variance. Least significant differences were used to separate means when F-values were significant ($p < .05$). (Figure 1)

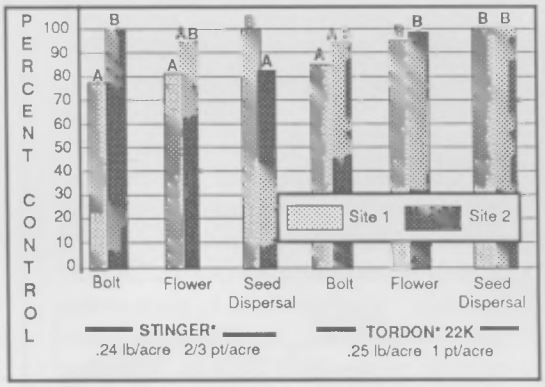

FIGURE 2: Percent spotted knapweed control at three growth stages with .25 lb/ac of STINGER* and TORDON* herbicides at two locations. Treatment means within sites followed by the same letter do not differ significantly at the 5% level.

Results and Discussion:

Herbicide Rate and Timing Study: STINGER herbicide rates greater than 1/6 pt/acre significantly reduced spotted knapweed density one year following application when compared to the control. There was no difference in spotted knapweed control between STINGER herbicide at 2/3 pt and 1 pt/acre and TORDON 22K herbicide at 1 pt/acre. These rates provided the greatest efficacy at both locations.

The effect of time of application on spotted knapweed efficacy differed between Site 1 and Site 2. STINGER herbicide at 2/3 pt/acre provided significantly greater control of spotted knapweed when applied at seed dispersal at Site 1. However, at Site 2 STINGER herbicide applied at the bolt growth stage provided significantly greater control than applications made at seed dispersal. TORDON 22K herbicide at 1 pt/acre provided significantly better control when applied at the flower and seed dispersal stages at Site 1. Time of application did not influence spotted knapweed control at Site 2 with TORDON 22K herbicide at 1 pt/acre (Figure 2). Differences between the two locations may be the result of extremely dry conditions at Site 1 during the spring application.

Forb Diversity Study: There were few significant differences in forb density and diversity between STINGER herbicide, TORDON 22K herbicide, and the control. The most

Chart 1

FORB	TORDON 22K	STINGER
Spotted knapweed	Reduced significantly	Reduced significantly
Western Yarrow	Reduced at Site 2	Reduced at Site 2
Sulfur cinquefoil	Eliminated	No effect
Lupine	No effect	No effect
Prairiesmoke	No effect	No effect
Sticky geranium	No effect	No effect
Pussytoes	No effect	No effect
Cutleaf daisy	No effect	No effect
Fleabane daisy	No effect	No effect
Misc. Composites	No effect	No effect

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significant difference measured between the two herbicides was with sulfur cinquefoil. This specie was eliminated from the plant community by TORDON 22K herbicide but was not damaged by STINGER herbicide. Spotted knapweed was significantly reduced by both STINGER herbicide and TORDON 22K herbicide when compared to the control.

These results suggest that either STINGER herbicide at 2/3 pt/acre or TORDON 22K herbicide at 1 pt/acre could be utilized for spotted knapweed control without significant detrimental impact to native forb populations. There was no reduction in native forb diversity at Site 1 or Site 2. With the exception of western yarrow at Site 2, no native forb species showed significant declines in density as a result of herbicide application (Chart 1). Sulfur cinquefoil and spotted knapweed were most susceptible to herbicide applications. Both species are introduced forbs considered noxious on rangeland in western Montana.

Conclusion:

STINGER herbicide at .25 lb/acre provides excellent control of spotted knapweed one year following application. No conclusions could be made on the optimum time for STINGER herbicide applications on spotted knapweed. Neither TORDON 22K herbicide nor STINGER herbicide applications of 2/3 pt./acre significantly reduced native forb density and had a minimal impact on native forb diversity.

Evaluation of these experiments support that the highest level of control with the least impact on forb density and diversity is achieved when management practices are tailored to specific site factors found at individual locations. TORDON 22K herbicide remains the product of choice to utilize in most range situations. STINGER herbicide fits in areas with trees such as conifers and in areas where shorter residual is desired.

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Risk Communication

Reaching A Concerned Public

People in the public eye sometimes seek shelter from scrutiny with the words "no comment." But those words are unlikely to inspire trust or cooperation — and people in the agrichemical industry have especially good reason not to use them: namely, food itself.

"Food, because it is a uniquely intimate substance, is a highly emotional subject. Rumors about food safety and quality spread easily," writes public health expert Elizabeth Whelan in her book, *Toxic Terror*. "Thus food is an ideal focus for a cancer scare."

Risk communication — which requires sharing rather than shielding — can help control an inflammatory situation or raise concern early enough to find effective solutions to a problem.

For example, risk communication might be the difference between calm or panic after a toxic spill, or prevention or treatment of an illness.

Though risk communication may seem a job for specially trained experts, it's also a job for scientists, executives, and educators, because the public and media often prefer to get information directly from the source.

Tips for communicating with the public.

Research shows people want to believe risks are being managed and there is nothing to worry about. If that isn't the case, however, they want to be informed of the risks. Here are some suggestions to keep in mind.

1. Know your audience.

Realize that lay people's perceptions of risk don't necessarily correlate with expert assessments or mortality statistics.

For example, people tend to perceive less risk if a situation is familiar than if it isn't. Crime statistics may show City A and City B have the same murder rate, but someone who lives in City A will feel safer there than in City B because the surroundings are familiar.

Also, people tend to perceive less risk in a voluntary situation than an involuntary one. Someone who buys a house knowing it is near a toxic-waste landfill is likely to think of the risk as smaller than someone who buys the house and learns of the landfill later. Peter Sandman, professor of environmental journalism at Rutgers University, summarizes some factors involved in risk perception in the booklet "Explaining Environmental Risk," written for the Environmental Protection Agency. In addition to those already mentioned, situations are perceived as less risky if they are fair, chronic, natural, detectable, not fatal, or not memorable. Situations are perceived as more risky if they are unfair, acute, artificial, undetectable, fatal, or memorable.

Sandman also provides an illustration of the theory that people fear risks from "artificial" sources more than risks from "natural" sources. He notes that 30 percent of the homes in northern New Jersey contain radon in amounts significant enough to threaten health. Naturally-occurring geological uranium is the source of radon in many of the homes; however, in just three communities, the homes are located near a landfill used for radioactive waste.

Communities threatened by naturally-occurring radon have shown little concern. On the other hand, communities near the landfill demanded an expensive cleanup.

Notes Sandman, "Successful risk communication begins with the realization that risk perception is predictable, that the public overreacts to certain sorts of risks and ignores others. You can know in advance whether the communication problems will be panic or apathy."

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Knowing The Truth

Pesticides In Food: Man-Made And Natural

Andrea Pagenkopf, PhD, RD
Food and Nutrition Specialist
Montana State University

By Andrea Pagenkopf

Pesticides are a part of our food production system. They make it possible to produce the quantities of food that American agriculture has been known for for many years. Without them there would be less food, and the food we would have would be more expensive. However, regardless of how much pesticides aid in the production of food, if they are dangerous they should not be used. Most Americans realize that there is risk involved in nearly everything we do, including eating. However, we must have some means of evaluating risk so that the benefits outweigh the risks.

The Food and Drug Administration is charged with determining the level of pesticides in food. Each year they collect a market basket of food in each of 4 regions: eastern, western, central, and southern. Each market basket contains 234 food items. The food is prepared as it would be in the home and then analyzed for pesticides or other potentially harmful chemicals. From these results it is known that pesticide residues seldom exceed the legal limits.

There are no adequate figures on pesticide residues in foods to form the basis for calculation of intakes by humans of the various pesticides. Current reports have thus assumed that each food tested had the tolerance level or the maximum amount allowed in a food by law. By using these figures and food consumption data, they calculated the maximum possible pesticide consumption for humans in the United States. In other words, this is a worst case scenario, not what is actually being consumed presently. It is known that most foods available now are consistently below the legal limit or tolerance for pesticides. Only 3 to 4 %

"Communication"

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2. Acknowledge emotions.

Do this before attempting explanations. People who think their feelings have been ignored tend to be become more upset than they were by the issue alone.

Of course, telling people you understand their anger "won't eliminate the anger," Sandman says, "but it will eliminate the need to insist on the anger and will thus free energy to focus on the issue."

3. Seek public participation.

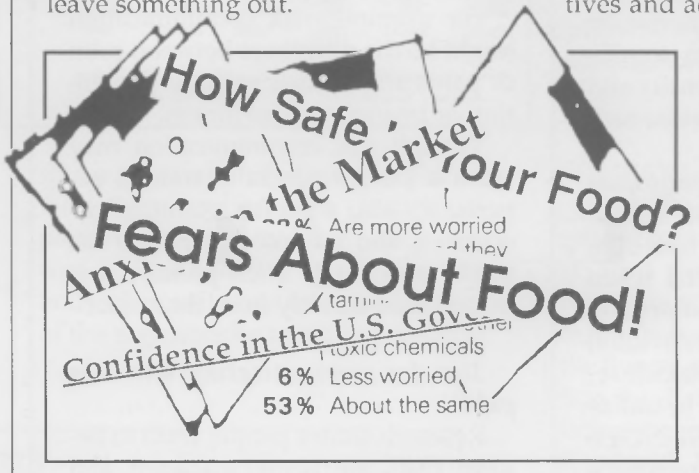
Another factor influencing risk perception is the degree to which people feel in control of a situation. "It is hardly coincidental that risks the public tends to overestimate generally raise serious issues of equity and control," Sandman says. "Most of the widely underestimated risks (smoking, fat in the diet, insufficient exercise, driving without a seat belt) are individual choices."

Consulting the public on risk management early in the process and continuing throughout will make people more likely to accept the outcome.

4. Simplify your presentation.

Use words a lay person can understand, not jargon. If you must use technical terms, explain them.

Speaking in plain language is better than omitting details, but there are guidelines you can follow if you must leave something out.



- Tell people what they ought to know.
- Add whatever context is necessary to help them understand what they've been told.
- Use qualifiers so they won't feel misled by new information.

5. Choose your words carefully.

Research indicates the terms in which risk is expressed can affect perceptions. Is the glass half-empty or half-full?

Presenting the same information about risk in different ways (for example, mortality rates as opposed to survival rates) alters people's perspectives and actions. A seriously ill person offered treatment with a 70% chance of dying and one with a 30% chance of living is likely to choose the latter, though there is no statistical difference.

The ability to influence others through choice of words may be unsettling to some, but Sandman views it practically. "There is in fact no `neutral' way to present risk data, only ways that are alarming or reassuring in varying degrees," he says.

Five tips for communicating through the media.

Since the media have an enormous impact on the public's perception of risk, dealing with them must be an integral part of effective risk communication.

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of all samples checked contained residues in excess of that allowed by law.

In spite of the work done by FDA to monitor the food supply, the public appears to be more concerned about pesticide residues and other chemicals in foods than any other food component. A survey done in January 1984 revealed that residues such as pesticides and herbicides were thought by 77% of the surveyed population to be a serious hazard; 18% thought them to be somewhat of a hazard. In comparison, 45% of those people surveyed thought that cholesterol was a serious hazard; 37% thought salt was a serious hazard. Given such feeling by the public it seems important to provide information indicating the current information about pesticide residues, how they are monitored, and the research-based data on their safety.

Pesticides account for only 4% of the agricultural production costs. Some feel that because they are inexpensive, producers may be tempted to use more than necessary, putting the public at increased risk. The FDA surveillance program is set up to detect such misuses. The production of virtually all perishable fresh fruits and vegetables depends heavily upon pesticides.

It is estimated that 18% of all pesticides used on food are capable of promoting tumor formation or growth in humans. This does not mean that any food treated with that pesticide will cause cancer in humans. But if the residue of that pesticide on the food is in excess of the tolerance level set, those people particularly susceptible, if they eat a substantial amount of the food, may have an increased chance of developing a tumor. Assuming a worst-case scenario, 80% of the *estimated dietary tumor risk is from the residues of 10 pesticides on only 15 different foods. The committee suggested that the resources of the agencies in charge of regulating pesticides should concentrate on those foods and pesticides known to present potential problems.*

The foods with the greatest potential for pesticide residues are listed in order from highest to lowest based on the potential for tumor causation: tomatoes, beef, potatoes, oranges, lettuce, apples, peaches, pork, wheat, soybeans, beans, carrots, chicken, corn (bran, grain), and grapes. **This does not mean that these foods are dangerous**, only that because of the current use of pesticides and the laws governing that use, if there is going to be a problem this is likely where it will be. The committee stressed that there is no reason for people to alter the amount of these foods they eat.

Even given the worst case scenario, calculations using known risk from pesticides and cancer incidence rates, it appears that the use of pesticides **may** increase the incidence of cancer in this country a fraction of a percent from 25 per 100 population to 25.1 per population.

Consumers are often misled to believe that any food sold in a health food

See "Food" on page 8

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1. Again, know your audience.

Journalists strive for accuracy, but often lack the scientific background that will help them place a story in perspective. Or they don't have adequate time because they have a deadline to meet. Also, journalists try to present both sides of the story rather than draw conclusions.

2. Avoid both middle-of-the-road and extreme positions.

Sandman recommends envisioning a scale from 0 to 10 of all possible positions on an issue. He says reporters pay little attention to 0, 1, 9, and 10 because they are too extreme to be credible. Positions 4, 5, and 6 are boring. Sandman suggests adopting position 3 or 7 to have the most impact on a story. He calls a person with such a position a "credible exponent of an identifiable viewpoint." The point is to be neither wishy-washy nor extreme but somewhere between.

3. Don't wait to be called.

Whelan suggests scientists "should announce well in advance of a breaking story their availability to answer questions on specific topics." Volunteering your expertise before risk communication is necessary can help a reporter cover a story better if the need arises.

If communication becomes necessary, continue to be available. Keeping quiet won't prevent the story; rather, it could result in more attention to speculation and fear.

Whelan argues scientists have an obligation to debate questionable claims made by others. "To stand back is to permit facts to be distorted —a serious error omission."

4. Maintain control of the interview.

Once you have a journalist's attention, there are several measures you can take to express yourself effectively.

- Be prepared. Brush up on what you want to say.
- Look for opportunities to emphasize key points.
- Stay composed, avoid assigning blame, and don't be led into unfamiliar territory.
- If you don't know the answer to a question, admit it rather than guess. Admitting you don't have all the answers can make you seem human and give you credibility. Offer to get the answer, then do it as soon as possible.
- Never lie to a reporter.
- Be available for follow-up.

5. Be your own translator.

Even if the reporter understands technical terms, he or she usually must choose words the reader or viewer will understand. If you use plain language from the start, you leave less room for error in translation.

"If you refuse to simplify what you say, the reporter will try to do the job for you (at great risk to accuracy)," Sandman says.

An interview for a documentary or a trade magazine — as opposed to the six o'clock news or a mass-circulation paper — may require less simplification. If time permits, prepare your remarks with their destination in mind. Otherwise, assume you must reach a large, diverse group with a short attention span.

Resist Temptation.

When people in the public eye fear public outrage or being misquoted, the temptation to say "no comment" is strong. The temptation to think lay people won't understand the information they're seeking is also strong.

But when real risks are involved, there is no place for an "us against them" view. Trust and cooperation are essential.

Effective risk communication on the part of the agrichemical industry can help achieve it. ◆

"Food"

Continued from page 7

store or labeled "natural" is free of pesticides. This has been found not to be the case. Even if a crop does not have pesticides applied, the chemicals may find their way to the crop by way of the wind or water from another field on which the pesticide's applied. Many foods analyzed from health food stores have been found to contain pesticides at comparable levels to those purchased in regular supermarkets. It is important to note that food from both sources contained small amounts of pesticides. The same laws that apply to food raised and marketed domestically also apply to imported food.

Man-made pesticides are the only forms of pesticides most people think of when they think of chemicals in food which may be harmful. However, we know that many plants produce pesticides naturally to protect themselves from their environment. Many of these natural pesticies are known to be potential cancer causing substances. This is not necessarily cause for great concern because such pesticides generally occur in foods at very low levels. The human body appears to be able to handle such low levels without harm.

It is estimated that people in this country currently consume natural pesticides in gram amounts per day. Man-made pesticides are consumed in milligram quantities or less per day or at one-ten thousandth the level. A recently developed new variety of potato could not be marketed as human food because of its high content of a natural pesticide, solanine, which is toxic to humans in the amounts present in the new variety. There are no tolerance levels set for naturally occurring pesticides.

The appearance of pesticides on foods at levels above the tolerance level generally results from improper use. For example, the pesticide solution may have been mixed improperly so that the concentration was higher than allowable. In some cases a pesticide has been used on a crop for which it was not approved. People who use restricted pesticides are required to enroll in training in the use and safety of pesticides to avoid such problems.

The danger from consumption of pesticides in the amounts currently found in the food supply would seem to be small when compared to other risks encountered every day. Vigilance is always important on the parts of those applying chemicals to foods as well as by those consuming the foods. Excessive consumption of one food may expose one to a high level of a pesticide whereas normal consumption may present no problem. Continued surveillance by the government agencies responsible will be important to maximize the safety of the food supply.

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