Monsanto

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SUBJECT : PCB PRESENTATION

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REFERENCE :

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Attached for your information is a copy of a recent presentation on PCB issues and concerns -- "Polychlorinated Biphenyls A Perspective."

This speech was drafted in response to requests for Monsanto comment on various local PCB concerns and issues. It has been/will be presented at the following:

City of Dayton, Ohio Review Committee, Review of Hazardous Substances Ordinance
RCGA (St. Louis) Hazardous Waste Committee, PCB Issues and Regulatory Update
Connecticut Citizens Group, Residents Against Polluting Environment (RAPE), fact-finding to oppose local zoning permit for licensed PCB storage-for-disposal site
Union Electric (St. Louis), PCB disposal in high-efficiency boilers

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jb
enclosure

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IN - 10 (REV. 8/77)

POLYCHLORINATED BIPHENYLS
A PERSPECTIVE

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PCB'S (POLYCHLORINATED BIPHENYLS) HAVE RECEIVED CONSIDERABLE ATTENTION OVER THE PAST DECADE BECAUSE OF THE PUBLIC'S CONCERNS OVER THEIR POSSIBLE EFFECTS ON THE ENVIRONMENT AND HUMAN HEALTH. THESE CONCERNS HAVE PROMPTED A SEARCH FOR ANSWERS TO MANY QUESTIONS ABOUT PCB'S AND HOW THEIR EFFECTS CAN BE CONTROLLED.

THIS PRESENTATION WILL BROADLY DISCUSS PCB'S AND OUTLINE THE PCB PROBLEM AND ISSUES IN THE UNITED STATES. HOPEFULLY, IT WILL PUT PCB'S INTO PERSPECTIVE SO THAT YOU AS INDIVIDUALS CAN MAKE YOUR OWN INFORMED JUDGEMENTS ON THESE ISSUES.

CHEMISTRY AND STRUCTURE

FIRST, WHAT ARE PCB'S? THE TERM POLYCHLORINATED BIPHENYLS, OR PCB'S, REFERS TO A CLASS OF ORGANIC CHEMICALS INTRODUCED INTO UNITED STATES INDUSTRY IN 1929. CHEMICALLY, THE COMPOUNDS ARE MADE UP OF CARBON, HYDROGEN AND CHLORINE ATOMS. THESE ARE ESSENTIALLY ARRANGED AS 2-6 MEMBERED CARBON RINGS JOINED TOGETHER THROUGH 1 CARBON ATOM ON EACH RING, I.E., A SUBSTITUTED BIPHENYL MOLECULE. IN THE BIPHENYL MOLECULE EACH REMAINING CARBON ATOM HAS ATTACHED TO IT ONE HYDROGEN ATOM. WHEN THESE H ATOMS ARE CHEMICALLY REACTED WITH CHLORINE TO SUBSTITUTE A CL ATOM FOR A H ATOM, PCB'S RESULT.

THUS, THE BIPHENYL RING IS COMPOSED OF:

(A) 2-6 MEMBERED RINGS OF CARBON ATOMS.

(B) THE TWO RINGS ARE JOINED THROUGH ONE CARBON ATOM ON EACH RING.

(C) THE REMAINING 10 CARBON ATOMS HAVE ATTACHED TO EACH A HYDROGEN ATOM CAPABLE OF UNDERGOING A CHEMICAL SUBSTITUTION REACTION BY CHLORINE.

BECAUSE OF THE POSSIBLE VARIATIONS THAT CAN OCCUR IN SUBSTITUTION OF THESE 10 AVAILABLE H ATOMS BY CL ATOMS, I.E., COMBINATIONS AND PERMUTATIONS, IT IS THEORETICALLY POSSIBLE TO FORM 209 DIFFERENT CHLOROBIPHENYL MOLECULES.

COMMERCIALLY PRODUCED PCB'S CONSISTED OF MIXTURES OF THESE 209 POSSIBLE INDIVIDUAL PCB MOLECULES; HOWEVER, ONLY ABOUT ½ OF THE THEORETICALLY POSSIBLE 209 ISOMERS ARE FORMED DURING COMMERCIAL PCB MANUFACTURE. COMMERCIAL PCB MIXTURES CONTAINED FROM 21%-60% CHLORINE (AN AVERAGE OF 3-5 CHLORINE ATOMS PER MOLECULE).

COMMERCIAL PCB MIXTURES TYPICALLY COULD CONTAIN VARIOUS CONTAMINANTS DEPENDING UPON THE PARTICULAR PROCESS USED FOR MANUFACTURE. THESE IMPURITIES INCLUDED VARIOUS POLYCHLORINATED DIBENZOFURANS (PCDF'S) AND CHLORINATED NAPHTHALENES, WHICH HAVE BEEN IMPLICATED AS BEING AT LEAST PARTLY RESPONSIBLE FOR SOME OF THE TOXICITY REPORTED FOR PCB'S. I'LL HAVE MORE TO SAY ABOUT THESE IMPURITIES LATER.

PROPERTIES AND USES

THE CHEMICAL AND PHYSICAL PROPERTIES OF PCB'S ARE VERY UNIQUE AND IT IS THESE UNIQUE PROPERTIES THAT HAVE LED TO ITS WIDESPREAD USE.

PCB'S ARE CHEMICALLY INERT, STABLE AND FIRE RESISTANT. THEY HAVE A VERY LOW VAPOR PRESSURE (BP RANGES 275°-425°C). THESE COMPOUNDS FUNCTION UNIQUELY AS DIELECTRIC INSULATORS TO ACT AS NON-CONDUCTORS OF DIRECT ELECTRIC CURRENT. THESE PARTICULAR PROPERTIES MADE THEM IDEALLY SUITED FOR ELECTRICAL APPLICATIONS WHERE HIGH-VOLTAGE ARCING COULD OCCUR, AND RESULT IN FIRES AND/OR EXPLOSIONS, DAMAGE TO EQUIPMENT AND CREATE SIGNIFICANT HAZARDS TO HEALTH AND LIFE.

AS THE UNIQUE PROPERTIES OF THIS MATERIAL BECAME MORE FULLY UNDERSTOOD, MANY ADDITIONAL USES WERE FOUND. THEIR FIRE-RESISTANT NATURE MADE THEM AN EXCELLENT CHOICE FOR USE IN HYDRAULIC AND HEAT TRANSFER FLUIDS. THEIR INERTNESS IMPARTED LONG-LASTING QUALITIES TO LUBRICANTS. THEY ALSO IMPROVED THE WATERPROOFING CHARACTERISTICS OF SURFACE COATINGS AND OFFERED SIMILAR AND OTHER BENEFITS TO THE MANUFACTURERS OF CARBONLESS COPY PAPER, PRINTING INKS, PLASTICIZERS AND SPECIAL ADHESIVES.

DISTRIBUTION

OVER FOUR DECADES, PCB'S EVOLVED AS A TRULY UNIQUE CLASS OF CHEMICALS WHICH MET BOTH IMPORTANT SOCIETAL AND INDUSTRY NEEDS. IT WAS WITHIN THIS FRAMEWORK THAT MONSANTO AND OTHER PRODUCERS DEVELOPED A GROWING, WORLDWIDE BUSINESS FOR THESE VERSATILE PRODUCTS. FROM 1930 TO 1977, WHEN PCB MANUFACTURE CEASED IN THE U.S., ABOUT 1.4 BILLION POUNDS OF PCB'S WERE PRODUCED. IT IS ESTIMATED BY VARIOUS SOURCES THAT OVER HALF OF THOSE ARE STILL IN USE TODAY IN ELECTRICAL TRANSFORMERS AND CAPACITORS.

A 1979 REPORT BY THE NATIONAL ACADEMY OF SCIENCES LISTED MONSANTO INDUSTRIAL CHEMICALS COMPANY AS HISTORICALLY THE ONLY IMPORTANT U.S. PRODUCER OF PCB'S. MONSANTO'S PLANTS WERE LOCATED AT ANNISTON, ALABAMA, AND SAUGET, ILLINOIS, WHERE PRODUCTION OF PCB'S ENDED IN 1970 AND 1977, RESPECTIVELY.

PCB'S HAVE ALSO BEEN PRODUCED, IMPORTED OR EXPORTED BY A NUMBER OF OTHER COUNTRIES. OTHER PRODUCING COUNTRIES WERE ITALY, FRANCE, JAPAN, GREAT BRITAIN, AUSTRIA, CZECHOSLOVAKIA, WEST GERMANY, SPAIN AND THE U.S.S.R.

ACCORDING TO THE U.S. ENVIRONMENTAL PROTECTION AGENCY, PCB'S WERE IMPORTED FOR USE BY FINLAND, NEW ZEALAND, CANADA, FRANCE, ITALY, NORWAY, SWEDEN AND GREAT BRITAIN. COUNTRIES WHICH HAVE EXPORTED PCB'S INCLUDE FRANCE, ITALY AND GREAT BRITAIN.

MANY EUROPEAN COUNTRIES STILL ALLOW, AND IN SOME CASES, <u>REQUIRE</u> USE OF PCB EQUIPMENT FOR CERTAIN APPLICATIONS. THESE REQUIREMENTS ARE BASED UPON THEIR OWN RISK/BENEFIT ASSESSMENTS OF THESE COMPOUNDS.

<u>RISK/BENEFIT</u>

THE <u>RISK/BENEFIT</u> ISSUE WITH RESPECT TO PCB'S IS THE <u>KEY</u> TO THE WHOLE PCB PROBLEM. MUCH SOUL-SEARCHING IS BEING DONE TO DEFINE THESE PARAMETERS FOR PCB'S. THE BENEFIT SIDE OF THE EQUATION IS PERHAPS THE EASIER OF THE TWO TO DEFINE.

WE KNOW THE BENEFITS OF USING NON-FLAMMABLE PCB'S IN CERTAIN KEY AND ESSENTIAL INDUSTRIES WHERE TECHNICALLY SUITABLE REPLACEMENTS ARE NOT READILY AVAILABLE. WE CAN CALCULATE THE BENEFIT OF PREVENTING FIRES AND SAVING LIVES IN:

HIGH-RISE BUILDINGS, HOSPITALS, SCHOOLS

UNDERGROUND UTILITY TUNNELS

UNDERGROUND TRANSPORTATION FACILITIES, E.G., SUBWAYS, TRAINS, RIVER TUNNELS, PARKING GARAGES

HYDRAULIC SYSTEMS OF AIRPLANES AND OTHER PUBLIC TRANSPORTATION

UTILITY POWER TRANSMISSION AND DISTRIBUTION CENTERS

HOW DO WE QUANTITATIVELY MEASURE RISK --

RISK OF HUMAN HEALTH HAZARD

RISK OF ENVIRONMENTAL DAMAGE, ETC.,

AND, COMPARE THEM WITH BENEFITS?

THIS RISK/BENEFIT PROBLEM IS NOT UNIQUE TO PCB'S, BUT CONFRONTS US WITH MANY CHEMICALS AND MANY ASPECTS OF LIFE, WHETHER IT'S A NEW MEDICAL/SURGICAL PROCEDURE, A NEW (OR OLD) CHEMICAL, A NEW TOY OR AUTOMOBILE OR A NEW GADGET OR WORK-SAVING APPLIANCE.

ENVIRONMENTAL AND HEALTH CONCERNS

IN THE LATE 1960'S, SOME 40 YEARS AFTER PCB'S WERE INTRODUCED, THE FIRST SIGNS OF POTENTIAL ENVIRONMENTAL PROBLEMS TURNED UP IN TWO SEPARATE EVENTS -- ONE IN JAPAN, THE OTHER IN SWEDEN.

SWEDISH FINDINGS

THE FIRST SIGN OF TROUBLE WAS REPORTED BY A SWEDISH BIOLOGIST. WHILE USING A NEW AND THEN TOTALLY UNIQUE TECHNIQUE, CHLORINATED PESTICIDE ANALYSIS, HE FOR THE FIRST TIME IDENTIFIED PCB'S IN THE BODIES OF FISH. MONSANTO AND OTHERS BEGAN IMMEDIATELY TO STUDY THE SWEDISH WORK. BUT, BEFORE THESE FINDINGS COULD BE CONFIRMED OR DUPLICATED IN THE U.S., ANALYTICAL METHODS HAD TO BE REFINED IN ORDER TO SEPARATE PCB'S FROM THE OTHER CHLORINATED HYDROCARBONS (LIKE DDT) THAT WERE KNOWN TO BE PRESENT IN THE ENVIRONMENT. NEW TECHNIQUES ALSO HAD TO BE DEVELOPED TO ENABLE RESEARCHERS TO IDENTIFY THE CHEMICALS IN THE LOW PARTS PER BILLION RANGES BEING REPORTED.

YUSHO INCIDENT

IN 1968, ABOUT 1,000 PEOPLE IN JAPAN BECAME ILL FROM EATING RICE OIL HEAVILY CONTAMINATED WITH JAPANESE PRODUCED PCB'S AS A RESULT OF AN UNFORTUNATE INDUSTRIAL ACCIDENT. THIS HAS COME TO BE KNOWN AS THE "YUSHO INCIDENT." THE LEVEL OF PCB CONTAMINATION IN THE RICE OIL WAS 2,000-3,000 PARTS PER MILLION, EXTREMELY HIGH CONCENTRATIONS. (FOR COMPARISON, LEVELS BEING REPORTED TODAY IN FISH AND WILDLIFE ARE IN THE LOW PPM AND PPB RANGE.) (PPB EXAMPLE)

SOME NEWS ACCOUNTS LINKED THIS INCIDENT WITH DEATHS, STILLBIRTHS AND MISCARRIAGES, WHILE, IN FACT, NO SUCH CASES WERE ACTUALLY ATTRIBUTED TO THE INCIDENT. PERSONS EXPOSED TO PCB CONTAMINATED RICE OIL DID EXPERIENCE DIZZINESS, NAUSEA, LOSS OF APPETITE, WEAKNESS AND DERMATOLOGICAL SIDE EFEECTS. INFANTS, BORN TO MOTHERS WHO HAD BEEN EXPOSED DURING PREGNANCY, EXHIBITED DARKENED SKIN AT BIRTH; HOWEVER, IN EVERY CASE, THIS CONDITION CLEARED WITHIN THREE WEEKS.

THE VICTIMS OF THE YUSHO INCIDENT HAVE BEEN SUBJECTED TO EXTENSIVE FOLLOW-UP MEDICAL STUDIES SINCE THE EVENT TO EVALUATE POSSIBLE LONG-TERM CHRONIC EFFECTS OF THE EXPOSURE. SOME LONG-TERM CHRONIC HEALTH EFFECTS WERE OBSERVED IN THE YUSHO PATIENTS, INCLUDING CANCER. HOWEVER, RESULTS OF THESE INVESTIGATIONS INDICATE THAT PCB'S PER SE MAY NOT HAVE BEEN THE CULPRIT IN THE YUSHO INCIDENT. OTHER ORGANIC CONTAMINANTS KNOWN TO BE SIGNIFICANTLY MORE TOXIC THAN PCB'S HAVE BEEN FOUND IN PATIENTS AT HIGH CONCENTRATIONS AND IN JAPANESE MANUFACTURED PCB'S. SOME MEDICAL RESEARCHERS AND SCIENTISTS ARE NOW UNWILLING TO BLAME PCB'S FOR CHRONIC EFFECTS OBSERVED IN THE YUSHO INCIDENT, ESPECIALLY IN LIGHT OF SEVERAL HUMAN EPIDEMIOLOGY STUDIES NOW AVAILABLE RELATED TO PCB EXPOSURE.

ALTHOUGH CONCLUSIONS ABOUT THAT INCIDENT HAVE BEEN CLOUDED BY THE UNKNOWN IMPACT OF IMPURITIES IN JAPANESE MADE PCB'S, THE INCIDENT SOUNDED A CAUTIONARY SIGNAL.

U.S. CONCERNS

IN 1970, WHEN THESE SCIENTIFIC INVESTIGATIONS FIRST CONFIRMED THE PRESENCE OF PCB'S IN THE ENVIRONMENT IN THE U.S. AND LONG BEFORE INFORMATION REGARDING THE POTENTIAL IMPACT OF THIS CONTAMINATION WAS DETERMINED, MONSANTO, WORKING WITH VARIOUS AFFECTED INDUSTRY SEGMENTS AND GOVERNMENT AGENCIES, VOLUNTARILY BEGAN ITS PROGRAM OF TERMINATING SALES OF PCB'S FOR OPEN APPLICATIONS -- THOSE WHICH COULD LIKELY RESULT IN UNCONTROLLABLE ENTRY INTO THE ENVIRONMENT.

HOWEVER, TERMINATION OF SALES FOR DIELECTRIC USES WOULD HAVE RESULTED IN SEVERE ECONOMIC AND SOCIAL PROBLEMS FOR THE NATION. THIS WAS RECOGNIZED BY THE FEDERAL INTERDEPARTMENTAL TASK FORCE ON PCB'S WHICH CONCLUDED IN 1972 THAT:

"THEIR CONTINUED USE FOR TRANSFORMERS AND CAPACITORS IN THE NEAR FUTURE IS CONSIDERED NECESSARY BECAUSE OF THE SIGNIFICANTLY INCREASED RISK OF FIRE AND EXPLOSION AND THE DISRUPTION OF ELECTRICAL SERVICE WHICH WOULD RESULT FROM A BAN ON PCB USE."

AT THIS TIME, MONSANTO MADE THE CONSCIOUS DECISION TO CONTINUE SUPPLYING PCB'S ONLY TO THE ELECTRICAL POWER DISTRIBUTION INDUSTRY WHERE THEY WERE MARKETED AS DIELECTRIC FLUIDS IN "CLOSED" OR SEALED SYSTEMS SUCH AS TRANSFORMERS AND CAPACITORS. IN CONTINUING THESE SALES, MONSANTO REQUIRED CUSTOMER ASSURANCES THAT THE MATERIALS WOULD BE SAFELY HANDLED AND PROPERLY DISPOSED.

MONSANTO, THE GOVERNMENT AND THE ELECTRICAL INDUSTRY TOGETHER CONCLUDED THAT THE BENEFITS TO SOCIETY OF CONTINUED PCB DIELECTRIC USE IN ENCLOSED ELECTRICAL UNITS FAR OUTWEIGHED THE RISKS. THE KEY TO MANAGING THE RISK WAS SOUND MAINTENANCE PRACTICE AND DISPOSAL CONTROL.

IN 1977, MONSANTO VOLUNTARILY CEASED ALL PRODUCTION OF PCB'S ONCE WE HAD BEEN ASSURED BY THE ELECTRICAL POWER INDUSTRY THAT SUITABLE SUBSTITUTES WERE AVAILABLE.

ENVIRONMENTAL EFFECTS

PCB'S ARE STABLE; THEY RESIST DEGRADATION IN THE ENVIRONMENT AND PERSIST FOR LONG PERIODS OF TIME. AS THEY PERSIST, THEY TEND TO ACCUMULATE IN ANIMALS AS THEY MOVE UP THE FOOD CHAIN. LOWER ANIMAL FORMS CONSUME THEM AND IN TURN ARE CONSUMED BY HIGHER FORMS AND, IN SOME CASES, PCB'S MAY ULTIMATELY REACH HUMANS VIA THE FOOD CHAIN.

THE IMPACT OF PCB CONTAMINATION ON ECOLOGICAL SYSTEMS IS NOT FULLY UNDERSTOOD. HOWEVER, THERE HAVE BEEN A NUMBER OF ATTEMPTS TO SUMMARIZE APPARENT EFFECTS AND TO ESTIMATE POSSIBLE FUTURE IMPACTS.

PCB'S HAVE BECOME WIDESPREAD THROUGH CERTAIN NATURAL AND MAN-MADE MECHANISMS AND ARE OFTEN FOUND AT VARIOUS LEVELS AND LOCATIONS IN THE SOIL, AIR AND WATER.

PCB CONTAMINATION IN URBAN AIR HAS BEEN REPORTED. ALSO, SOME U.S. WATERS AND SEDIMENTS SHOW PCB CONTAMINATION.

PCB'S ARE FOUND AT VARIOUS LEVELS IN ANIMAL AND AQUATIC SPECIES. ONE STUDY CONDUCTED BETWEEN 1970 AND 1974 BY THE U.S. FISH AND WILDLIFE COMMISSION SHOWED PCB RESIDUES IN VARIOUS FRESHWATER FISH, WATERFOWL AND STARLINGS. A 1972-1974 STUDY OF THREE LAKE MICHIGAN FISH SPECIES TAKEN IN THE EASTERN PART OF THE LAKE SHOWED MEAN WHOLE FISH CONCENTRATIONS RANGING FROM 5.24 TO 22.9 PPM IN BLOATERS, SALMON AND LAKE TROUT.

MORE RECENT STUDIES IN THE GREAT LAKES (1979-1980) INDICATE THAT PCB LEVELS IN FISH ARE NOW DECREASING. SIMILAR REPORTS HAVE BEEN MADE FOR FISH IN OTHER PARTS OF THE COUNTRY.

PCB'S HAVE BEEN FOUND IN THE GENERAL U.S. POPULATION. SAMPLES OF HUMAN ADIPOSE TISSUE AND MILK, COLLECTED IN 1973 AND 1974 IN A NATIONAL SURVEY, SHOWED THAT 35.1% AND 40.3% OF THE SAMPLES, RESPECTIVELY, CONTAINED 1 PPM OR MORE PCB'S ON A WETWEIGHT BASIS; ABOUT 5.0% OF EACH STUDY SHOWED GREATER THAN 2 PPM PCB'S.

HEALTH CONCERNS

QUESTIONS HAVE BEEN RAISED IN FOUR AREAS OF POSSIBLE HEALTH EFFECTS OF PCB'S:

(A) SKIN (REDDENING, RASHES, CHLORACNE)

(B) SYSTEMIC EFFECTS (LIVER DAMAGE, RESPIRATORY EFFECTS)

(C) WORKER EXPOSURE

(D) CARCINOGENICITY

IN THE CLASSICAL SHORT-TERM EXPOSURE OR ACUTE TOXICITY SENSE, PCB'S ARE CLASSIFIED AS "SLIGHTLY TOXIC" BY ORAL INGESTION, LD_{50} 4,000-8,000 MG/KG (SIMILAR TO NACL-SALT). FOR INHALATION, OSHA HAS ESTABLISHED SAFE EXPOSURE LEVELS FOR WORKERS EXPOSED TO PCB'S. (THE EIGHT-HOUR TIME-WEIGHTED AVERAGE THRESHOLD LIMIT VALUES (TLV) FOR WORKER EXPOSURE ARE 1.0 (42% CHLORINE) TO 0.5 (54% CHLORINE) MG/M^3.)

SKIN

LONGER-TERM STUDIES ON SKIN EFFECTS USING LABORATORY ANIMALS HAVE SHOWN THE FOLLOWING:

(A) REPEATED AND PROLONGED SKIN CONTACT WITH THE HIGHER CHLORINATED BIPHENYLS CAN PRODUCE SKIN IRRITATION.

(B) HARMFUL AMOUNTS CAN BE ABSORBED UNDER REPEATED, PROLONGED CONDITIONS, SUCH AS BY WEARING LEATHER GOODS THAT HAVE BECOME SATURATED WITH PCB'S.

(C) A SAFE EXPOSURE LEVEL DOES EXIST FOR EACH PCB MATERIAL (I.E., A NO-EFFECT LEVEL).

IN ADDITION, STUDIES IN 218 HUMAN VOLUNTEERS USING THE PATCH TEST TECHNIQUE OF THE U.S. PUBLIC HEALTH SERVICE CONCLUDED THAT AROCLOR

(PCB) "...HAS NO PRIMARY IRRITANT EFFECT NOR IS IT A SENSITIZER OF HIGH POTENCY...." (MONSANTO RECORDS SHOW THAT THIS STUDY USED AROCLOR 1254.)

HUMAN EXPOSURE STUDIES ALSO INDICATE THAT SKIN EFFECTS ARE REVERSIBLE ONCE THE SOURCE IS REMOVED.

INHALATION/RESPIRATORY STUDIES

SEVERAL ANIMAL TESTS HAVE BEEN PERFORMED TO STUDY THE EFFECTS OF LONG-TERM INHALATION EXPOSURE TO PCB'S. IN SOME CASES IT WAS NECESSARY TO HEAT THE PCB'S IN ORDER TO OBTAIN THE HIGHER CONCENTRATIONS NECESSARY TO CONDUCT THE EXPERIMENTS.

VARIOUS PCB'S WERE STUDIED AT TEST CHAMBER CONCENTRATIONS OF ABOUT 1-6 PPM. NO INJURY WAS OBSERVED AFTER PROLONGED INTERMITTENT EXPOSURE OF SEVERAL ANIMAL SPECIES AT THESE CHAMBER CONCENTRATIONS USING THE LOWER CHLORINATED PCB'S (I.E., 42% CL). AT COMPARABLE TEST CHAMBER CONCENTRATIONS OF THE HIGHER CHLORINATED PCB'S (E.G., 54% CL) SIGNS OF REVERSIBLE LIVER CELL INJURY WERE APPARENT.

PARTLY, AS A RESULT OF THESE STUDIES THE AMERICAN CONGRESS OF GOVERNMENT INDUSTRIAL HYGIENISTS (ACGIH) TLV STANDARDS WERE ESTABLISHED AND WERE SUBSEQUENTLY INCORPORATED INTO CURRENT OSHA STANDARDS (1.0 AND 0.5 MG/M^3).

WORKER EXPOSURE/EPIDEMIOLOGY

THE HEALTH EFFECTS OF LONG-TERM HUMAN EXPOSURE TO PCB'S HAVE BEEN CAREFULLY REVIEWED BY SEVERAL RESEARCH GROUPS. MONSANTO IS AWARE OF SEVEN EPIDEMIOLOGICAL STUDIES DONE IN THE U.S. OF GROUPS OF PEOPLE EXPOSED TO PCB'S. THESE INCLUDED PERSONS WITH OCCUPATIONAL, AS WELL AS COMMUNITY, EXPOSURE. THE POTENTIAL HEALTH EFFECTS STUDIES INCLUDED DEVIATIONS IN BIOLOGICAL PARAMETERS (SUCH AS BLOOD AND TISSUE LEVELS) AND REPORTED SYMPTOMS AND ILLNESSES. IN ADDITION, THE CAUSES OF ANY DEATHS OF ANY PERSONS FROM THE SAMPLE POPULATION WERE INVESTIGATED.

THE FOUR MOST RECENT STUDIES APPEAR TO CONSTITUTE THE MOST EXTENSIVE EPIDEMIOLOGICAL WORK YET DONE ON PCB'S.

IN TOTAL, THE HUMAN EPIDEMIOLOGY EXPERIENCE INDICATES AN ABSENCE OF MORBIDITY (ILL HEALTH) ASSOCIATED WITH SIGNIFICANT EXPOSURE TO PCB'S. MORE IMPORTANTLY, NONE OF THESE STUDIES FOUND PCB'S TO CAUSE CANCER IN HUMANS.

POTENTIAL CARCINOGENICITY - ANIMAL STUDIES

WHAT ABOUT CANCER IN ANIMALS? IN 1975, DR. RENATE KIMBROUGH REPORTED THE INDUCTION OF LIVER CARCINOMAS IN FEMALE RATS FED AROCLOR 1260, A PCB, FOR TWO YEARS.

MONSANTO COMPANY HAD SPONSORED PREVIOUSLY THREE 2-YEAR RAT FEEDING STUDIES USING THREE DIFFERENT AROCLOR MIXTURES, INCLUDING THE SAME LOT OF AROCLOR 1260 USED BY DR. KIMBROUGH. THE RESULTS FROM THE MONSANTO STUDIES SHOWED THAT THE TEST COMPOUNDS PRODUCED LIVER INJURY BUT NO CANCER.

AN EXTENSIVE RE-EVALUATION BY INDEPENDENT CONSULTANTS WAS MADE OF THE LIVER TISSUE SPECIMENS FROM THE MONSANTO SPONSORED STUDIES. IN ADDITION, SPECIMENS OF LIVER TISSUE FROM DR. KIMBROUGH'S STUDY WERE ALSO EVALUATED BY INDEPENDENT CANCER RESEARCH EXPERTS. THAT REVIEW FAILED TO CONFIRM THE KIMBROUGH FINDINGS. IN OTHER WORDS, IT SHOWED NO OCCURRENCE OF LIVER CANCER IN ANY OF THE FOUR STUDIES.

IN 1977, THE NATIONAL CANCER INSTITUTE REPORTED THEIR RESULTS OF YET ANOTHER INDEPENDENT STUDY FOR POSSIBLE CARCINOGENICITY OF PCB'S (AROCLOR 1254) USING RATS IN A 2-YEAR FEEDING STUDY. THE NCI REPORT STATED THAT AROCLOR 1254 WAS NOT A CARCINOGEN UNDER THE TEST CONDITIONS.

SUMMARY/CONCLUSIONS

PCB'S HAVE BECOME AN INTENSELY EMOTIONAL ISSUE. IMPORTANT DECISIONS AFFECTING THEIR USE, STORAGE AND ULTIMATE DISPOSAL ARE BEING MADE WITHOUT BENEFIT OF PROPER SCIENTIFIC ASSESSMENT.

PCB'S WERE USED AS THE SYMBOLIC EXAMPLE OF WHY THIS NATION NEEDED TOUGH, NEW REGULATIONS TO CONTROL TOXIC SUBSTANCES. IN THE PROCESS, THE HAZARDS OF PCB'S WERE GREATLY EXAGGERATED!

IN SOME CASES, THESE COMPOUNDS HAVE BEEN LABELLED BY REGULATORY AGENCIES, LEGISLATIVE BODIES, THE POPULACE AND THE MEDIA AS HUMAN "CANCER-CAUSING AGENTS" AND "DEADLY TOXINS." HOWEVER, THE SCIENTIFIC EVIDENCE DOES NOT SUPPORT THESE CLAIMS.

THERE HAS NEVER BEEN A SINGLE DOCUMENTED CASE IN THIS COUNTRY WHERE PCB'S HAVE BEEN SHOWN TO CAUSE CANCER OR ANY OTHER SERIOUS HUMAN HEALTH PROBLEMS.

IN NO WAY DO I WISH TO MINIMIZE THE VERY REAL ENVIRONMENTAL CONCERNS ASSOCIATED WITH IRRESPONSIBLE DISPOSAL OF WASTES CONTAINING PCB'S. PCB'S ARE PERSISTENT. THEY BIOACCUMULATE IN LIVING ORGANISMS -- THAT IS, THEY BUILD UP IN THE FATTY TISSUE, EACH NEW DOSE ADDS TO WHAT IS ALREADY THERE.

AS COMPANIES, INDIVIDUALS AND AS A NATION, WE SHOULD MAKE PROPER ASSESSMENTS OF PCB'S AS WELL AS OTHER WASTES AND TAKE STEPS TO SEE THAT PROPER HANDLING, STORAGE AND ULTIMATE DISPOSAL OCCURS. THERE ARE ENOUGH LEGITIMATE CONCERNS ABOUT POTENTIAL ENVIRONMENTAL HARM FROM PCB'S (AND OTHER CHEMICALS FOR THAT MATTER) WITHOUT USING SCARE-MONGER LABELS SUCH AS "CANCER-CAUSING" AND "DEADLY TOXIN" TO UNNECESSARILY ALARM THE PUBLIC.