

HERBICIDE &
PESTICIDE
USE HEARING

Senate Health, Education and Social Services Committee
Hearing - January 3, 1985
1:00 pm - 5:00 pm

RE: Herbicide and Pesticide Use

Legislators Present:

Senator Joe Josephson, Chair, Senate HESS
Senator Vic Fischer, Member, Senate HESS
Senator Pappy Moss, Member, Senate HESS
Senator Paul Fischer, Member Senate HESS

Senator Tim Kelly

0 Senator Josephson commenced the hearing at 1:00 pm.

Josephson: This hearing was called for because of concerns raised over herbicide and pesticide spraying. Since the Railroad will be transferred over to the State it is appropriate that the Senate obtain information about this issue and determine if legislation or budgetary changes are suggested by this hearing.

4 Frances Weeks, Chief Engineer of Alaska Railroad:
We've contracted with the Corps of Engineers to prepare an environmental impact statement with respect to herbicide. Corps can only work with Railroad as long as it's a federal agency. However, Mr. Turpin (as President and CEO of Alaska Railroad) signed a memorandum of understanding to continue to proceed forward with the work as we are currently doing.

5 Josephson: One of the concerns I've heard is that when the Railroad Corp. begins operation, it would no longer be governed by provisions with regards to federal agencies. Can you give me some enlightenment about that as to what degree the transfer will relieve the Railroad of environmental assessment or impact statement obligations?

Weeks: Right now we're proceeding as if no change is taken place (between state and federal) and we're proceeding with the EIS.

8 Senator V. Fischer: Has there been or is there any staff recommendations to the Board of Directors to move ahead with the use of herbicides?

Weeks: There has not been anything happening in house as far as making recommendations to the Board as far as this issue. Of course with the publicity that had been in the paper... So as far as the change in the direction that we're heading, I really don't see any change. Of course I fortunately believe that we do have a good program as far as herbicides. I feel that we would be able to, after the completion of the documentation that we're working on, continue with the program. And I don't really see any change due to the fact that's it's no longer going to be a federal entity but part of the Alaska Corporation.

- 11 Josephson: Are there any claims, in the right of the transfer act, to which the state would have exposure. Is the state liable from any prior herbicide spraying?

Weeks: I do not know of any claims that are involved in this. The litigation is did the federal government, or the Alaska Railroad acting through the federal government, comply with NEPA (?).

Josephson: Is there any monetary claims pending either formally or through informal notice through the railroad arising from herbicide spraying?

Weeks: Not from the spraying activities themselves.

- 13 Josephson: As I remember there was some issue as to whether there were other ways to clear the right of way besides the use of herbicide. That other ways could be less controversial. Would you enlighten me about that? Whether you know about any of these alternatives?

Weeks: As far as our herbicide program there are two portions to the program. There's two types of vegetation that we're trying to control and two different areas related to the track. The one is the area that's in the middle twenty feet of the track which we're trying to completely defoliate the track section. The other is outside, where you're trying to control the tall vegetation, i.e. the brush. As far as how you attack the two, you have to look at them individually. The brush we spray, we use mechanical cutters, we use hand labor, and in the past combinations of these. In the middle of the track, as far as I'm concerned, basically no substitute for the herbicide in the middle of the track. There are some things that you do with the track in normal track maintenance that will reduce the amount of vegetation in the track. Is it a viable option to have local citizens to go up and physically pull the weeds from the track to be foliated? Looking at it from a legal and safety standpoint, I see some great problems in that area.

16 Josephson: You mean the individual volunteers might get hurt?

Weeks: Yes, the conflict between the people in the track and the train operation, we of course, frequently have citizens, namely contractors in the middle of the track, various highway projects that are working with utilities and we do have problems with them and we do have very strict safety requirements on that operation.

17 William W. Mitchell, Professor of Agronomy, Agricultural and Forestry Experiment Station, Palmer:

My work involves the use of herbicides. Because I use them myself, naturally I'm concerned with the safety of their use and their effect on me. Therefore I've looked at the work that other scientists have done with them, those who know much more about herbicides than I do and looked at the results they have obtained. I brought with me several items that have a bearing on the subject. There's a Council for Agricultural Science and Technology who put out a report on herbicides that I will leave with the Committee. Another publication put out by an Oregon researcher, of course they're concerned a great deal with forestry and brush control. Another, Chemical Brush Control: Assessing the Hazards. Another one by the same author, Behavior and Impact with Herbicides in the Forest. Several other studies and some court cases were also mentioned.

All the evidence now on hand with the effects of herbicide use, I am convinced that they are safe to use, of course the users should not be careless. As to the control of brush, chemical control can be a valuable tool. It is less expensive than mechanical control and more lasting in its effect. Over some terrain, mechanical control can be very difficult, even impossible and dangerous. I see the usefulness and safety of bike trails diminished by the growth of brush which limits visibility and threatens the structure of the trail. I think the judicious use of chemicals to control the growth of brush will improve their safety.

22 Judith Macnak, Glen Ray, Anchorage citizens:

We're speaking on behalf of not only our own families, but a dozen other families in Anchorage as well, who have been directly exposed to unwanted pesticide spray during the past two summers. Our concern is the exposure to these potentially hazardous chemicals in our own home environment. These chemicals may be EPA registered, however this registration does not assure their safety. All of these chemicals are toxic.

Ray: There are two sides to this question which we're concerned with. One, we want a greater physical safety for our children and ourselves in our homes. Two, we want to live in an environment free from emotional stress caused by the worry that these hazardous chemicals give us. It's not a question of is there a risk or no risk. There is either a risk or there are unknown risk.

Macnak: It was mid morning July 3, 1984, it was a gusty morning. I was just preparing our children to go outside to play. At this point, a pest control truck drove up in front of our home and parked there and the applicator began preparations for spraying in our next door neighbor's yard. We just had enough time to close our doors and windows and the high pressure spraying of two large birch trees began. The spray rained down upon our home, our yard, our children's toys and our garden. When we confronted the applicator after he finished spraying, if we hosed down the toys and the garden, there would be no danger. Whether he lied or was misinformed about the dangers of the substance, we don't know. However, upon consulting the Cooperative Extension Service and DEC, we were advised to eat nothing from our garden for a full three weeks. We were shocked, angered and depressed. The most important thing, is that had we not been there, we probably would not have been aware of the spraying.

35 Ray: In dealing with these hazardous chemicals, such as the pesticides. In regards to the residue, we have the following questions: How individually susceptible are each of our children to this? Do these poisons interact with other chemicals in our environment? Testing of these chemicals does not answer these questions. During the summer of 1984, the Department of Health and Environmental Protection had received an increased number of complaints of which we were one. We collected twelve names of people. The Department was concerned about getting a handle on the use of practice of pesticide in Anchorage and took the initiative to writing an amendment to the pesticide ordinance here in Anchorage that would regulate the use of pesticides. A meeting was called. The pesticide applicators suggested a compromise and proposed a ban on spraying pesticide above four feet. The city is in the process now of writing a new amendment that bans the spraying the pesticides in Anchorage and will be introduced to the Anchorage Assembly on February 5.

37 Macnak: This ban received a broad base of support. It still only touches the tip of the iceberg. Concerns still exists about soil contamination, contamination of well waters, streams, all from the use of chemicals into the soil.

Ray: We'd like to suggest three things to this committee to be considered for future legislation: 1. Regulate the pesticides sold in Alaska, allowing only those with a minimum risk to people and the environment. 2. Formulate state guidelines on pesticide application and ensure minimum risk to people and the environment. 3. Fund research on effects of hazardous chemicals such as pesticides in our environment with emphasis as to how these chemicals work into our drinking water and impact marine life.

I'm relieved to find that there's a body of research that says that some of these chemicals are safe for certain things. But there is no research that says any of these chemicals are safe in all categories. And they're not talking about no risk, they're talking about a level of risk. I'm relieved to find out there is some assurance in some categories but it doesn't leave me feeling that the chemical is still ok for all things.

40 Macnak: I have information that of more than 3,000 pesticides, more than 60% have minimal to no toxicity data available whatsoever. In only 10% of the cases is there a complete assessment on these particular pesticides. We are playing a very risky game in the use of them and we must consider restricting them.

Josephson: Do you have a copy of the Anchorage ordinance?

Ray: It's in the attorney's office, Michael Marsh has it. Not written yet. Dr. Wilson sent a memo asking to put it in terms so it can get put before the Assembly.

TAPE I - SIDE B

Josephson: Was there testimony before Judge R---(sp?) indicating that these compounds were toxic or harmful, as opposed to the literature that the Professor gave us today?

Weeks: Yes, there was considerable testimony and documentation. Since that time when we looked at the possible effects on one of the chemicals that we had been using, we no longer have that as part of our program. In the summer of 1984 we did no chemical application on the weeds. As far as the track section the railroad became much greener this year, we lost the ground as far as our maintenance program. Spraying weeds in the track is kind of like changing oil in your car engine. You can get by for awhile without changing oil but pretty soon something is going to happen. Outside of the track area, in the brush, we used mechanical cutter and also dozers and a little hand labor.

4 Guy McConnell, Alaska District Corps of Engineers:
Last two years I've been working with the Railroad, I've prepared the environmental assessment that was prepared earlier this year. I've come across several misconceptions. Three areas: herbicides are a discrete chemical group of themselves; toxicity of herbicides; and exposure of herbicides. Herbicides as a group, are not chemically similar. The only shared characteristics among these 130-140 chemicals is that they all affect the growth of plants. You can't judge one herbicide by another. There's no valid reason that herbicides are any more or less toxic to humans and animals than many other functional groups of chemicals. Exposure varies widely among the herbicides, no way to generalize about it.

11 Senator Moss: Is there a cumulative effect on 24D, 245T?

McConnell: In chemicals that are carcinogenic, it appears that they are hit and run chemicals. If you're exposed to carcinogens over a period of time, even though the chemical itself may leave your body, the effect of the chemical may remain. This is for things that cause cancer, in particular. For others, if the chemical leaves the effect seems to go away, unless there was some permanent damage done to an organ. Now your question is does the chemical remain? In the chemicals that you've asked about, 24D, 245T, they have done laboratory tests, both with humans and animals that show these chemicals, both of them, are rapidly eliminated from the body without being metabolized. They are not used in the body unless the body is ever saturated with them. When you reach a certain level, the body loses its ability to excrete them as fast as they're coming in. It takes quite a large amount to do this. There are impurities, dioxins, in both chemicals, in extremely small amounts. The dioxin in 245T is quite poisonous although it is an extremely small amount. The dioxin in 24D is much less poisonous than 24D itself and is also an extremely minor contaminant. Both of these materials, the dioxin, because of the chemical nature, are tended to be retained by the body for longer periods than the basic chemical itself. Speaking of the single dose short term exposure, if the level is small enough the body tends, in general, to eliminate these chemicals as long as they are below a threshold level. You exceed that level, you can cause sickness, damage to the body.

20 Josephson: Part of your function in doing the impact statement is to consider options for the railroad in regards to environmental problems when encountering spraying.

McConnell: Yes, under the Environmental Policy Act, you're required to review public concern in the matter and for a full range of alternatives to any particular problem. We received comment and examined a number of alternatives. As Mr. Weeks said before, the railroad uses a number of means to control vegetation at this time and has before, although they relied principally on herbicide. I could find no railroad in the United States or in Canada that did not use herbicide as a mainstay for vegetation control. I was not able to find anyone in the industry or in the scientific community who could suggest ways that seemed feasible to control vegetation on the roadbed to meet railroad objectives without the use of herbicide. That doesn't mean we shouldn't continue to look for methods. But couldn't find anyone that could solve this problem without herbicides.

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The controversy over herbicides among informed members of the public and scientific community, is not whether herbicides will kill, but whether years of exposure can cause increases of instances in some kinds of disease. And not whether spot application or occasional use will cause widespread ecological damage. But whether applying tons of pesticide per square mile, decade after decade, will affect the function of some types of soil ecology. In the U.S. in general, about 2.7 billion lbs of pesticides are used each year in the croplands in the grain baskets of the U.S., using well over a ton per square mile of herbicide. The railroad in its application was using about a ton or so for the entire railroad, 600 miles of railroad, when they were using herbicide. I'm not suggesting that we should ignore the real problem that can be associated with the improper use of herbicide but rather that we get these problems in perspective and go to responsible sources for information to answer our questions about these chemicals. We should be suspicious of any person or organization who tries to tell us that herbicides or other pesticides can be applied indiscriminately without consequence or that the pesticides registered with EPA are automatically safe in any application for which they are registered. Or that there is no need to carefully evaluate both the target organism and other components of the affected environment before the herbicide is used. We also should be suspicious of sources that try to tell us that most herbicides are highly toxic. The truth is that we should evaluate all the alternatives to solve pest control problems on a case by case basis.

- 27 Arndt Von Hippel, Anchorage citizen:
Would like to speak against the use of herbicide and pesticide. Now if anyone says to you that they know what the long term effects of pesticide or herbicide are, I would suggest to you that they're wrong. We all know that research is funded by these large chemical companies. We get alot of phony data. There are various reasons for people to come up with various papers proving various things, the more outstanding the finding, the more likely it is to receive publicity, and more likely it is in line with the chemical company's desires, the more likely you are to get further grants. You can't believe everything you hear.

TAPE II - SIDE A

- 0 I believe there's no overwhelming reason to ever apply any chemical pesticide or herbicide in Alaska. All chemical herbicides and pesticides are bad news, as far as we can tell, we frequently don't know. Some of them may be just fine, but I don't think the studies are there to show that. I don't think any legislation against chemical pesticides should however make it impossible to use biological deterrents.

Sprayers that I've talked to, if they're being honest, they're significantly worried about their own health.

Would like to suggest that any party that sprays anything be required to have a coloring agent and a flavoring agent to that spray that lasts as long as any environmental persistence in the environment of that substance. There needs to be marking on pesticide spray.

I think that the Alaska Railroad and others are relying on the literature, and most of this literature is unreliable. The Alaska Railroad is run by a very fine manager, or was, Mr. Jones. He's however working within financial and other restrictions. I think that if we give him guidelines there will be no herbicide or pesticide spraying around the state. I'm quite sure we could work our way around it. I see no excuse for using chemicals that have long lasting effects on us and the environment in exchange for not passing a few dollars around to people who are willing to work on the weeds.

- 12 David Wigglesworth, Alaska Health Project:
Industry does most of the testing on herbicides, government does not have the funds to do the testing. Many pesticides used now were grandfathered at the time when the federal program was enacted in the early 1970's. To guarantee that a pesticide is safe is next to impossible and the federal

program and the system does not pretend to manage pesticides by their safety but on a reasonable risk. A fundamental question that we may want to ask ourselves as a state is, are we willing to follow the present system with its loose guidelines, the unknown risks inherent in the system, the unknown liability that the state may incur by following the present system. It's time to have the state look into developing an overall pesticide policy for the state. Also have a policy where the public is informed, workers are informed, as well as managers.

26 We have to begin to really fund departments, like DEC, Department of Labor, with adequate funding to get them out there to do what their main function is to do, which is to protect the environment and protect workers and public health in Alaska. And we must make this a priority.

31 What we have to do is look at all the data, and come up with a rational decision and a plan and a policy guideline for which pesticides, herbicides are to be used. It's not a real clear cut decision making process. It's very arbitrary. We need to have more adequate testing facilities here within the state.

35 Raymond Jorgensen, Alaska Department of Labor, Chief Industrial Hygienist in Labor Standards and Safety Section:

Josephson: What is the Railroad inspection program with respect to herbicides?

Jorgensen: That's a good question. I don't think there is any activity. The scope of the inspection team that's taking a look at the railroad for federal/state changeover is looking and focusing in on facilities only. They're not looking in at the right of way.

Josephson: Are the OSHA violations within your jurisdiction?

Jorgensen: Not until the changeover becomes effective. We have not received any complaints from employees working at the Railroad. We may. And we would have some impact by our actions in responding to those complaints.

Josephson: Can you summarize the Department of Labor's relationship to the Alaska Railroad.

Jorgensen: Now the Department is spending money for information gathering for serving the facilities to produce a report to the railroad people for corrections for health and safety hazards.

Josephson: Do you know if or not the ongoing work indicates any significant health hazards, whether there's herbicide exposure otherwise?

Jorgensen: I'm not knowlegable of that. However, there are people in the Department that are.

Senator V. Fischer: Assuming the transfer has occurred, what jurisdiction would your Department have over the Alaska Railroad with respect to these issues?

Jorgensen: We would be looking at the protection of the employees of the Railroad that are mixing, applying the pesticides or herbicides.

39 Senator V. Fischer: Is this the kind of jurisdiction you'd have in responsibility for any department of the state?

Jorgensen: Yes it is. We have jurisdiction over all places of employment in the state, whether they're state government or private enterprise.

Josephson: After the transfer of the railroad, you will be able to address the issue of herbicide, not from the standpoint of the safety of the Alaska public at large, but focused upon the issue of employees.

Jorgensen: Yes. We suspect we will be spending alot of time looking at railroad facilities and occupational safety and health problems there. Department of Labor has recently hired a physician that will enable us to do some medical work on workers that have been exposed to herbicides as well as perhaps even collecting blood samples, tissues and have those analyzed. Analysis is very expensive and time consuming and only occassionally can we use local laboratories. But legally we cannot resort to uncertified laboratories, and most of these certified laboratories are located out of state.

TAPE II - SIDE B

7 Jorgensen: We rely heavily upon research of others and try to make it apply to Alaska. I'm not advocating that we set up our own research team. We do follow the U.S. Department of Labor's mandates on their standard setting. Which is based upon research all over the world and the country.

Josephson: How many people do you have in your office?

Jorgensen: As far as the people with the expertise to look at the application of herbicide, the industrial hygienists, there are currently five enforcement types and one consultant type that cover the entire state. Our working budget for the entire program for all of our staff is somewhere around \$2 million. \$1 million is matched by \$1 million from U.S. Department of Labor. The transfer action of the railroad gave a lot of money to the Department of Labor to pick up several other people to do the survey. So there are two people that are primarily looking at safety hazards associated with the railroad facilities. The inspectors do not have the health credentials that they should probably be having to make the health, to recognize and evaluate the health hazards.

- 10 Senator Moss: Your department is responsible for the safety of the workers, but what about those people that live along the railroad. How often do they have to be exposed to these chemicals before your department will say we have a health and safety problem?

Jorgensen: It's a good question about where does one's jurisdiction end and where does one's begin. The law that we're operating under says that there has to be an employee/employer relationship. Many people are happy because that's where our jurisdiction does end. Where it has to be picked up then, from that point on, would be the people in charge of public health or the environment. The Department of Labor and OSHA tries to focus in on the sources of the hazards and the causes of the conditions that would expose the public also if they happen to be in the vicinity.

- 18 There are some things you cannot expect the Department of Labor to do under the OSHA law. Such as to protect the general public, the innocent bystander. For example, while a building with asbestos is being demolished, the people doing the demolishing are protected as employees, while the bystanders aren't.

We would inform the employer and the employee that the hazards that they're exposed to are dangerous and they're not adequately protected. They must take measures to protect from those exposures. Including: elimination, substitution, personal protective equipment, and other types of control (engineering or administrative) measures.

- 25 Senator V. Fischer: In regards to broader protection, beyond just the worker, when you become aware of a hazard when they affect more than just the workers, when they affect the community or whatever, is there any communication between your Department and others?

Jorgensen: There is communication. There's probably not enough. What generally happens, the public health people encounter the problem of exposure and do not have the capability of evaluating it and call us to evaluate it. The people that should be responsible for it are the people who are protecting the environment, DEC or Public Health Department or whoever. But they frankly do not have the technical equipment or the funding or the people or all of it and they rely upon our little department to come up with our expensive equipment and do the monitoring and measuring. And we have done that.

There's two ways that people that who are running businesses can get help for occupational safety and health. They can ask for it through a consultant, a voluntary type of way, where we would send consultants out to evaluate their problems and they do not run the risk of being cited or fined. The other way is for us to knock on their door, unannounced, and conduct an inspection, and they do run the risk of being cited and fined. So the Railroad can ask to use our voluntary compliance services, they're free to all the places of employment in the state.

30 Bill Burgoyne, Alaska Department of Environmental Conservation, Pesticide Control:

OSHA or the Department of Labor is responsible for the safety of workers involving pesticide use or application. DEC is responsible for everyone else, including the general aspects of the environment. In addition, the DEC pesticide section has had a responsibility in the past eight years under a contract with the federal government, we are responsible for the federal pesticide law.

I've worked with the Alaska Railroad on their pesticide use and safety program for the past six years.

Like most government agencies we're not happy with the number of staff that the pesticide section has. It presently has one person.

We have done some research on long term effects of the ---- herbicide on the environment and was funded almost entirely by the Railroad (expense of research was over \$750,000 over the past six years). It gives us one of the very few data basis that we have on toxicity in cold climate. With the pesticides, in our cold weather, they don't disappear as fast, they don't work as well. The dosage that's recommended for outside states, where most of the research is done, is not totally applicable up here. There is at the University system one investigator, at the Ph.D., level who is working on herbicides, there's myself and the railroad studies have been finished for the present. And that's about it in this state. Not much research done

on pesticides in northern latitudes. Thus we make alot of decisions done on lower 48 data. Most of the time it works, sometimes it's been called into question. If it's questioned, it takes alot of time, alot of money and people to answer the question.

35 Josephson: Has the Railroad ever asked your office for alternatives to the herbicide they use? How do you get involved in what herbicides to select and where and how they should be used?

Burgoyne: When I started about ten years ago, the 245T (?) was commonly used in the state. I said this one was no good. I finally got voluntary compliance.

Josephson: Does the Railroad use 245T?

Burgoyne: At the present time, it uses 240, a related compound. Not used at all now in Alaska presently.

37 Dianne Soderlund, Environmental Protection Agency:
EPA promulgates regulations to protect the environment from unsafe uses or abuses from pesticides. EPA can enter into cooperative agreements with state agencies, thus allowing the state to have a permanent responsibility for implementing a program. And this is what we've done in Alaska. Up to this point, in this role, EPA has provided funds to Alaska DEC and these have been in the amount of \$10-15,000 annually and have been used solely for the purpose of certifying and training operators. These funds are matching grant funds. There are other funds available to the state, in the range of \$45-60,000 annually for enforcement purposes, but so far the state has opted not to accept these grant monies. I believe these are matching funds but not positive.

My first order of business is to develop a profile or inventory of pesticide uses in the State of Alaska. Presently, it's unknown what quantity of pesticides are used in this state, where they're used, whether they create a problem. This profile will take about a year. The profile will include the quantity used, concentrations, acreage it's covered, where they're used at, who's using them, is it commercial applicators or private citizens, what are problems with the uses, and what the state needs are. With pesticides, I'm talking about a broad range (pesticides used in seafood processing, oil and gas industry, in agriculture, and right of way, etc.).

TAPE III - SIDE A

EPA now is spending a great deal of time and resources with what toxicity effects are, whether the data is adequate, and reregistering pesticides that are old, to bring them up to par with the national guideline that is used today.

In the State of Alaska, DEC has been making the recommendations to the railroad and are using EPA data, and other data to do that.

7 Paul Bratton, Alaska Survival Group:

Read a statement from an Judy Price (attached) who has been exposed from herbicide used along the railroad tracks around Talkeetna, and became ill as a result and is currently still suffering.

17 In 1982 I and another representative from the community went with Herb Rice, who at that time was in charge of the Railroad spraying. We identified and flagged sensitive areas in the community which should not be sprayed (creeks, trails, cabins, gardens, etc.). The spray truck went through that summer and did not spray those areas. We felt at last we were successful in our requests for the railroad not to spray certain sensitive areas. Then about a week later, the spray truck went through again, this time just after midnight and it sprayed everything, over creeks, trails, gardens, everything. To this day, Herb Rice denies that he sprayed those areas. It was about that time that Alaska Survival Group filed suit against the Alaska Railroad in federal court.

In 1983, I once again went to identify sensitive areas along the railroad. I admit I had reservations as to the usefulness of it. I walked twelve miles to Talkeetna to meet with Mr. Rice and other railroad people. We road up the track and discussed what areas should not be sprayed. Mr. Rice agreed that the entire area could be considered sensitive and that there was no need to spray herbicides that summer. Less than ten minutes after we returned to Talkeetna, Mr. Rice called me and said he talked to Mr. Weeks on the phone and he would have to spray the area. This was because Mr. Weeks, 100 miles away, not even seeing the area, insisted that it must be sprayed. And it was sprayed.

We have offered to clear the tracks of vegetation for free, they refused. We have offered to clear them for a price no greater than the cost of herbicide and they have so far refused to respond. Many of the people in this area are

sick, are afraid for themselves and their children, many are angry. We hope that the State, as it assumes responsibility for the Railroad, will work with the residents to develop safe alternatives to the spraying of toxic herbicides before it is too late.

Josephson: Is the information regarding the effects of the spraying verified by medical information?

Bratton: In Judy's case, it's verified that her thyroid no longer functions.

Josephson: More specific, does the physician link her thyroid condition upon the spraying of herbicide?

Bratton: In the three or four major cases we're talking here, it's been a pretty consistent theme that the doctor's have told them that what you are suffering can have two or three causes. One, toxic chemicals, two genetic..

Josephson: What is the population of your area?

Bratton: About 200 full time residents north of Talkeetna.

25 Josephson: What is the present status of the law suit?

Bratton: We hope and expect the Railroad will complete the environmental impact statement. But its up to the Railroad to make that decision. We are represented by the Sierra Legal Defense Fund.

30 Marilyn Heiman, Anchorage citizen:
Worried that the Railroad won't take into consideration health and social effects, for example economically when decisions are made (if herbicide spraying is cheaper than an alternate safer form of clearing vegetation). Alternatives should be used whenever possible. Concerned about lack of adequate information on the chemicals sprayed by the railroad. Many of the studies in the environmental assessment that the Alaska Railroad did were determined inadequate by the U.S. EPA. Also many of these studies were done by the chemical companies which produced the chemicals. DEC needs additional funding.

32 Becky Long, Talkeetna citizens:
Read a letter from Linda Stefanowski of Talkeetna who could not be present (letter attached). Thank you for giving attention to this matter. The only access to our home is via the Alaska Railroad stop. We have been involuntarily

exposed to toxic chemicals the Railroad has decided to use in its vegetation control program. We have made repeated requests to the Railroad to at least stop spraying herbicide at flag stops. Finally in June 1982, the Railroad agreed not to spray areas of vital concern to resident's health, but when the spray truck went through the following month, they violated the agreement and sprayed everywhere as usual. At that June meeting, Dr. Burgoyne informed us that our area had been selected for experimental use of a new chemical of unknown toxicity. I have seen two of my neighbors become seriously ill with thyroid disorders and it just so happens that chemicals used by the Railroad are linked to these disorders. It is a life or death matter to those of us who live here. We must curtail the use of herbicides/pesticides along the use of the Railroad, power line right of way and in the agriculture business.

Ms. Long's personal comment is that the Railroad's chemical weed control costs \$375 per mile per year while DDT-PF control highway vegetation with no herbicide at \$104 per mile.

35 Denis Ransy, Talkeetna, Alaska Survival Group:
Has testimony from Jim Sykes, Chase resident - thank you for holding these hearings. My family feels there are serious risks from herbicide spraying, some of them yet unknown. The Alaska Railroad didn't use herbicide until 1953, or thirty years of maintenance without herbicide. Various people in our area have experienced serious health problems which they feel are traceable to APR's spraying program. I hope the state will take more interest in the well being of the citizens than the federal leased owned line has done to date.

Ransy's own comments - will any of these herbicides be discovered as the new DDT? Many of the residents in the area will be willing to work on a contract basis clearing the brush. What effects will these herbicides have on people twenty years from now? Urges the legislators to continue working on this problem.

40 Bill Robb, Municipal Horticulturist, Anchorage:
As a horticulturist, I look at the plant aspects. All the pesticides should be used safely. We contract out on the spraying in Anchorage. Most of the applicators are reputable, and have pretty good training and knowledge of the materials they use. One thing the horticulturist industry has done in the past two years, has been to develop a horticulturist association to try to educate the public to safe processes. Discussed "fly by nighters" in spraying industry.

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Various comments from people.

- 3 Josephson: Thanked everyone for participating and adjourned the hearing.



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News and Views

Canadian high court clears 2,4-D, 2,4,5-T

The spraying of 2,4-D, 2,4,5-T or combinations of both can be carried out safely and does not present a health hazard, the Supreme Court of Nova Scotia ruled this past fall. The 182-page decision cleared the way for use of these phenoxy herbicides in that Canadian province and may influence thinking elsewhere.

Justice D. Merlin Nunn, author of the decision, wrote, "I am satisfied that the overwhelming currently accepted view of responsible scientists is that there is little evidence that, for humans either 2,4-D or 2,4,5-T is mutagenic or carcinogenic and that TCDD is not an effective carcinogen, and further, that there are no-effect levels and safe levels for humans and wildlife for each of these substances."

The Supreme Court had heard scientists from both environmental groups and industry present their case, and clearly he could see a difference between them: "While I do not doubt the seal of many of the plaintiffs' scientific witnesses or their ability, some seemed at many times to be protagonists defending a position, thereby losing some of their objectivity. There was a noticeable selection of studies which supported their view and a refusal to accept any criticism of their or contrary studies. Where the study was by anyone remotely connected with industry there was a tendency to leap to the 'fox in the chicken coop' philosophy, thereby ruling out the value of the study as biased. In my view a true scientific approach does not permit such self-serving selectivity, nor does it so readily decry a study on the basis of bias.

"I had the opposite impression of the scientific witnesses offered by the defendant. I did not detect any partisanship. They related their work, their involvement with the

substances, the results of their studies, and their considerations of other studies in a professional, scientific manner and I therefore found their opinions to be reliable and, indeed, I accepted them as such."

Judge Nunn wrote that it would be a Herculean task to go through the evidence of each witness indicating which particular facts were accepted or rejected. In summary, though, he wrote that, "As a general point, I accept the evidence of the defendant's witnesses as representing the generally accepted view of responsible scientists, and also as indicative of the risks involved. Each of them categorically states that neither 2,4-D nor 2,4,5-T, nor the concentration of TCDD presently in 2,4,5-T, nor the mixture of 2,4-D and 2,4,5-T in the concentrations to be sprayed on Nova Scotia forests pose any health hazard whatever."

The judge continued, "Having made this finding, it is unnecessary for me to consider the matter of riparian rights or groundwater rights. Since I have accepted that no risk to health has been proved, I need not consider these areas. Were I required to do so, and perhaps to allay public fears, I will add that the strongest evidence indicates that these

substances sprayed in the Nova Scotia environment will not get into or travel through the rivers or streams, nor will they travel via groundwater to any lands of the plaintiffs who are adjacent to or near the sites to be sprayed.

"Further, if any did, the amount would be so insignificant that there would be no risk."

This is one of the strongest and most clear rulings to come out of any court regarding these two herbicides. When asked if he thought this ruling as a defeat for the environmental movement, George Cooper, attorney representing Nova Scotia Forest Industries, Inc., said it was not, but rather it was "a victory for responsible environmentalism."

Computers can help create agchemicals

Scientists can now synthesize agricultural chemicals with a computer model that can spot the active compounds, says Judith B. St. John, USDA-ARS biochemist, Beltsville, Md.

"Picking out the chemicals that will have agricultural uses is a bit like finding a needle in a haystack," she says. For example, a group of similar compounds named pyridazinones has thousands of possible variations of the basic structure. But only a few of them are useful.

The biochemist cooperated with Falk Rittig and Hermann Blicholder of BASF Aktiengesellschaft, Germany, in synthesis and testing of the different pyridazinones. Based on the structure-activity relationships of 50 compounds, the computer predicted which structures of pyridazinone would be effective in altering the lipid (fat) in the membranes that line the plant cells.

Scientists are interested in changing the lipid composition of the membranes since previous studies have shown that this affects the



"Shouldn't you be taking notes?"



The herbicide 2,4,5-T [(2,4,5-tri-chlorophenoxy) acetic acid] has been a valuable asset for the past 25 years due to its excellent control of broadleaf plants. It has

been especially important for clearing rights-of-way and in the production of pine timber and rice. However, recently 2,4,5-T has been under investigation to determine whether it may be harmful to animal or human life. The Environmental Protection Agency has suspended many uses of 2,4,5-T and it has been the subject of much controversy.

Included with the information currently being compiled by EPA are data collected by researchers at the University of Arkansas. We were interested in collecting information which was lacking on actual human exposure to 2,4,5-T. For our study, field workers were tested who used 2,4,5-T in their regular spray operations. The proximity of these people to mixing and application operations should afford the maximum human exposure possible to 2,4,5-T applicators.

A great amount of investigation has already taken place with 2,4,5-T. The Council for Agricultural Science and Technology (CAST) has studied 2,4,5-T, along with other phenoxy herbicides. CAST reports issued in 1975 and 1978 state that these herbicides are beneficial and safe for use if precautions that must be taken with any pesticide are observed.

Although opposition to this opinion remains, the reputation of 2,4,5-T may have been clouded for the public by its past association. It was among the broadleaf defoliants used in Vietnam and, consequently, is sometimes still allied with the reputations of Agent Orange or dioxins. These compounds are presently being blamed for adverse effects on human life resulting from their use in the war in Vietnam.

To color the reputation of 2,4,5-T further, it is a fact that TCDD (2,3,7,8-tetrachlorodibenzo-*p*-dioxin), a dioxin toxic to a animal life, occurs as a by-product during the manufacture of 2,4,5-T. When 2,4,5-T was first produced, levels of TCDD remaining in the herbicide could run as high as 32 ppmw, but the process today produces 2,4,5-T with only trace levels of less than 0.05 ppm. The compound used

in our study contained 0.04 ppmw of TCDD. (This amount is equivalent to 1 drop in 7200 gallons of the spraying mixture). Although estimates had been made on human exposure prior to the study by our staff at the University of Arkansas, only limited information was available on the level of exposure to humans applying 2,4,5-T.

The study was carried out using crews engaged in their usual work activities in central Arkansas pine forests and rice fields. Twenty-two workers participated in the study. Some of these people have been involved in 2,4,5-T spray operations for several years. None of them have reported harmful effects as a result of working with the herbicide. As nearly as possible, investigators did not interfere with work habits of the crew members. Spray operations included a ground crew with backpack spray rigs, a tractor-propelled mist blower crew, and helicopter crews who make aerial application.

Our objectives were to analyze the 2,4,5-T content of the air around the worker to which his skin might be exposed, the air he breathed, and his urine, which can indicate the total internal dose to which he is subjected.

To accomplish the first analysis, we attached gauze patches to the clothing of the worker on the chest, upper back, bicep, and thigh areas just before each spray operation began and removed them immediately after the spraying was complete. The gauze patches were placed in amber-colored glass jars containing methyl alcohol and transported to the laboratory for analysis.

To measure 2,4,5-T in the breathing zone, we attached a small pocket-sized air pump to the clothing of the crewman. The pump pulled air across an absorbing resin which trapped the 2,4,5-T present. This resin was taken to the laboratory, extraction made with methyl alcohol, and analysis performed with a gas chromatograph equipped with an electron capture detector.

Complete urine samples were collected from each crew member from one day before to four days beyond the spraying operation. Previous studies had shown that over 95% of the 2,4,5-T that enters the body is excreted in a 7-day period.

Analyses were carried out at Northrop Laboratories in Little Rock and at the Alzheimer Laboratory in Fayetteville. The methods used have been shown to be precise to the 10 parts per billion level. We attempted not only

to determine how much exposure each worker was subjected to but also to note the relationship of the amount of exposure to his official work duties. All workers involved in the spray operation were included: supervisors, spray mixers, backpack sprayers, tractor driver for the mist blower, helicopter pilots, and flagmen. Some workers handled the spray compound more than others, and some (backpack crewmen, especially) were in closer contact with the spray mist. Crewmen also had their individual techniques for performing their duties. Some wore protective clothing and were very careful; others

¹Published with approval of Director of Arkansas Agric. Exp. Stn., Univ. of Arkansas, Fayetteville.

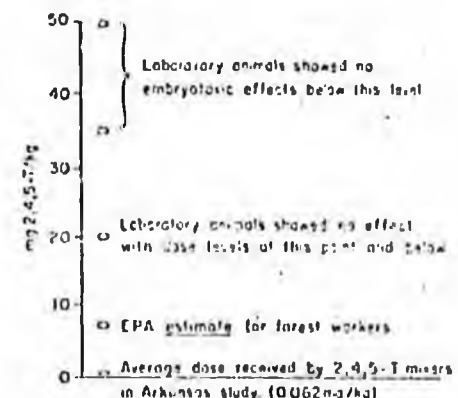


Fig. 1. Comparison of Arkansas Field test results with 2,4,5-T information from other studies.



Fig. 2. Backpack sprayers preparing to spray.



Fig. 3. Helicopter with spray boom.

scanned negligent in taking safety precautions. Our research crew made no suggestions and measured exposure without reference to work habits.

Total exposure was determined by the urine analysis and was measured in terms of milligrams per kilogram of body weight. This measurement can, in turn, be used with comparisons to exposure of laboratory animals in other studies. Mice (the most sensitive animal species studied) can tolerate levels of 20 mg/kg without showing any ill effects. Results from our tests indicated that workers who mixed the concentrate received the highest exposure with an average of 0.062 mg/kg, and backpack spray operators were second high with 0.047 mg/kg. The rice levee spray operator received less exposure than the backpack or mist blower crews. Helicopter flagmen received least with 0.001 mg/kg. Results averaged by crew showed that the backpack crew received the most exposure (0.055 mg/kg) followed by the mist blower (0.044 mg/kg) and the aerial crew (0.022). EPA had estimated that a backpack spray operator would receive an exposure of 7.0 mg/kg.

We compared the analyses of human exposure in these Arkansas tests with

EPA estimates on exposure and with other studies on toxicity of 2,4,5-T (Figure 1). These comparisons show that actual exposure to crewmen in these field tests were well below those that EPA had estimated for human exposure in spray operations. Exposure levels to 2,4,5-T and the dioxin associated with it are also well below those found to produce toxicity symptoms in sensitive laboratory animals. When we divide 20 mg 2,4,5-T/kg body weight (a dose level showing no effect in laboratory animals) by 0.062 mg/kg (the highest 2,4,5-T exposure received by any group of workers in our study), we interpolate that the crewmen could likely have been exposed to 322 times more than they were without harmful effects.

By analogy, if a human takes a single overdose of as much as 3 times the prescribed dosage of a pirin, he would likely exhibit adverse effects. Since over 95% of the 2,4,5-T absorbed by humans is excreted within 7 days, toxic levels could not build up in the body even for individuals repeatedly applying the herbicide.

The results of our test alone cannot be considered conclusive, but the popu-

lar reputation that 2,4,5-T has acquired, perhaps through association with dangerous substances, appears to be unwarranted. Our data have been included in the information which was recently evaluated by the Scientific Advisory Panel appointed by EPA to study 2,4,5-T. Final EPA decisions have not yet been made, but a portion of the panel's recommendations reads as follows:

"After extensive review of the data, we find no evidence of an immediate or substantial hazard to human health or to the environment associated with the use of 2,4,5-T or silvex on rice, rangeland, orchards, sugarcane, and the noncrop uses."

EPA has several alternatives to choose from: 1) lift the current ban of 2,4,5-T for forestry, rights-of-way, and pastures; 2) increase the ban to include the use of 2,4,5-T on rice, rangeland, orchards, sugarcane, and non-crop uses; 3) continue to study benefits and risks of using 2,4,5-T; or 4) take some other course of action. Hopefully, the information collected by our research team will help expedite this important decision.

Day and Night Differences in Sicklepod Response

How important is the time of day to application of herbicides?

It depends on which weed you are trying to kill, according to SEA weed scientist Robert N. Andersen.

For sicklepod, a weed common in field crops in the southeastern United States, herbicide spray treatments were nearly twice as effective when applied during the middle of the day than when applied in the evening, night, or early morning.

Andersen, stationed at the University of Minnesota, St. Paul, Minn., and Gary W. Kraatz, graduate student, selected the weed for detailed field studies because evidence from earlier research indicated sicklepod might show significant differences in response to day and night herbicide treatment.

When sicklepod leaflets fold together and droop, as they do from evening to early morning, the leaf area exposed to an herbicide spray from directly above the plant is only about 14 percent of the area exposed when the leaves are fully extended as they are during the middle of the day, Andersen says.

The researchers evaluated sicklepod plants treated with herbicide at different times of the day and night.

"Our results clearly suggest that leaf changes related to the time of day can be an important factor in the efficiency of some herbicide treatments on some species of weeds," Andersen says.

Because of extreme leaf movements, both sicklepod and coffee senna would be expected to intercept much less herbicide from an over-the-top spray application when they were in the "night" position than they would in the "day" position, Andersen says.

"Kraatz's specific studies of sicklepod show a very significant reduction in the effectiveness of herbicide applications from evening through early morning as compared to other times of application during the day," Andersen says.

In earlier research, Andersen and University of Minnesota plant physiologist Willard L. Koukkari found that all velvetleaf plants sprayed with herbicide at mid-day were killed, but only 28

percent control was obtained when plants were treated during the "sleep" period.

In other research, Andersen and Koukkari evaluated the leaf movements of nine weed species in growth chambers under several different light-dark schedules. They studied wild mustard, redroot pigweed, black nightshade, jimsonweed, common lambsquarters, common cocklebur, prickly sida, sicklepod, and coffee senna.



There are "day and night" differences in the response of sicklepod to herbicide treatments — depending on time of day plants are sprayed.

Phenoxyes

5

Herbicide exposure, mortality and tumor incidence. An epidemiological investigation on Swedish railroad workers

by Olav Axelson, M.D. and Lennart Sundell, M.D.*

Axelson, O. and Sundell, L. Work-environm.-hlth 11 21-28. Herbicide exposure, mortality and tumor incidence. An epidemiological investigation on Swedish railroad workers. An epidemiological investigation of tumor incidence and mortality among Swedish railroad workers, exposed to different herbicides, shows a slightly dose-dependent and significantly increased tumor incidence and mortality among workers exposed to amitrol (3-amino-1,2,4-triazole), whereas those exposed to phenoxy acids (2,4-dichlorophenoxyacetic acid = 2,4-D and 2,4,5-trichlorophenoxyacetic acid = 2,4,5-T) have about normal tumor incidence and mortality. Based on animal experiments, there is some evidence that amitrol may cause malignant tumors in different tissues, although tumors in the thyroid gland and the liver have been observed and discussed most frequently. Except for two lung cancers, the tumors in this study are of different origin, which is somewhat similar to what has been found and described in animals exposed to amitrol. However, exposure to amitrol in this study is sometimes related also to exposure to diuron and to some extent to monuron which confuses the evaluation of the relationship between the amitrol exposure and the excess tumor incidence. Although this investigation may be criticized on this point and perhaps in other respects, the result, being in agreement with animal data, suggests precautions in using amitrol.

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In early 1972 rumors caused newspaper headlines in Sweden about excess lung cancer mortality among railroad workers exposed to the herbicides 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). These rumors also made the Swedish National Board of Occupational Safety and Health request an epidemiological evaluation of the stated excess mortality and its relation to herbicide exposure.

The railroad workers were found to be exposed not only to 2,4-D and 2,4,5-T but also to other herbicides, especially 3-amino-1,2,4-triazol (amitrol), sometimes in combination with 3-(3,4-dichlorophenyl)-1,1-dimethylurea (diuron) and to some

extent also with 3-(p-chlorophenyl)-1,1-dimethylurea (monuron; table I). Spraying with phenoxyacids was performed by means of hand- or motor-operated equipment carried on the back. A wagon on the track was used for amitrol spraying (fig. 1). The exposures of the railroad workers are not exactly known in terms of concentrations of different herbicides in ambient air but many have reported wet skin in the face and on the hands due to the aerosol. On the whole those exposed to amitrol and its combinations had a fairly low exposure to phenoxy acids and vice versa but several also had both types of exposure. Therefore in considering the possible effect of exposure to one particular herbicide the exposures to other herbicides obviously will be somewhat confusing and thus the situation is difficult to evaluate properly.

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MATERIAL AND METHODS

Consulting the literature (3, 4, 12) and particularly the Report of the Secretary's Commission on Pesticides and Their Relationship to Environmental Health (15) it was found that especially amitrol might be suspected of carcinogenicity judging from animal experiences reported. Based on one of these reports (15) monuron exposure to some extent also could be suspected of carcinogenicity. However, as shown by table 1, monuron was used to a fairly limited extent and the individual exposure to this compound was more or less impossible to evaluate. Table 1 also shows that diuron was sometimes used in a fixed combination with amitrol and consequently there are difficulties in differentiating these exposures.

Because of facts and difficulties outlined above, it was decided that particularly the exposure to amitrol and its combinations should be considered, as this compound might be of interest from the carcinogenic point of view. The rumors which started the investigation also made it necessary to account for the relation of the mortality and cancer incidence to the exposure of phenoxy acids and their combinations. A remaining group with those exposed to other different preparations also had to be created, but to the greater extent this group also appeared to have been exposed to amitrol and combinations. Due to general epidemiological considerations (1), i.e. avoiding a "dilution" by those with a very low exposure, the studied population of sprayers was restricted to those with a total herbicide exposure of > 45 days (corresponding to about one spraying season).

Thus, four cohorts were considered: one with a total exposure to herbicides of > 45 days and consisting of 348 people contributing 2,978 person-years at observation; another cohort with exposure > 45 days to phenoxy acids and combinations and consisting of 207 persons contributing 1,747 person-years at observation; a third cohort with exposure > 45 days to amitrol and combinations consisting of 152 persons contributing 1,285 years at observation; a fourth group with exposure > 45 days to other herbicides and combinations consisting of 29 persons contributing 293



Fig. 1. Spraying amitrol and combinations in front of the open wagon, pushed by a locomotive.

person-years at observation. It should be pointed out that the different cohorts overlap each other which also means some of the cases to be in common for the cohorts, e.g. in the total cohort there will be found people with an exposure of 30 days to amitrol and combinations and with another 30 days exposure to phenoxy acids and combinations; these people, however, do not appear in either the phenoxy- or in the amitrol and combinations cohort. Although desirable, a closer evaluation of diuron and monuron exposure had to be given up for reasons discussed above.

In spite of a retrospective study, the exposure evaluation and the assessment of the different cohorts probably are reasonably adequate as the Swedish (state-owned) railways have a fairly effective administration which was able to provide not only comprehensive lists of persons engaged in herbicide spraying but also fairly good data in terms of exposure days. However, the number of days with herbicide exposure may sometimes be very different from the actual exposure expressed as a concentration-time product, unfortunately not available. For each cohort the expected number of deaths during the study period 1957—1972 was calculated from the Swedish average age and sex specific death rates and incidence rates provided as the official statistics of Sweden (14) and by the Cancer Registry

Table 1. Available information about amount of herbicides consumed 1957--71 on Swedish railways, in tons.*

Trade name	Active compounds	Year														
		1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Tolex	Atrazin	57.1	X													
Urcabor	Dinatriumtetraborate + Monuron		X	X	X											
Karmex	Diuron		X	X	X											
Telwar	Monuron		X	X	X											
Flyvar	Bromacil					0.29										
Primatol A	Atrazin		X	X	X		3.7									
Primatol D 43	Atrazin + Mecoprop + 2,4,5-T		X	X	X		4.0									
Ernisol 100	Amitrol		X	X	X		7.2	2.3	5.7	5.6	4.9	1.1	1.4	1.2	1.3	0.9
Ernisol 50	Amitrol															
Weedex tel	60 % Amitrol + 40 % Monuron						28.8									
Weedex kar	60 % Amitrol + 40 % Diuron										1.2					
Totalex extra	Atrazin + Dichloro- propionic acid + 2,4-D + 2,3,6-TBA															
Uridal	Diuron + Dichloro- propionic acid															
Total amount of different herbicides (X)			52.8	51.5	40.0	45.0										

* The (inactive) vehicles are unknown. Additional 2,4-D and 2,4,5-T seems to have been used.

(7, 13). Statistical evaluation was based on Poisson distribution and one-tailed p-values (1).

However, the latent period problem has to be taken into account (2) as far as by now (1973) is practically possible, the exposure occurring as late as during 1957-1971. Therefore, we considered observed versus expected deaths and incidences without the latent period aspect as well as with a latent time of ≥ 3 and ≥ 5 years respectively, which means that a member of the cohort is a counting risk (i.e. person-years at observation) from the third and the fifth year after achieving an accumulated exposure of > 45 days (of total exposure or exposure to either amitrol and combinations or to phenoxy acids and combinations etc. in the different cohorts, respectively).

A case-control study (6, 8, 9, 10) using four age-matched controls (11) was also applied in an attempt to evaluate a possible dose-response relationship and also for the investigation of possible co-carcinogenicity from smoking. The smoking habits also were controlled in the cohorts; table 8.

RESULTS

As shown in table 2 there seems to be a possible association between excess tumor mortality and exposure to amitrol and its combinations, especially if a latent period is considered ($p < 0.03$). On the contrary, in the cohort exposed to phenoxy acids and combinations a fairly good agree-

Table 2. Observed and expected number of total deaths; deaths due to tumors (WHO chap. II) and lung cancer (WHO A 50) during 1957-72 among herbicide sprayers with a total exposure ≥ 45 days. Expected number based on Swedish average age and sex-specific death rates.

Exposure	Cause of death	Latent period *								
		0 yrs			3 yrs			5 yrs		
		Obs. pers. yrs	Exp.	Obs.	Obs. pers. yrs	Exp.	Obs.	Obs. pers. yrs	Exp.	Obs.
Total	All causes	2,978	20.54	18	1,948	15.25	16	1,362	11.58	14
	Tumors		4.88	6		3.67	6		2.81	6
	Lung cancer		0.23	2		0.63	2		0.50	2
Phenoxy acids and comb.	All causes	1,747	12.48	10	1,128	9.22	8	770	6.88	7
	Tumors		2.97	2		2.22	2		1.68	2
	Lung cancer		0.51	0		0.39	0		0.29	0
Amitrol and comb.	All causes	1,235	8.51	9	830	6.13	4	531	4.62	6
	Tumors		1.96	4		1.47	4		1.11	4 ³
	Lung cancer		0.33	2 ²		0.25	2 ³		0.20	2 ³
Other herbicides and comb.	All causes	293	1.63	4	209	1.34	4 ²	156	1.09	4 ³
	Tumors		0.39	3 ⁴		0.32	3 ⁴		0.26	3 ⁴
	Lung cancer		0.05	1		0.05	1 ²		0.04	1 ²

* 2 p < 0.05 3 p < 0.03 4 p < 0.01

ment is found between the expected and the observed deaths independent of the latent period. The corresponding tumor incidence data, however, may be more relevant than the mortality data, particularly as the latent period in the mortality evaluation will include not only the «latent time proper» but also the duration of cancer illness. Moreover, cancer may not always cause death within a few years. As found in table 3 an excess tumor incidence is associated with exposure to amitrol and combinations (p < 0.01). The significance-levels in the cohort exposed to other herbicides and combinations are probably just reflecting the fact that those people exposed to amitrol also to a great extent were exposed to a variety of other preparations as described in table 1.

An evaluation of the situation may also be performed on the basis of a case-control study, which appears in tables 4 and 5. In these tables the exposure is considered in categories of exposure and the corresponding relative risk is calculated in table 6. In these calculations of the relative risk the individual matching is not maintained however, which probably means some loss in validity as there is some tendency of correlation between the

exposure of cases and controls. Concerning amitrol the table might indicate dose-response relationship, which also can be suspected in considering the data in table 7, although this table does not account for any influence of age as a risk factor for developing cancer.

It should finally be added that there has been some dispute about the actual exposure in the case of the reticulum cell sarcoma and in the case of the prostate cancer (table 7). These men are supposed to have been exposed to amitrol and combinations, but should perhaps be considered in the phenoxy acid cohort instead of in the amitrol cohort. (If so, there may be an excess of cancers in the phenoxy acid cohort (p < 0.05) but the p-value of the amitrol cohort will still be on the 0.05-level; no changes in the total cohort (p < 0.025). However, amitrol exposure seems to be most probable).

The tabulation of the smoking habits appears in table 8 and 9. Thus, the railroad workers were found to smoke a little less in 1971 than did the Swedish people in 1963 (12). Applying the case-control view it is possible to construct table 10, which is indicative of a co-carcinogenic influence from smoking.

Table 3. Observed and expected incidence 1957-1972 of all tumors (WHO 140-205), respiratory tumors (WHO 160-165) and lung cancers (WHO 162) among sprayers with an exposure to different herbicides.

Exposure > 45 days	Type of tumor	Latent period **								
		0 yrs			≥ 3 yrs			≥ 5 yrs		
		Obs. pers. yrs	Exp.	Obs.	Obs. pers. yrs	Exp.	Obs.	Obs. pers. yrs	Exp.	Obs.
Total *	All tumors	2,978	8.36	15 ³	1,948	6.26	13 ³	1,362	4.78	11 ³
	Respiratory tumors		1.22	3		0.93	3 ¹		0.72	2
	Lung cancer		1.02	2		0.78	2		0.60	2
Phenoxy acids and comb.	All tumors	1,747	5.03	8	1,128	3.78	7	770	2.83	5
	Respiratory tumors		0.74	1		0.56	1		0.43	0
	Lung cancer		0.62	0		0.47	0		0.36	0
Amitrol and comb.	All tumors	1,295	3.36	9 ⁴	839	2.51	8 ¹	581	1.90	7 ⁴
	Respiratory tumors		0.49	3 ³		0.37	3 ⁴		0.29	2 ²
	Lung cancer		0.41	2 ¹		0.31	2 ²		0.24	2 ³
Other herbicides and comb.	All tumors	233	0.63	4 ⁴	209	0.55	4 ⁴	155	0.45	3 ³
	Respiratory tumors		0.10	2 ⁴		0.07	2		0.07	1 ¹
	Lung cancer		0.03	1 ¹		0.07	1 ¹		0.05	1 ¹

* "Total" means that any comb. amounts to > 45 days.

** 1 p < 0.10 2 p < 0.05 3 p < 0.01 4 p < 0.01

Table 4. A case-control study on tumor incidence (WHO 140-205) during 1957-72 concerning Swedish railroad workers with > 45 days of total (combined) herbicide exposure.*

Case no.	Case	Phenoxy acids (2,4-D; 2,4,5-T)**			
		Controls			
098	--	II	II	--	--
079	I	III	--	II	--
257	--	--	I	II	--
135	--	I	--	--	--
127	II	--	--	--	III
354	--	--	--	III	--
014	--	--	--	III	--
256	--	--	I	--	II
009	II	II	II	II	--
309	II	--	--	II	--
317	II	--	--	--	I
163	--	--	I	--	II
268	III	II	II	--	II
172	II	--	--	--	--
266	III	II	III	II	--
334	II	III	II	--	I

* Amount of exposure (> 1 day I; > 45 days II; > 90 days III) at date of case's last exposure, age-matched (within 1.5 yrs).

** ≥ 1 day p < 0.03 (one-tailed); relative risk = 1.6.

Table 5. A case-control study on tumor incidence (WHO 140-205) during 1957-72 concerning Swedish railroad workers with > 45 days of total (combined) herbicide exposure.*

Case no.	Case	Amitrol **			
		Controls			
098	I	II	II	--	III
079	I	III	I	--	III
257	III	I	II	--	III
135	III	--	II	I	--
127	--	--	--	I	--
354	II	--	--	--	--
014	III	--	II	III	I
256	III	III	--	III	--
009	II	--	--	--	III
309	II	III	II	--	III
317	--	I	--	I	--
163	I	--	I	II	--
263	--	--	--	III	--
172	--	--	--	--	--
266	III	--	--	--	II
334	II	--	--	II	--

* Amount of exposure (> 1 day I; > 45 days II; > 90 days III) at date of case's last exposure, age-matched (within 1.5 yrs).

** ≥ 1 day p < 0.025 (one-tailed); relative risk = 4.6.

Table 6. A case-control study on tumor incidence during 1957-72 concerning Swedish railroad workers with > 45 days of total (combined herbicide exposure)*

Exposure, days	Phenoxy acids			Amitrol		
	Ca	Co	Rel.risk	Ca	Co	Rel.risk
> 90	2	6	1.7	5	11	4.1
46-90	6	15	1.9	4	9	4.0
1-45	1	6	0.9	3	8	3.4
0	7	35	1.0	4	36	1.0

* Ca = cases; Co = controls. The individual matching is not maintained in table.

DISCUSSION

This investigation considers a comparatively small group of people with both a particular type as well as a considerable degree of exposure to different herbicides. The results obtained may therefore not necessarily reflect the situation at hand when herbicides are used in agriculture or forestry. However, the observed association of amitrol exposure and an excess tumor incidence in the study needs further evaluation in light of animal data.

The tumorigenic effect of amitrol has

Table 7. Data on population with diagnosed cancer, year of incidence, and exposure.

	Number exposed	Case no.	Diagnosis	Year	Amount of exposure in days if required latent period is		
					0 yr	≥ 3 yrs	≥ 5 yrs
Not exposed to amitrol	150	127	Ca. ventriculi	1972	0	0	0
		317	Mb. hodgkin	1970	0	0	0
		268	Ca. recti	1967	0	0	0
		172	Ca. renis	1972	0	0	0
Exposed to amitrol 1-45 days	46	098	Ca. labii	1962	20	0	0
		079	Ca. coli	1970	28	28	20
		163	Ca. maxillaris	1970	10	10	10
Exposed to amitrol 46-90 days	80	354	Reticulum cell sarcoma (retroperitoneal)	1972	90*	90*	90*
		009	Chron. lymphat. leucemia	1969	55	45	45
		300	Ca. epipharyngis	1968	63	49	35
		334	Ca. prostatae	1971	52*	52*	52*
		257**	Ca. pulm (Acinous adenoca.)	1970	249	215	215
Exposed to amitrol > 90 days	72	135	Ca. vesicae urin.	1969	128	128	128
		014	Ca. pancreatis	1965	139	93	47
		256**	Ca. pulm (oatcellca.)	1967	166	166	106
		266	Tumor cerebri	1970	433	381	280

* Also divergent information about exposure occurs.

** Moderate smokers.

Table 8. Smoking habits among herbicide sprayers (railroad workers) in 1971.

	Phenoxy acids and comb. %	Amitrol and comb. %	Other herbicides and comb. %	Swedish average 1963 %
Non-smokers	53	50	49	38
Occasional	0	0	0	10
Smokers	47	50	51	52

Table 9. Smoking habits among Amitrol sprayers (railroad workers) compared to frequency to be expected from Swedish average.

	Obs. %	Exp. %	Diff. %	Rel. risk of lung cancer*
Non-smokers	49	40.4	+ 8.6	1
All smokers	51	59.6	- 8.6	
Cigarettes/day				
1-9	15.2	22.6	- 7.4	2 5
10-19	8.3	6.0	+ 2.3	2 8
>20	1.4	3.0	- 1.6	2 12
Pipe				
≤ 50 g/week	20.0	16.1	+ 3.9	
> 50 g/week	6.2	11.9	- 5.7	

* Relative risk estimated from Doll & Hill as quoted by MacMahon & Pugh (1971).

been a matter of discussion as to malignancy or not and the amitrol-induced tumors in animals most frequently have been observed in the thyroid gland and the liver (3, 4, 12). In this epidemiological study there is no overrepresentation of any particular type of tumor with the exception of the two lung cancer cases, but it may be reasonable to consider the three respiratory cancers and the bladder cancer to be of special interest as representing critical organs from the exposure point of view. Furthermore, particularly one of the papers referred to (12) offers information of great interest in comparison with the result in this study, because amitrol was found not only to cause more or less malignant tumors in the thyroid gland and the liver but the animals (rats) also developed sarcomas and mammary gland tumors. The author of this paper, Napalkov, also states that tumor development might be expected in different tissues as a result of exposure to amitrol and other compounds with a similar anti-thyroid action like the one of amitrol. The anti-thyroid action itself, however, might not be responsible for the tumorigenicity to judge from the experiments undertaken (12).

There is also some excess tumor incidence (not significant) in the cohort exposed to phenoxy acids and combinations. This finding may be more easily explained by the fact that four of the eight cases in this cohort also were exposed to amitrol and combinations (thus appearing in both cohorts), rather than by suspecting an underestimate in the expected in-

Table 10. Case-control study on tumor incidence and smoking among herbicide exposed railway workers, age-matched as in tables 4 and 5.*

Case no.	Case	Smoking**			
		Controls			
098	+	+	-	-	-
079	+	+	+	-	-
257	+	+	+	-	-
135	+	+	+	+	+
127	+	+	+	+	-
354	+	-	+	-	+
014	+	-	-	-	+
256	+	-	-	+	+
009	+	-	+	-	+
309	-	+	-	+	-
317	-	-	+	-	+
163	+	+	-	+	+
268	-	+	-	-	-
172	-	-	+	-	+
266	+	-	-	-	-
334	-	-	-	+	-

* + denotes a smoker.

** $p \sim 0.10$ (one-tailed).

cidence, because of the close agreement between expected and observed mortality when tumors are excluded. This also indicates that the cohorts have been correctly assessed, which is also reasonable to believe for other reasons as pointed out previously.

As mentioned, to some extent there has been a fixed combination between amitrol and diuron, which confuses the evaluation of observed excess tumor incidence as clearly related to amitrol. The same may be stated about the relations between

amitrol and monuron, although the monuron exposure probably has been fairly low. Thus, it is not reasonable to charge monuron with an etiological role of tumorigenicity in this particular investigation.

It is important to consider the vehicles for the different compounds and possible contaminants. The vehicle for amitrol, monuron and diuron consisted of water, whereas water as well as mineral oils were used for the phenoxy acids. No data concerning contaminants in the different preparations are available.

Although some factors might be considered as less well controlled in this small-scale investigation, the result is not unexpected in view of the animal data and the hypothesis referred to (12) and therefore suggests a recommendation of a restrictive and closely supervised use of amitrol (15).

ACKNOWLEDGEMENTS

We are grateful to Mr. Magnus Rehn for skillful help. The investigation was requested and supported by the Swedish National Board for Occupational Safety and Health.

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Received for publication: 27.9.1973.

alaska survival

Nov. 15, 1984

BOX 343 TALKEETNA AK 99676

Governor Bill Sheffield
Pouch A
Juneau, Alaska 99811

Dear Governor Sheffield,

Thank you for your Oct. 12 reply which stated your intention to delegate the authority for initiating the use of herbicides to the Alaska Railroad Corporation. We will certainly argue the case against public exposure to toxic herbicides in every available forum. However the managers of the Alaska Railroad have shown a consistent inability to deal competently with this matter and therefore we believe the Corporation board is likely to be hamstrung on this issue.

In addition, it is our belief that public herbicide use throughout the heart of Alaska is a public health and safety issue rather than simply a railroad management problem. Since former Governor Hammond prohibited the use of herbicides on our state's roads in a 1978 order, Alaskans have come to expect our state to exercise more concern and caution about the health of its citizens than has been the case in too many other states. At that time Gov. Hammond stated, "Since we have other means of controlling brush build-up, I think it is better to prohibit the use of herbicides while there are still questions about its potential effects."

Questions about the effects of herbicides have multiplied in the past six years. While Alaska led the way in prohibiting herbicide use, other areas are only now beginning to realize the ramifications of this practice. In seven consecutive federal court decisions in recent months, various agencies have been found guilty of illegally failing to assess or disclose potential health effects of their herbicide use. Based on these court orders, the Chief of the U.S. Forest Service has halted all use of herbicides on federal lands in Oregon and Washington, and has severely restricted use in Alaska, California, Nevada, Idaho, and Montana—allowing only ground application in nurseries, research areas, and other non-public areas.

We believe that the introduction of herbicides to 535 miles of state right-of-way in some of the most populous areas of our state would be a significant change in state executive policy. In addition a Deputy Commissioner of DOTPF has informed us that ARR herbicide policy will guide future vegetation management decisions on state highways.

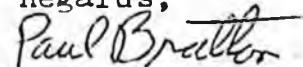
As is true of much of Alaska, our area contains a high proportion of men and women of child-bearing age, young children, Vietnam Veterans, and others who face serious risks from exposure or reexposure to these chemicals. At the present time several residents of our area are suffering debilitating illnesses that can be linked to exposure to ARR herbicides, many others suffer acute effects following every spraying, and all are fearful of the long-term effects which may yet appear. We simply cannot allow the Alaska Railroad to again expose us and our children to these toxic chemicals when reasonable alternatives are available.

It is sometimes difficult for those whose bodies don't carry the obvious scars of toxic herbicide exposure to realize the full ramifications of this problem. Therefore I am enclosing two papers which I hope you will take the time to review. Dr. Shearer explains the breakdown of EPA regulation and summarizes the review of the scientific literature which she conducted for Metropolitan Seattle health authorities. The Swedish Railroad Worker study is the first in a series of Swedish studies which has linked exposure to various herbicides with increased levels of cancer and other chronic diseases.

I might point out that I sent the Swedish Railroad Worker study to ARR officials in 1981, more than a year before we filed suit in federal court. It is indicative of ARR officials' disregard for worker and public health that absolutely no action was taken to reassess their own herbicide use even though a very similar program produced increased levels of cancer in the Swedish workers.

I am aware that other experts will assert the complete safety of all herbicides, nevertheless it is our belief that the people of Alaska have come to expect our government to lean towards, rather than away from, protecting the public health. We hope you will continue the six-year-old prohibition on herbicide spraying on our state's rights-of-way and thereby ensure protection of the public health.

Regards,



Paul Bratton

RECEIVED JUL 12 1982

FILED

JUL 09 1982

UNITED STATES DISTRICT COURT
DISTRICT OF ALASKA

By _____ Deputy

Alaska Survival, et al
V Francis Weeks, Chief
Engineer of The Alaska
Railroad, et al

No. A82-253 CIVIL

AFFIDAVIT OF DR. RUTH W. SHEARER

STATE OF WASHINGTON

County of KING

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ss:

July 1, 1982

I, Ruth W. Shearer, am a consultant in genetic toxicology affiliated with the Issaquah Health Research Institute, a nonprofit health research organization in Issaquah, Washington. I hold a Ph.D. in molecular genetics from the University of Washington and completed a two-year postdoctoral fellowship in pathology there. For eleven years I did grant-funded research on the mechanism of carcinogenesis and other aspects of normal and abnormal gene regulation, and have published fifteen research papers on this subject.

For the past six years I have intensively studied the regulation of chemicals which cause genetic toxicity (carcinogens, mutagens, and teratogens) and the testing methods used to detect these effects in animals and to predict hazard to humans. I have been a consultant in this field for five years, assisting public agencies and citizens' organizations in the evaluation of existing test data on the health effects of chemicals of concern to them, including many herbicides. During this study I have become aware of the shocking failure of the Environmental Protection Agency (EPA) to protect the public from untested toxic pesticides (1).

Prior to 1972, no testing for chronic or cumulative injury to animals was required for pesticide registration. Since the passage of major amendments to the Federal Insec-

ticide, Fungicide, and Rodenticide Act (FIFRA) in 1972, the EPA has been charged with reviewing and reregistering more than 35,000 pesticides whose registrations were carried over from previous regulatory agencies, as well as registering new pesticides. Reregistrations and new registrations were to be done only after tests on animals indicated that the pesticide was unlikely to cause cancer, mutations, birth defects, sterility, neurotoxicity, or many less dramatic injuries.

No pesticide on the market today has been reregistered after meeting the health testing standards set by Congress in 1972. Now, over nine years later, less than thirty active ingredients have been reviewed for the publication of registration standards listing the data gaps which must be filled before they can be reregistered. Actual reregistration cannot take place until the EPA has received and evaluated the new data requested in the registration standards.

No pesticide registration has ever been cancelled or even suspended for lack of safety test data on an active ingredient, although a few formulations have been cancelled for not responding to a published registration standard by providing a schedule for the start of testing. The EPA recently reiterated this position: "the Agency's policy is not to cancel routinely the registration of products for which it lacks data or to withhold registration merely for the lack of data"(2).

I have completed world-wide literature searches and evaluated the testing data on Tordon 101 and its active components, 2,4-D (2,4-dichlorophenoxyacetic acid) and picloram (4-amino-3,5,6-trichloropicolinic acid). There are no reports of animals exposed to Tordon 101 by any route for longer than one month, and no reports of animals so exposed having been observed beyond one month from the start of exposure. No testing for absorption, metabolism, neurotoxicity, chronic toxicity, mutagenicity, fetal toxicity,

or induction of cancer, birth defects, or sterility has been reported. All of the tests of acute toxicity were done for the manufacturer, Dow Chemical Company, which has consistently refused to allow public examination of any health test data, even after the pesticide law was amended in 1978 to explicitly make such information public.

The Tordon 101 formulation contains the isopropanolamine salts of 2,4-D and picloram, which break down to the acid forms. Nearly all of the testing of picloram has been done by the manufacturer, and most of it has concerned acute effects. Picloram has a high lethal dose, or low acute toxicity. This is not relevant to chronic low-dose environmental exposure. Rats fed picloram for three months showed histopathological changes in the liver and kidneys (3). A three-generation reproduction study on rats fed picloram continuously showed increased stillbirths in the first generation (3). A variety of birth defects also occurred, but no data on the control rats was released for comparison. A teratology study used such high doses that maternal toxicity made the developmental toxicity produced of questionable meaning (4).

Picloram has had two long-term feeding studies to detect chronic injury and cancer. The first of these was done by Industrial Biotech Labs under contract with Dow Chemical, and was reported to be negative although the data were never made public. After it was discovered that IBT had turned in fraudulent and unsubstantiated test results to both FDA and EPA (5) an audit of all health tests done there was initiated. Pesticide tests were divided between EPA and Health Protection Branch of Canada, and picloram was assigned to Canada which found the cancer test invalid. No review of the IBT picloram cancer test was possible because no raw data exists.

The second picloram cancer study was done by Gulf South Research Institute under contract with the National Cancer Institute (NCI) and was also reported to be negative by the test laboratory (6). When EPA later audited many more contract laboratories, the report on Gulf South Research said:

"Serious deficiencies noted in bioassays done on contract for NCI. These include improper feed mixing procedures, possible cross contamination of diets with other substances being tested concurrently in the same room, as long as a 99-day time lag between time of sacrifice and time of necropsy, discrepancies between the raw data and final report, improper recording of age of animals at death, questionable animal identification and record-keeping practices" (7).

A careful review of the NCI test slides by an independent pathologist(8) showed a positive correlation between treatment with picloram and tumors of the liver and endocrine organs in rats, and tumors of the spleen in mice. Animals fed Picloram developed liver and kidney damage, tremors, thyroid and parathyroid hyperplasia, skin irritation, hair loss, vaginal bleeding, dark urine and atrophy of the testes (6,8).

Picloram was selected for testing by NCI because its extreme persistence in soil and water suggested a potential for long-term low-level human exposure (6). It has been responsible for contamination of many wells and aquifers (9,10,11).

Picloram has been involved in many cases of human accidental poisoning by means of hand spraying, drift from aerial spraying, and contamination of drinking water. I am personally acquainted with 14 persons who have had symptoms for at least two years following exposure to Picloram in combination with 2,4-D, including one small child and five teenagers. All continue to suffer from pain and swelling in joints, weakness and rapid fatigue, and sensitivity to re-exposure to nonphysiological chemicals. Residual symptoms common to at least half of them include chronic headaches, vision problems (poor focus or double vision), deterioration of memory and concentration, and tingling hands and feet. These symptoms are not detectable in standard animal tests.

I am familiar with more than 30 people who have been acutely poisoned by 2,4-D alone or in combination with other herbicides. Many of these are still incapacitated years later. Acute symptoms in my own experience include nausea, vomiting, diarrhea, headache, temporary loss of vision,

weakness, burning eyes, sore throat with burning in chest, and difficulty in thinking. Residual effects include numbness and tingling in hands and feet, chronic respiratory impairment, bleeding tendency, concentration and memory problems, and hypersensitivity to non-physiologic chemicals which prevents participation in most modern job environments. Many of those injured were young forestry workers, but others were poisoned by drifting of an aerial spray, hand-spraying weeds, drinking from a contaminated spring, mowing a newly-sprayed lawn, or inhaling powdered 2,4-D. Reports of other cases of 2,4-D poisoning with similar symptoms have been published.

2,4-D is fat-soluble and rapidly absorbed through all normal routes of human exposure (inhalation, ingestion, or skin absorption). 2,4-D is rapidly distributed into all tissues (including through the placenta) and moves readily into cell nuclei. It is apparently not metabolized in the body, and is excreted fairly rapidly in the urine. No evidence of storage in animals has been found, indicating that long-term effects on health are of a hit-run nature.

Nearly all the human symptoms of 2,4-D poisoning are undetectable in laboratory rodents. Bleeding is detectable, however, and has been demonstrated in animals given high doses of 2,4-D and in fetal rats whose mother was given very low doses. Although most of the human 2,4-D poisoning symptoms referable to the nervous system are undetectable in test animals, altered brain function and paralysis have been reported. A rat study demonstrates impaired function of the blood-brain barrier during 2,4-D poisoning (12). This is supported by the observation that blood cells appear in the cerebrospinal fluid as a consequence of capillary injuries.

Animal research on the health effects of 2,4-D points to the likelihood of serious human side effects. 2,4-D has been shown to cause point mutations in animal cells, chromosome damage in human lymphocytes as well as mouse bone marrow

cells, DNA damage which mimics the effect of ionizing radiation, and stimulation of cell division in non-dividing muscle cells (13,14). The primary use of testing for ability to cause mutations or DNA damage at present is as a pre-screen for likely carcinogens. However, mutation is a most undesirable injury in its own right. Aging of tissues is thought to involve an accumulation of mutated cells. Mutation in germ cells can result in loss of fertility, early death of the embryo, malformation and malfunction which may lead to death in the fetal or neonatal period, and hereditary diseases which limit physical or mental function.

A three-generation reproduction test for the Food and Drug Administration (15) detected no interference of 2,4-D with reproduction and fertility in rats, but a more recent study (16) demonstrated loss of fertility in both sexes of rats after relatively low doses of 2,4-D butyric acid, a herbicide of the 2,4-D family. Impaired fertilizability was also observed in first generation progeny, and in the third generation there was a 12% incidence of hairless and 15% incidence of dwarf young among the newborn, indicating induction of recessive mutations in the germ cells of the treated grandparents.

Birth defects can be the result of mutations in the sperm or egg before conception, toxic injury to the embryo or fetus during development, or nutritional imbalance resulting from maternal toxicity. These three problems can be separated by appropriate experimental design. The significance of various forms of developmental toxicity induced by 2,4-D in test animals depends on this separation. The hairless progeny and dwarfism reported above are of the first kind (mutation) since no 2,4-D was given at any time during the pregnancy. Skeletal and eye malformation and fetal deaths have been reported only when doses producing maternal toxicity have been given during pregnancy, but malformation and malfunction of the peripheral circulatory system were seen after very low doses. The effects of

2,4-D on the fetal circulatory system are synergistic with those of its impurity and degradation product, 2,4-dichlorophenol; there was a significant increase in fetuses with hemorrhaging cavities, organs, and soft tissues at doses at which neither chemical produced an effect alone (0.1 mg/kg/day) (17). This suggests a greater risk from exposure after part of the 2,4-D has been broken down by soil microorganisms than immediately after spraying.

The U.S. Council on Environmental Quality recently released a report on the chemicals for which it is possible to compare the lowest dose which causes reproductive effects in humans and animals. For eight out of eight teratogenic chemicals, humans were susceptible at lower doses than the most sensitive animal species (18). Humans were also distinctly most sensitive to seven out of eight chemicals having non-teratogenic reproductive effects.

Carcinogenicity testing of 2,4-D has been limited to three studies. The experimental design or assay of these is inadequate according to present standards. In spite of this, the two American studies reanalyzed by Reuber in 1979 demonstrate statistically significant increases in malignant tumors when analyzed by organ systems (15,19, 20). In both mice and rats, the lymphoreticular system was most sensitive to 2,4-D carcinogenesis, but other organs also showed increases in rats. Inadequately designed assays for carcinogenesis will give false negative, not false positive results. Therefore, such studies cannot be used to prove safety of a test substance, but positive results should be considered valid proof of hazard. The only other carcinogenicity study on 2,4-D was done in the USSR and indicated tumor promoting activity in mice (21).

Following great public pressure, EPA conducted a review of much of the 2,4-D literature and resolved the problem of the large body of adverse data by declaring it invalid because the published papers did not include the detailed individual records for each animal which are now required with the manufacturers' test data. (No journal would publish such detail.) This allowed EPA to make the totally misleading

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ing statement that "information from scientifically valid studies does not indicate that the continued use of 2,4-D poses an imminent hazard of unreasonable adverse effect" (22), which has been widely quoted as an assurance of safety rather than an acknowledgement of lack of valid studies.

Nearly all negative tests of 2,4-D health effects were also invalid by modern testing criteria, leaving EPA with practically no "valid" data at all (22), and leading to EPA's notice of August 29, 1980 that registrants must begin to develop data in the categories of oncogenicity (cancer), reproduction (including fetal toxicity), teratogenicity (birth defects), neurotoxicity, metabolism, acute oral toxicity, acute dermal toxicity, and dermal absorption (23). These tests include all of the major categories of tests theoretically required for registration with the exception of mutation tests which were to be done by the Department of Health, Education, and Welfare instead of the registrants.

A primary consideration in the EPA's conclusion that "the presently available information on the potential adverse health effects of 2,4-D does not support a regulatory action to remove 2,4-D products from the market" was that "there is no evidence available at this time that 2,4-D contains any form of dioxin ...". A few months later, Canadian scientists reported that 12 out of 26 commercial samples of 2,4-D analyzed for dioxin content were positive at 80 to 8000 parts per billion (ppb) for three types of dioxin: 2,7-dichlorodibenzo-p-dioxin (DCDD), 1,3,7-trichlorodibenzo-p-dioxin, and 1,3,6,8-tetrachlorodibenzo-p-dioxin. After receiving this information, the EPA still took no action to restrict 2,4-D exposure, but began a sampling program to determine whether dioxin contaminants are present in U.S. products. During the first phase of this program, 3 out of 30 samples were found to contain DCDD in concentrations below 100 ppb and no TCDD was detected. However, when the three positive samples were sent to another laboratory for higher resolution confirmation, concentrations of DCDD up to

184 ppb were found, and 2 out of the 3 samples contained 1,3,6,8-TCDD at 6 to 11 ppb. The other 27 samples were not assayed by the most sensitive procedure, and none of the 30 samples was tested for the trichloro-dioxin found in Canadian analyses. In addition, the higher resolution laboratory reported that extremely high concentrations of unidentified chlorinated contaminants were also present in the U.S. samples.

There are few data available on the toxic effects of the dioxins in 2,4-D. A Dow Chemical Company study reported that DCDD was minimally toxic. However, Khara and Ruddick of the Health Protection Branch, Department of National Health and Welfare, Canada, found significant teratological injury to the heart muscle in fetuses of rats given 2.0 or 1.0 mg/kg/day of DCDD (suppression of growth of cardiac tissue was indicated) (24).

A bioassay of 2,7-DCDD for possible carcinogenicity in rats and mice was completed in 1979 under sponsorship of the National Cancer Institute. Rats developed toxic liver lesions but no tumors in excess of controls. In male mice, liver tumors occurred in dose-related incidences; there were also significant increases in the incidence of leukemias and lymphomas, hemangiosarcomas, and hemangiomas in the low-dose male mice, but not in the high-dose group (25).

Although the dioxins found in 2,4-D are not nearly as toxic as the one present in 2,4,5-T (2,3,7,8-tetrachlorodibenzo-p-dioxin), they clearly add to the health hazard of 2,4-D because they would be expected to be much more resistant to degradation than 2,4-D, and to be stored in fatty tissue like the 2,3,7,8-TCDD.

Both 2,4-D and picloram are readily leached under high rainfall conditions (26). After application of Tordon 101 at 0.6 gallons/acre to a freeway right-of-way in Ontario, Canada, the picloram began to move vertically down the soil profile immediately. In spite of this loss, it was determined that if picloram were applied at this rate every two

years, the levels in the soil would slowly rise (27). The planned application rate for Tordon 101 on the railroad right-of-way in Alaska is 1 gallon/acre every year, which is clearly excessive for the purpose intended unless leaching in water is much more rapid and extensive than in Ontario. Putting a persistent poison like picloram into water creates a definite health hazard to persons using that water over a long period of time.

It is apparent from documented cases of contamination with Tordon 101 that the presence of picloram inhibits the usual rapid degradation of 2,4-D in soil, even in warm climates such as Alabama and Tennessee. This effect would be even more significant in a cold climate where degradation is already slower. The health effects of Tordon 101 in runoff water are particularly insidious because they develop slowly and do not go away after the cause is finally identified and a new water source is used. Tordon 101 should not be used where either ground or surface water will be used for domestic purposes, or where there is any possibility of human exposure to drift of the volatile 2,4-D breakdown products after application.

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Ruth W. Shearer

RUTH W. SHEARER

SUBSCRIBED AND SWORN to before me
this 2 day of July 1982.

Wendell B. Kelly
Notary public for Washington
My Commission expires: 6/5/1986

Testimony submitted by Judy Price
for the Senate Health, Education and Social Service Committee Hearing
on Herbicide and Pesticide Use

For thirty years the Alaska Railroad has sprayed herbicides on the railroad right-of-way. For the last 10 of those years, I have been exposed involuntarily to these chemicals. Most of those years I was exposed not only against my will, but without my knowledge. No signs were erected to warn of the spray; no public notice was given.

Like many of the people who regularly use the railroad tracks, I ate berries and drank water from beside the tracks. I ate grouse and moose that had been feeding there, and fish from creeks that run beneath the tracks. I probably have walked the nine miles of tracks between Chase and Talkeetna a hundred times.

I am not an exception in the amount of time I have spent on the tracks. For bush residents of the railbelt, the railroad right-of-way is, and has always been, a major access route. It is the only open passageway that connects the roadless area north of Talkeetna to a supply point and the State's road system. It is the only route with bridges across creeks and the Talkeetna River.

I have no idea how many chemicals I have been exposed to on the Alaska Railroad, nor what these chemicals are. The Alaska Railroad officials say they don't know what chemicals were sprayed there either. They say that prior to 1978 the Alaska Railroad's spray record is a complete unknown.

We have learned however that 2,4,5-T of Vietnam's Agent Orange was sprayed on the Alaska Railroad before its use was banned. So

we know that the people of the railbelt have been exposed to 2,4,5-T and to its contaminant dioxin (TCDD) which has been called one of the most potent carcinogens known to man. TCDD is not only dangerous, it is persistent, and cumulative in the body, as well, which means that we may still be suffering exposure to that chemical though it is no longer considered safe to use.

Since 1978, people of the railbelt have been exposed to 2,4-D and Picloram, known as Agent White, Amitrole, Bromacil, and Garlon, as well as to their degradation products and whatever chemicals may have been produced by the combining of these chemicals.

The officials of the Alaska Railroad tell us that we are in no danger, that EPA is taking care of us. Does that mean it is taking care of us like it did when the Alaska Railroad sprayed 2,4,5-T on the right-of-way. Considering the latest EPA shake-up and the Bio-Test Scandal, I don't think any intelligent person can be expected to believe that EPA is so much more capable of protecting the public health than it was when it allowed the use of 2,4,5-T.

Even when EPA does make restrictions that are intended to help safeguard the public, the Alaska Railroad ignores them. For example, Bromacil is banned for use on walkways, and yet the Alaska Railroad has never faltered in its practice of spraying Bromacil on areas that are known to be walkways, such as stations and flag stops, and sections of track that have heavy foot traffic.

In the railroad's recent Environmental Assessment, it was determined that Amitrole should no longer be used because it is a powerful anti-thyroid agent. That fact has been known for many years and yet EPA has not banned Amitrole. I can't say I'm not pleased

that the Alaska Railroad has finally gotten around to making that determination, but it has come too late for me.

In 1979, my thyroid atrophied. Because the thyroid controls the metabolism, my body functions were drastically slowed. I became ill, I became extremely depressed; I could not function in any normal way. In effect, I was dying.

Fortunately there is treatment for thyroid atrophy. It is not a cure. It is replacement hormone therapy. It is medical bills and constant vigilance and dependence on a pill every day for the rest of my life.

At the same time that my thyroid malfunctioned, something else happened to me that was not as easy to diagnose. It took me years to find out what it was, to learn that it is a common symptom of herbicide exposure, that it is becoming a widespread problem in this country and growing in epidemic proportions. It is chemical sensitivity.

It is for that reason I am not here in person today.

I am not the only person exposed to herbicides on the Alaska Railroad who has suffered and is suffering herbicide related illnesses. In the Chase area alone, I know of at least one other person with thyroid dysfunction. There is also a man who took his drinking water from a spring beside the tracks who has developed multiple sclerosis; he is now in a wheel chair much of the time and no longer able to live at his home at Chase. There is another man with connective tissue disease who may have but a few years left to live; he is a young man. There was a child with epilepsy. Another child who lives beside the tracks has dizzy spells and an unnaturally croaky voice. And during nearly every spray season, there is an

epidemic of sore throats, colds, flus.,

At Chase, we have begun to ask ourselves how many people must get sick before the railroad stops their annual dumping of hazardous waste through our community. How many of us must face terminal illnesses; how many will die. And we have come to the conclusion that we may not be able to stop the sickness because the chemicals are likely still present in our drinking water, and moose and fish, and in our bodies. But we can stop any further contamination of our home. So that is what we have done.

In November, the Chase Community Council has unanimously passed a resolution declaring our community "toxic-free." The residents have decided that they have been the Alaska Railroad's and Dow Chemical's and Union Carbide's guinea pigs long enough. We have decided to exercise our right to say no to involuntary exposure to toxic chemicals.

In the past, before we reached such an irrevocable decision, members of Alaska Survival and residents of the Chase area were more than cooperative with the Alaska Railroad. We bent over backwards trying to work with that agency to avoid being exposed to these hazardous chemicals. When we tried to get information about the spraying, we were ignored us. When we made Freedom of Information requests, we were refused. I have never once been able to get a response from the Alaska Railroad without making a Freedom of Information request and I have never gotten information without appealing the request to Washington. Most times I have had to threaten to take the railroad to court to get information that should be freely available to all members of the public.

The last request I made for information had to be appealed

to Washington, and even when I won the appeal, the Alaska Railroad refused to send me the information. I had to make a 250-mile round trip to Anchorage to get it, after which time I was seriously ill for nearly a week as my body tried to detoxify itself.

For years people asked the Alaska Railroad not to spray near their cabins and gardens and drinking streams, and stops where they wait for the train; they were ignored. In 1981, residents of Chase called the Railroad and asked them again not to spray these areas. They were told that if the no-spray zones were marked, they would not be sprayed. So residents put up flagged stakes, and the spray truck went through and sprayed everything. They sprayed into Chase Creek. They sprayed near gardens and houses. They sprayed every flag stop.

In 1982, a representative of Chase community and I went with Herb Rice, who was in charge of spraying at that time, and together we identified and flagged sensitive areas, creeks, trails, gardens, and cabins. The spray truck went through that summer—several people watched it pass—and it did not spray the staked off areas. There was a lot of jubilation in the Chase community that year. We thought at last we weren't going to be poisoned any more. And then, about a week later, the spray truck went through again, this time just after midnight, and it sprayed everything, over creeks, beside cabins, gardens, trails, everything. Jubilation turned to despair and anger and fear.

To this day Herb Rice denies that he sprayed those staked areas, but we are not foolish enough to believe that a strange blight suddenly overcame all the plants beside the tracks in one night, that one night that the spray truck was seen pulling north out of

Talkeetna.

That year the Alaska did not even have enough respect or concern for the people to be truthful with them and give them warning so that precautions could be taken to avoid exposure to hazardous chemicals.

It was at that time that Alaska Survival filed suit against the Alaska Railroad in Federal Court.

In 1983, I once again went to identify and flag sensitive areas on the Alaska Railroad. I admit that I had grave reservations as to the usefulness of it. Nevertheless I walked 12 miles to Talkeetna to meet Herb Rice and other railroad representatives. We road up the tracks and discusses what areas should not be sprayed. After several hours of discussion, Herb Rice agreed that the stretch of track through the Chase community was heavily used, that the entire area could be considered sensitive, and that there was no need to spray herbicides that summer. I wrote down his exact words, and four times I noted the quote, "We will not spray between Talkeetna and 244."

Less than ten minutes after we returned to Talkeetna, Herb Rice called me into the station and said that he had talked to Obie Weeks on the phone and that he would have to spray the area he had just agreed not to spray. This was because Obie Weeks, who had not even seen the condition of vegetation on the tracks, who was sitting 100 miles away in Anchorage, had insisted that it must be sprayed. And it was sprayed.

The Alaska Railroad has never been fair, nor even honest in its dealings with us. They have lied to us and deceived us, poisoned us, denied us information and even the right to protect ourselves. They have committed innumerable criminal acts against us and the people of this State. They have behaved as if they are a multi-national

corporation in a third world country and we are the peasants.

We can no longer tolerate those abuses. We are tired of suffering the consequences of the Alaska Railroad's spraying simply because they refuse to develop alternatives. We are tired of taking the risks while they reap the benefits. We have offered to clear the tracks of vegetation for free; they refused. We offered to clear them for a price no greater than the cost of herbicides; they refuse to respond.

Many people who live in the Chase area are sick. Many are afraid for themselves and their children. Many are too angry to try again to solve this problem with words. But we are unanimously agreed that our uncompromising, unyielding position is "No More Herbicides".

We hope that the state, as it assumes responsibility for the Railroad, will work with residents to develop safe and efficient alternatives to the spraying of toxic herbicides before it is too late for us all.

Justine

12/30/84

December 27, 1984

To: Senator Josephson and Committee on Health, Education and Social Services

From: The Stefanowski family, Box 161, Falkeetna, AK 99676

Subject: Hearings on Pesticide and Herbicide use on roadways in Alaska and other public corridors, especially the Alaska Railroad.

Dear Friends and Concerned Individuals:

We thank you for giving your attention to a matter of grave concern to us as 12-year residents of the "real" Alaska Railbelt. Since our only access to our home is via the Alaska Railroad stops where we must wait for the train, load and unload our food and supplies, or directly traverse the rail corridor by foot, skis, snowmachine, etc., we have been involuntarily exposed to the gamut of toxic chemicals the ARR has chosen to use in its "vegetation control" program. Over the years, myself and other mothers who live along the railbelt have made repeated requests to ARR to at least refrain from spraying herbicides at the flagstops (i.e. Mile 232, 233.5, 236, 244, etc.) where our children must wait for the train and near drinking water streams and springs, but never once were we afforded this small consideration in the concern of our health. Finally at a meeting in June, 1982 with O.B. Weeks of the ARR and Bill Burgoyne of the State Dept. Environmental Conservation, the ARR agreed not to spray areas of vital concern to residents health, but when the spray truck went through the following month they violated the agreement and sprayed everywhere as usual. At that same meeting we were informed by Dr. Burgoyne that our area had been selected for experimental use of a new chemical of unknown toxicity called Garlon, because "not very many people live in the area ...and they want to test it out on the fish." I am sure you are familiar with the court suit that followed, resulting in our first summer free of toxic sprays this past year. For once I was able to sit and wait for the train with my two children without worrying that it might be the day for the spray truck to come through.

Anyone who has studied nutrition and biochemistry, as well as the EPA reports on toxicity and side effects of its several hundred approved chemicals, as I myself have, can see the horror of exposing human beings to these mutagenic and carcinogenic substances. I have seen two of my neighbors become seriously ill with thyroid disorders and know two others succumbing to serious disorders of the central nervous system, and it just so happens that the chemicals used by ARR are linked to these disorders. I have also seen birds and spruce grouse return to the tracks this summer where previously I saw only dead birds.

Please understand that this critical situation demands your utmost attention. It is a life or death matter to those of us who live here and we will not be sprayed with any chemical anymore. Please listen to the truth and be courageous enough to act on it.

We all have the chance now to save Alaska from the fate of many states in the lower 48 that are becoming toxic wastelands where no water is fit to drink. We must seriously curtail the use of herbicides and pesticides on the railroad, powerline, right-of-ways, and in the budding agricultural business, or we will all be guilty of slowly poisoning ourselves and the planet God provided for us.

Sincerely,

Linda Stefanowski

December 30, 1974

Box 5

Talkeetna, Ak. 99676

Senator Joe Josephson
Health, Education, and Social
Services Committee
Pouch 1
Juneau, Ak. 99811

Dear Senator Josephson,

It is good you are holding hearings on the health effects of herbicide spray. My family feels there are serious risks to herbicide spraying, some of them yet unknown. We feel the Alaska Railroad's spray program is ~~is~~ a poison threat to local families' health.

We approve of the highway system ban on herbicides and feel it is sensible this policy be extended to the railroad. In fact, it recently came to light that the railroad owns plenty of mechanical vegetation clearing equipment to clear the line without herbicides. Apparently they have so much such equipment they have been leasing it to the State of Alaska to clear highway rights-of-way. They also didn't use herbicides until 1953, or 30 years of maintenance without herbicides.

Some people in our area have experienced serious health problems including spinal meningitis, which they feel are traceable to APP's spray program.

A railroad and State which serves its citizens with concern can surely think of better ways to clear vegetation.

So far the railroad has stonewalled our request to break out the real costs of the spray program, and have refused to answer written offers to clear the line with manual labor. (Hopefully the State will take more interest in the well being of its citizens than the Federally run line has to date.

Thank you.

Sincerely,
Jim Super

Herbicide spraying along Alaska RR tracks attacked

By CRAIG MEDRED
Daily News reporter

The herbicide-spraying policies of the Alaska Railroad were attacked Thursday as "abusive and arrogant" before a state Senate committee hearing.

Steven Kadish, an aide to state Sen. Vic Fischer, D-Anchorage, said residents of small, informal rural communities along the railroad were the most upset by the policies. They spoke at an Anchorage hearing of the Senate Health, Education and Social Services Committee.

To the dismay of residents along the railroad tracks between Anchorage and Fair-

banks, the railroad has for years used herbicides to control brush. The policy was put on hold last year because of complaints.

The railroad is completing an environmental impact statement on the hazards of spraying.

That hasn't eased the fears of rail-side residents. They simply want to see spraying stopped, Kadish said.

Some residents claim they have developed medical problems because of the railroad's spraying, he added.

The tracks are used as a hiking trail by many people living in the Bush north of Talkeetna, and there are some popular berry-

picking areas along the tracks. Such uses could expose residents to dangerous levels of herbicides, said Kadish.

He said Fischer and Sen. Joe Josephson, D-Anchorage, have considered legislation that could set state standards for herbicide and pesticide use.

"I think there will be legislation developed as a result of this," Kadish said.

He said the legislature could set standards for licensing sprayers, limit what chemicals are used in the state, or restrict the railroad to mechanical or manual brush removal.

Aside from concerns about the railroad's use of herbicides, Kadish said some people

expressed worries about home uses of pesticides and herbicides in Alaska.

"This was brought up over and over again by people who have had a neighbor spray," he said. The spray sometimes drifts around, coating a neighbor's yard or their children's toys, he said.

But Kadish noted the problems of pesticide and herbicide use in Alaska would not necessarily be solved by a ban on the chemicals.

Pesticides and herbicides are vital to modern agriculture, he said. Were Alaska to ban those chemicals, it might be making a decision to doom its still-struggling agriculture industry, according to Kadish.

Railroad sale includes legacy of weed woes

by Mary Scarpinato
Times Writer

1/4/85

Along with 600 miles of track, Alaska inherits something else from the federal government on Saturday: Weeds. Lots of them.

The scheduled takeover of the Alaska Railroad was what prompted Friday's state Senate committee hearing on the pros and cons of herbicide and pesticide use at the Legislative Affairs Agency offices here.

Several years of controversy over the railroad's chemical weed control program was indeed the main hearing topic — including an announcement that the railroad will continue to follow federal court-ordered spraying restrictions.

But neighborhood problems got a good portion of time, too —

including discussion of a local ordinance amendment, now in the drafting stage, to restrict pesticide spraying.

Information gathered from the hearing will be used in upcoming considerations on possible legislation or budgetary revisions, according to Sen. Joe Josephson, D-Anchorage, outgoing chairman of the Senate's Health, Education and Social Service Committee. About 20 people attended the hearing he chaired.

The railroad conducted no weed control spraying on or along its tracks last summer, in compliance with a federal judge's ban until environmental studies on such chemical use are completed this spring.

Francis Weeks, chief engineer
See Senate, page A-10

Officials resolve railroad transfer dispute

Times Staff and Associated Press

Officials negotiating the sale of the Alaska Railroad resolved a multi-million dollar dispute Thursday, clearing any doubt that the transfer from federal to state ownership would take place Saturday.

"The revolving fund and disabled workers' compensation issues have been settled and the transfer will go through," said Richard Knapp, commissioner of the state Department of Transportation.

"There's a little fine-tuning needed, but we do have an agreement," said Gerald Valinske, a member of the state railroad corporation's board of directors.

As late as Thursday afternoon — with

barely two days left before the railroad was to officially pass into state hands — officials in the governor's office were speculating that the transfer ceremony might have to be delayed until the method by which 50 disabled railroad workers were to receive about \$750,000 annually was resolved.

Board members and other state officials met all day in Anchorage, negotiating with federal officials there and in Washington by telephone.

The settlement "just happened later in the day," said Valinske, who declined to elaborate on details of the agreement. He said the transfer ceremony scheduled for Saturday in Nenana definitely is on.

The dispute was over who — the state or federal government — should assume liability for compensating railroad workers disabled while the line was owned by the federal government.

Officials said the dispute could cost the state between \$7.7 million and \$11 million — money the state wants the federal government to continue paying.

But federal transportation officials balked at that plan and wanted the bulk of the payments to come from a revolving fund the state will acquire with the railroad.

The talks, which had been under way for months, had intensified in recent days.
See Rail, page A-10

Senate committee probes railroad's pesticide, herbicide use

Continued from page A-1

at the railroad, said 13 chemicals are under study for possible use. He repeated earlier railroad arguments that a spray program is the only efficient means of keeping the tracks and easements safely clear of vegetation.

Opponents have argued the potential health hazards for those living or walking near the tracks.

One opposing speaker at the

hearing was Arndt von Hippel, a local physician, who said, "I believe all herbicides and pesticides are bad news."

"There are no long-term reliable studies of the effects of these chemicals on people," von Hippel said, adding that most research is funded by the major chemical companies and filled with "a lot of phoney data and sloppy work."

He suggested organic alternatives, such as weed and pest eating bacteria formulas. Salt water

and electrical charging were other alternatives mentioned at the hearing.

Judith Maenok and Glen Ray, two organizers of a Midtown homeowners group called Safe Home Environment, said a pesticide ordinance amendment is scheduled for hearing Feb. 5 before the Anchorage Municipal Assembly.

They had complained to city officials about drifting clouds of chemical spray onto their properties, their fear for their chil-

dren's health and the garden contamination warnings they had received after contacting conservation officials.

The amendment will propose a ban on spraying above six feet, Maenok said, adding that pest control professionals have endorsed root application as an effective alternative.

"There's no research that says any chemical is safe under all circumstances," Ray said. "None talk about risk. They only talk about the level of risk," he

said, suggesting the state regulate pesticide sales to those of minimum hazard, set up guidelines for application and fund research into hazardous chemicals.

Guy McConnell, a biologist with the U.S. Army Corps of Engineers, which is conducting the railroad studies, said the public is operating under the widespread misconception that all herbicides are similar.

"There is little rational basis to avoid all chemicals," he said, noting that a toxic reaction to

many requires heavy and prolonged exposure and many are rapidly eliminated from the body if exposure does occur.

McConnell said his research found no railroad in the United States or Canada that did not rely on herbicides for vegetation control.

To ban all, he compared would be like banning fiberglass because asbestos has been proven a hazardous insulation material.