REGISTRATION OF SAP STAIN CHEMICALS

by
Frank Cedar
Agriculture Canada
Pesticide Division, Ottawa

I would like to present as complete a picture as I can on antisapstain chemicals ..... their chemical structures, their regulatory status, their registration history, their toxicological data requirements and to talk on other aspects with respect to their use.

Let's look at these chemicals. They are:

- Sodium pentachlorophenate
- Sodium tetrachlorophenate
- Copper 8-quinolinolate
- 2-(Thiocyanomethylthio)benzothiazole or TCMTB
- Benomyl
- Methylene bisthiocyanate
- A mixture of ammonium and potassium bifluorides
- 3-Iodo-2-propynyl butyl carbamate
- Sodium tribromophenate
- Tetrachloroisophtalonitrile
- 2-(4-Thiazolyl)benzimidazole

Four of these eleven actives are registered for use in Canada (Table 1). Sodium pentachlorophenate was the first. In fact, I believe it dates from as early as 1941 with the registration of Permatox 10-S by the A.D. Chapman and Co. of Chicago, Illinois. That is 42 years ago, but I have no way of confirming what the composition of Permatox 10-S was back then or whether sodium pentachlorophenate was the active ingredient. We in government do not keep records from that far back, particularly for pesticide registrations!

In the mid to late 40's, A.D. Chapman and Co. moved to Tennessee and its two founding partners split the Company into two - Chapman Chemical and Buckman Laboratories - each going their separate way. The currently registered Permatox 10-S, with registration number 8,146, dates from 1962 and is in the name of Chapman Chemical.

Sodium tetrachlorophenate registrations date from 1967; copper-8 from 1974 and TCMTB from 1976. Yes, these latter two actives were registered 7 and 9 years ago, but most of the industry has only been hearing of their existence in the last year or two.

Although the brand name products listed are not the only antisapstain products registered and used by the industry in Canada, the four actives listed are. Thus no new antisapstain active ingredients have been registered for use in Canada in the last 7 years or since 1976. Why? Generally, two reasons: one, increased toxicological and product chemistry data to satisfy regulatory requirements and two, an increased emphasis on occupational exposure and safety. The labour force cannot be used

as a test population for the introduction of new chemicals. Industry, and to some extent labour, must face the fact that much more toxicological testing, at greatly increased cost, must be performed in order to prove the safety of new products before they are released in the market place.

Let's look at the other antisapstain chemicals I mentioned earlier (Table 2). Methylene bisthiocyanate, marketed as Kilstain by Tenneco, U.K., and approved for use in the United Kingdom. Chlorothalonil, marketed as Sta-Brite D by Bow Chemical Co., and registered for use in the United States. Benomyl, marketed as Benomyl 50 or Woodgard and approved for use in Sweden. The bifluorides, marketed as Improsol or Mykocid and approved for use in the U.K. and Sweden. IPBC, marketed as Polyphase by Troy Chemical Corp., and used in Indonesia. Sodium tribromophenate, manufactured by Velsicol Corp. and tested by Forintek Canada. And finally, thiabendazole, marketed as Mertect by Merck and approved for use in Sweden.

A number of these actives are registered for various agricultural and industrial uses in Canada. However, none are approved for use as antisapstain chemicals in Canada.

Now, if I may, I would like to take a few steps back in time and present a brief historical review (Table 3). In 1927, pesticides became subject to regulation in Canada. In 1939, the Act was revised and renamed the Pest Control Products Act. As mentioned earlier, 1941 saw the registration of Permatox 10-S - most probably the first antisapstain product to be used by the lumber industry. In 1942, the first chemical residue tolerance in Canada was established under the authority of the Food and Drugs Act. The chemical was arsenic. In 1946, one year after World War II, a large number of a new type of chemicals, termed synthetic pesticides, were introduced into use. Ten years later, in 1956, the first food tolerances for synthetic chemical pesticides were established by Health and Welfare Canada.

In terms of registration requirements, in 1946 and earlier, pesticides were likely granted registration on the basis that "if it works and doesn't harm the applicator, its OK to use". Acute toxicity studies were likely the only safety studies necessary. By the mid 1950's, I presume that 2 year feeding studies, were then necessary in order to establish food tolerances for pesticides to be used on food crops. In 1960, the thalidomide tragedy occurred. Again, I presume, but don't know for sure, that soon after this, the registration requirements increased with the addition of teratology studies.

In 1962, "Silent Spring" by Rachel Carson made the world aware of the adverse environmental impact that pesticides could have. Ecology and protection of the environment were major issues in the 60's. Again, data requirements for registration increased.

In 1969, the Pest Control Products Act was revised to reflect

modern times and the registration of synthetic chemical pesticides. The definition of pest was expanded and among the new classes of products which became subject to registration were industrial fungicides and biocides.

Copper-8 was registered for antisapstain use in 1974; TCMTB in 1976. Also in 1976 a re-evaluation of the chlorophenols was initiated by Agriculture Canada. In 1978, chlorophenolic antisapstain chemicals were banned in Sweden. I would like to note here that the chlorophenolic antisapstain formulations used in Sweden contained appreciable amounts of 2,4,5-trichlorophenol, and thus presumably were contaminated with 2,3,7,8-TCDD, the most toxic dioxin known. Similar formulations containing 2,4,5-trichlorophenol have never been used in Canadian mills to my knowledge. Therefore, occupational and epidemiological studies on Swedish workers cannot and should not be correlated to the health and safety of Canadian workers.

On September 8, 1980, Agriculture Canada implemented a Product Specific Registration (PSR) policy with respect to all pesticides. Essentially, a full toxicological data package on all actives, regardless of use, became a requisite for registration.

No manufacturer or applicant for a new antisapstain chemical could meet or economically justify the submission of such a costly data package. Thus, although there has been much interest in the introduction of new and/or safer antistain chemicals, few applications have been received for their registration.

Now let's look at the toxicological data requirements for technical active ingredients (Table 4). What you see listed for an agricultural chemical has been the toxicological requirements for some year, possibly dating back into the late 60's. However, as of Sept. 1980, those same toxicological tests are requested for all new actives regardless of use. Thus for the last three years that list is the list of the toxicological tests that Agriculture Canada and/or Health and Welfare Canada has been requesting for the registration of a new antisapstain chemical. The list on the right is an alternative approach to the toxicological requirements for antisapstain chemicals. This option deletes the long-term reproduction and teratology tests. Even this proposal is much more data than any other regulatory agency in the world demands. While we are mandated to determine the safety, merit and value of a pesticide, we also carry the obligation to maintain a realistic balance in data requirements. On the one hand we must have comtemporary data in line with modern science and at the same time we must not strangle the flow of new technology and stiffle our economy and job employment programs. We believe that this option comes close to meeting these goals and feel that it merits broader discussion and more careful consideration. I certainly will be interested in hearing your reaction to this approach.

It has been some 10 years now that I have been employed by Agriculture Canada as an evaluation officer for industrial

fungicides. Over that time, I have had the opportunity to visit a large number of sawmills to observe their operation and investigate their use of antisapstain chemicals. There have been many changes with respect to the use of these chemicals over that time-frame (Table 5).

I have noticed an increased awareness of management and labour for the need to use, and the hazard in use, of antisapstain chemicals. The amount of chemical mixing on site has been reduced; the majority of formulations are delivered via hoses from metered tank trucks to large storage tanks. Application technology has improved. Some low volume horizontal spray boxes have been removed. Drive-thru dip tanks have been filled and paved-over at some mills. Chemical containment and occupational exposure have been reduced with the introduction of high-pressure spray systems and some enclosed, automatic, end-of-line dip tanks.

For two years now, the Environmental Protection Service of Environment Canada has been spearheading a B.C. Task Force to introduce a Code of Good Practice for wood protection facilities. When introduced and implemented across Canada, this Code should further reduce exposure and increase awareness of all mill personnel to antisapstain chemicals.

Formulations have changed, enabling a reduction in the amount of active to be applied per board foot.

There has been much research activity directed to non-chlorinated chemicals. There is a need to have alternative antisapstain chemicals to the chlorophenate salts.

Due to the continuing concern of the public and health authorities with respect to the carcinogenic potential of chemicals in general, there is a need for two-year oncogenecity studies for antisapstain chemicals. Both pentachlorophenol and 8-hydroxyquinoline are currently under tests in the U.S. for their carcinogenic potential.

And now a few comments on the chlorophenols (Table 6). It is my opinion that worker exposure to chlorophenols and their contaminants has been reduced in recent years. Modernization and automation of mills, elimination of drive-thru dip tanks and old spray boxes, and the introduction of new wax formulations have all assisted in reducing the exposure of the mill employee to these chemicals.

Although the chlorophenols have been used for some 42 years now in the lumber mills, there is always an ongoing need for additional toxicological information. This applies to nearly all chemicals. With the chlorophenols, we in government would like more information on their occupational risk and exposure. We have a particular desire for Canadian epidemiology studies.

In the U.S. the National Institute of Environmental Health

Sciences is currently sponsoring the five listed pentachlorophenol related carcinogenicity studies. When completed, these tests could possibly differentiate between the carcinogenic potential of various industrial grades of pentachlorophenol with their known differences in dioxin contamination.

On the information "side of things", a number of new federal review documents will be released in late 1983 or sometime in 1984. The document will be:

- from Environment Canada, a supplement or update to their previously released document titled: Chlorophenols and Their Impurities in the Canadian Environment".
- from Health and Welfare Canada, a review titled: "Chlorophenols and Their Impurities: A Health Hazard Evaluation".
- jointly from Environment and Health, an Expert Committee Report on Dioxins.

In addition, there is a continued need to monitor and analyze technicals and formulations for their dioxin content with a view to reducing their levels and/or setting a regulatory standard. Finally, there will be continued efforts from many people to remove the chlorophenols from use as antisapstain chemicals.

This is an overview of the status of the use of antisapstain chemicals in Canada. I have only touched on those issues directly relating to the chemicals themselves and government's role in regulating them. But, as we proceed, in time, other "outside" factors will impinge on their use. The world is changing rapidly. Governments and industry are forced in rethink old economic principles. Society's perception of value and values have changed also. Information is rapidly disseminated via new communication techniques. The public is demanding more information from industry and government.

Paul Hawken in his book "The Next Economy" states that we are moving into an "informative economy". "In an informative economy", he writes, "We change from an affluent to an influent society. An affluent society may possess an opulent and abundant amount of goods, but that does not mean it will be able to utilize, appreciate, and maintain them. An influent society will have less, but its relationship to what it has will be more involved and concerned; people will take care of what they have, and what they have will mean more to them". What this new kind of thinking does is force consideration of the human value issues in the application of technology and government decision-making. It will be a matter of making decisions that are optimal for society.

Table 1

REGISTRATION HISTORY OF ANTISAPSTAIN CHEMICALS

Chemical	Product Name	Reg.No.	Date of first Registr.	Registrant
NaPCP	Permatox 10-S	1170	1941	A.D. Chapman & Co.
	Permatox 10-S	B146	1962	Chapman Chemical
NaTCP	Permatox 100	9933	1967	Chapman Chemical
	Woodbrite 24	10,924	1971	Van Waters & Rogers Ltd.
Cu-8	PQ-8	12,143	1974	Chapman Chemical
TCMTB	Busan 30-I	13,314	1976	Buckman Labs.

Table 2

OTHER PRODUCTS

Chemical	Product Name	Company	Country of use
MBT	Kilstain	Tenneco (UK)	U.K., (Forintek)
TET	Sta-Brite D	Dow Chemical Co.	U.S.
BML	Benomyl 50	Du Pont	Sweden
	Woodgard	Sadolin	Sweden
Fluorides	Improsol 1	Penarth RIL	Sweden, U.K.
	Mykocid BS	--	Sweden
IPBC	Polyphase	Troy Chemical Corp.	Indonesia, (Forintek)
TBP	--	Velsicol Corp.	(Forintek)
TZL	Mertect	Merck	Sweden

Table 3

HISTORICAL REVIEW

1927 - Pesticides become subject to regulation in Canada

1939 - Act revised, becomes the Pest Control Products Act

1941 - Permatox 10-S, a wood preservative, registered

1942 - First Chemical Residue Tolerance (Arsenic at 1.4 ppm) Established under the Food and Drug Act

1946 - Widespread Introduction of Synthetic Pesticides (DDT, 2,4-D, lindane, chlordane, methoxychlor)

1956 - Food tolerances established for synthetic pesticides in Canada (10 years after their introduction into use)

1960 - Thalidomide

1962 - "Silent Spring", Rachel Carson

1969 - A new revised Pest Control Products Act (Industrial fungicides/biocides subject to reg'n)

1974 - Cu-8 registered for antisapstain use

1976 - TCMTB registered for antisapstain use

1976 - Chlorophenols scheduled for in-depth re-evaluation by Agriculture Canada

1978 - Chlorophenolic antisapstain chemicals banned in Sweden

1980 - September 8th - Product Specific Registration (PSR) Policy Introduced by Agriculture Canada (full data package for all actives required for registration

1981 - January 1st - Regulatory Action on Chlorophenol Use by Agriculture Canada.

1982 - March - Field and Lab. Studies on Antisapstain Preservatives (Sweden)

1983 - January - Field Trial Report on Antisapstain Chemicals (Forintek Canada)

Table 4

DATA REQUIREMENTS FOR TECHNICAL ACTIVE INGREDIENTS

	Agricultural Chemical (food crop)	Antisapstain chemical (proposed)
Acute		
-Oral	x	x
-Dermal	x	x
-Inhalation	x	x
-Skin	x	x
-Eye	x	x
Short term		
-90 day oral	x	x
-90 day dermal	-	x
-21/90 day inhalation	C.R.*	C.R.*
Mutagenecity Tests	x	x
Long Term		
-reproduction	x	-
-oncogenicity	x	x
-teratology	x	-

(*) Conditional on acute inhalation results.

Table 5

GENERAL OBSERVATIONS ON ANTISAPSTAIN CHEMICALS

- increased awareness of management and labour for the need to use and the hazard in use of antisapstain chemicals.

- improved application technology

- introduction of Code of Good Practice
  - proper protective equipment (gloves/aprons/etc.)
  - reduction of skin contact
  - good hygiene
  - worker education re hazards of all chemicals

- introduction of new formulations

- need for alternative antisapstain chemicals

- need for two-year onogenicity studies
  -pentachlorophenol (N.I.E.H.S.)
  -8-hydroxyquinoline (N.I.E.H.S.)

N.I.E.H.S. = National Institute of Environmental Health Sciences (U.S. National Toxicology Program)

Table 6

CHLOROPHENOLIC ANTISAPSTAIN CHEMICALS

- worker exposure has been reduced in recent yrs.
  -number of mills modernized and automated
  -old dip tanks and spray boxes eliminated
  -new formulations have reduced exposure

- need for occupational risk/exposure/safety data
  -need for Canadian epidemiology studies

- N.I.E.H.S. carcinogenicity studies underway
  -pentachlorophenol (pure)
  -pentachlorophenol (technical)
  -pentachlorophenol (Dowicide EC-7)
  -pentachlorophenol (DP-2)
  -pentachloroanisole

- new federal review documents to be released
  -Environment Canada: Update/Supplement to "Chlorophenols and Their Impurities in the Canadian Environment"
  -Health and Welfare Canada: "Chlorophenols and Their Impurities: A Health Hazard Evaluation"
  -Env.Can./NHW Expert Committee (Non-gov't members) to Issue a Report on Dioxins

- need to monitor/analyze technicals and formulations for their dioxin content with a view to reducing their levels (regulatory standard)

- continued efforts to remove from use