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GENTLEMEN:

MY PARTICIPATION IN THIS PRESENTATION WILL BE A BRIEF REVIEW OF THE DEVELOPMENTS WHICH INCRIMINATE THE POLY-CHLORINATED BIPHENYLS INCLUDING OUR AROCLORS AS NEARLY WORLD-WIDE ENVIRONMENTAL CONTAMINANTS.

EXAMPLES ARE THE ALMOST COMPLETE DEPLETION OF PEREGRINE FALCON ALONG THE NORTHEAST COAST OF THE UNITED STATES; DEPLETION IN POPULATION OF THIS SPECIES IN CALIFORNIA; AND THE REPORTED EFFECT ON THE BROWN PELICAN IN CALIFORNIA.

- 3) PCB'S ARE PARTICULARLY TOXIC TO SHRIMP.

AT PENSACOLA, THERE WAS A LOSS OF 1 TO 3 GALLONS PER DAY OF AROCLOR 1254 INTO THE ESCAMBIA RIVER FROM OUR NYLON PLANT. THE RESULTANT CONCENTRATIONS OF PCB ONE-QUARTER MILE BELOW THE PLANT WERE ABOVE THE LEVELS NEEDED TO KILL JUVENILE SHRIMP IN LABORATORY TESTS.

- 4) THERE ARE STILL MANY UNKNOWNNS BUT SPECULATION AS TO THE ROLE OF PCB'S IS RAMPANT.

ALTHOUGH SOME OF THE REPORTS OF ANALYTICAL IDENTIFICATION ARE NOT CERTAIN, THE MEDICAL DEPARTMENT--AFTER 18 MONTHS OF INVESTIGATION IN CONJUNCTION WITH THE ORGANIC DIVISION--IS CERTAIN THAT THE PCB'S CAN BE RESPONSIBLE FOR ECOLOGICAL DAMAGE. THERE IS NO SCIENTIFIC CONSENSUS AS TO THE DEGREE OF PCB INVOLVEMENT BUT THESE COMPOUNDS CANNOT ESCAPE A SIGNIFICANT SHARE OF THE BLAME FOR DAMAGE.

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- 5) SPECULATION IS LEADING TO CONCERN WHICH MAY GROW TO ALARM.

THE MEDICAL DEPARTMENT BELIEVES THAT THE MYRIAD OF INVESTIGATORS PRESENTLY WORKING ON PCB'S IN GOVERNMENT AND UNIVERSITY LABORATORIES IS CERTAIN TO PROMOTE A MORE PROMINENT ROLE FOR PCB DAMAGE, LEADING AT BEST TO EXTREMELY DAMAGING PUBLICITY AND, AT WORST, LEADING TO COMPLETE BANNING OF THESE PRODUCTS.

CERTAINLY ALL OF YOU ARE AWARE OF THE PRESENT CONCERN ABOUT THE RESIDUES OF DDT, ITS METABOLITES AND OTHER CHLORINATED HYDROCARBON PESTICIDES THROUGHOUT THE WORLD. SINCE WORLD WAR II AND IN THE LAST DECADE IN PARTICULAR, THERE HAS BEEN A SAMPLING NETWORK WHICH HAS IDENTIFIED DDT AND ITS METABOLITES IN PRACTICALLY EVERY LIVING ORGANISM AND IN THE AIR, WATER AND SOIL ACROSS THE FACE OF THE GLOBE. IT WOULD NOT BE UNEXPECTED TO FIND THAT EACH OF US IN THIS ROOM HAS 5 TO 10 ppm OF DDT IN OUR FATTY TISSUES.

AS ANALYTICAL TECHNIQUES HAVE IMPROVED AND INCLUDED VERY SENSITIVE GAS CHROMATOGRAPHY METHODS, INTERFERING SUBSTANCES HAVE APPEARED WHICH RAISE QUESTIONS AS TO THE VALIDITY OF PRESENT AND EARLIER DETERMINATIONS OF DDT MATERIALS.

THIS DIAGRAM INDICATES THE GAS CHROMATOGRAMS OF SEVERAL OF OUR AROCLORS. AT THE BOTTOM THE PEAKS FOR VARIOUS HYDROCARBON PESTICIDES ARE SHOWN. IT IS OBVIOUS THAT SOME OF THE PREDOMINANT PEAKS IN THE AROCLORS FALL IN THE SAME POSITION IN TERMS OF RETENTION TIME AS DDT

AND ITS METABOLITES. PLEASE NOTICE THAT THIS IS PARTICULARLY TRUE FOR AROCLORS 1254 AND 1260 AND IT IS THESE TWO PARTICULAR POLYCHLORINATED BIPHENYLS, WHETHER MANUFACTURED BY MONSANTO OR OUR COMPETITORS, THAT ARE THE PRODUCTS WHICH ARE MOST CONSISTENTLY IDENTIFIED (PENTA ^{and hexa} ~~10-octa~~ CHLORO). LET ME EMPHASIZE THIS POINT BECAUSE IT HAS A PARTICULAR BEARING ON THE FUTURE MANUFACTURE, SALES AND USE OF THE WHOLE PRODUCT LINE.

WHERE HAVE THE PCB'S BEEN FOUND?

THIS NEXT TRANSPARENCY INDICATES LOCATIONS WHERE THESE MATERIALS HAVE BEEN REPORTED. THE AMOUNTS FOUND VARY FROM PARTS PER TRILLION IN SOME WATER SAMPLES TO HUNDREDS OF PARTS PER MILLION IN FISH AND SOME FISH-EATING BIRDS.

LET ME DIGRESS A MOMENT TO EQUATE THESE UNITS OF PPM, PPB AND PPT TO SOMETHING THAT WE ALL RECOGNIZE (SHOW TRANSPARENCY ON COMPARISON OF PPM TO FIFTHS).

RETURNING TO THE REPORTED FINDINGS OF THE PCB'S, THE VALUES THAT HAVE BEEN REPORTED IN SWEDEN VARY FROM 10 PPB IN FISH, BIRDS AND EGGS TO 20,000 ppm IN ONE OR TWO SINGLE SPECIMENS. IN THE LATTER CASE, THESE HAVE BEEN DEAD BIRDS AND THERE IS SOME QUESTION AS TO THE VALIDITY OF THE RESULTS. IN REGARD TO CHILDREN'S HAIR, DR. JENSEN HAS POINTED OUT THAT HIS FIVE MONTH OLD CHILD HAD MORE PCB'S IN THE HAIR THAN HIS THREE AND SIX YEAR OLD CHILDREN AND HE POSTULATED THAT THIS WAS DUE TO THE PCB BEING IN MOTHER'S MILK. THE SAME LEVELS OF PCB'S HAVE BEEN FOUND IN FISH, BIRDS, AND EGGS IN

GREAT BRITAIN AND THE NETHERLANDS. IN THE UNITED STATES AS WE HAVE INDICATED, THE PCB'S HAVE BEEN FOUND IN IN-LAND WATERS. THIS IS QUITE DIFFERENT UP TO THIS POINT AS REGARDS THEIR DISTRIBUTION IN GREAT BRITAIN, IN THE NETHERLANDS AND IN THE SCANDANAVIAN COUNTRIES. *TP*PERHAPS I SHOULD REMIND YOU THAT MONSANTO IS THE SOLE PRODUCER AND SUPPLIER OF POLYCHLORINATED BIPHENYLS IN THE UNITED STATES AND GREAT BRITAIN. THIS IS IMPORTANT SINCE ANY PUBLIC OR GOVERNMENTAL AGENCY ACTIVITY WHICH MAY LEAD TO THE RESTRICTION OF USE OF POLYCHLORINATED BIPHENYLS MAKES MONSANTO PARTICULARLY VULNERABLE FROM A PUBLIC RELATIONS STANDPOINT IN THE UNITED STATES, GREAT BRITAIN AND PROBABLY CANADA.

IN TERMS OF TOXIC OR HARMFUL EFFECTS FROM THE PRESENCE OF PCB'S, WE CAN MAKES THESE STATEMENTS SUPPORTED BY A GROWING AMOUNT OF TOXICOLOGICAL RESEARCH DATA:

1. THE AROCLOR'S ARE NOT HIGHLY TOXIC FROM AN ACUTE STANDPOINT TO MAN, ANIMALS, BIRDS OR FISH. FOR EXAMPLE, THEY ARE NOT NEARLY AS TOXIC AS DDT AND CERTAINLY MUCH LESS TOXIC THAN DIELDRIN AND ALDRIN.
2. FROM A CHRONIC TOXICITY STANDPOINT, THE PCB'S MAY BE CONSIDERED "MODERATELY TOXIC" TO MAN, ANIMALS AND FISH. FROM THE STANDPOINT OF REPRODUCTION, THE PCB'S ARE HIGHLY TOXIC TO BIRDS. THIS CONCLUSION IS BASED ON ON-GOING RESEARCH AT OUR CONSULTING LABORATORY IN CHICAGO WHERE WHITE LEGHORN CHICKENS--A RELATIVELY RESISTANT MEMBER OF THE BIRD SPECIES--ARE LAYING EGGS AFTER BEING

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FED A DIET OF 10 PPM WHICH FAIL TO HATCH. AT 100 PPM THE EGGS HAVE GREATLY REDUCED EGG SHELL THICKNESS AS WELL.

IN THE AQUATIC ENVIRONMENT, SHRIMP APPEAR TO BE PARTICULARLY SENSITIVE TO THE PCB'S. IN A TEST CONDUCTED AT THE BUREAU OF COMMERCIAL FISHERIES LABORATORY, GULFSTREAM, FLORIDA, 5 PPB CAUSED THE DEATH OF 18 OUT OF 25 JUVENILE SHRIMP IN 18 DAYS.

ALTHOUGH AT THIS POINT THE PCB'S ARE NOT BEING TOUTED AS SERIOUS TOXICANTS, THERE HAVE BEEN COMMENTS IN EACH OF THE PUBLICATIONS WHICH HAVE APPEARED WHICH HAVE IMPLIED-- IF NOT STATED DIRECTLY--THAT THESE MATERIALS ARE "HIGHLY TOXIC".

THE FUTURE OF THESE MATERIALS IS THREATENED MORE BY THE POTENTIAL EFFECT ON SOME FORMS OF WILDLIFE RATHER THAN POTENTIAL TOXIC EFFECTS AS WE USUALLY THINK OF THEM IN RELATION TO HUMAN OR ANIMAL FOODS. IN THE ENVIRONMENT WE ARE FACED WITH THIS CYCLE--FISH IN WATER CONTAINING PPB OF PCB CONCENTRATE THE MATERIAL TO PPM. THE SWEDES SAY THAT LARGER FISH EATING SUCH SMALLER ONES SHOW A 10 FOLD INCREASE IN THE AMOUNT OF PCB IN THEIR TISSUES. BIRDS THEN EATING THESE FISH SHOW 100 FOLD CONCENTRATION OF PCB FROM THAT IN THE FISH WHICH THEY HAVE EATEN. IT IS POSTULATED AS IN THE CASE OF DDT THAT THIS CONCENTRATION LEADS TO EGGS WITH LITTLE OR NO SHELL THICKNESS AND WITH DECREASED OR NO REPRODUCTION.

HOW DO THE PCB'S GET INTO THE ENVIRONMENT?

OUR EFFORTS TO DATE HAVE NOT BEEN COMPLETELY SUCCESSFUL IN PIN-POINTING SOURCES OF THE PCB'S. AS MR. BERGEN AND MR. SPRINGATE WILL DISCUSS SHORTLY, WE DO HAVE SOME IDEAS CONCERNING SPECIFIC PRODUCT USES.

WE CAN, HOWEVER, MENTION THREE INSTANCES WHICH WILL GIVE SOME IMPRESSION AS TO SOURCES SUCH AS OUR MANUFACTURING PLANTS, A MONSANTO "CUSTOMER" PLANT, AND EARLY RESULTS OF WIDE-SPREAD SAMPLING IN LAKE MICHIGAN (SHOW TRANSPARENCY OF SEVERN RIVER, PENSACOLA AND LAKE MICHIGAN). THIS IS AN INDICATION OF THE PCB CONCENTRATION IN MUD NEAR THE OUTFALL OF OUR NEWPORT PLANT. YOU WILL NOTE THE SCALE IN MILES AT THE BOTTOM AND THE DISTRIBUTION OF PCB ALONG THE ESTUARY OF THE SEVERN RIVER.

SIMILAR FINDINGS COULD BE SHOWN FOR THE STREAMS BELOW OUR ANNISTON AND KRUMMRICH PLANTS.

AN INDICATION OF "CUSTOMER" USAGE AS A SOURCE IS INDICATED IN THIS SLIDE. THIS IS A MONSANTO CUSTOMER PLANT WHERE THE PENSACOLA INSTALLATION WAS USING FIRE RESISTANT AIR COMPRESSOR LUBRICANT CONTAINING AROCLOR 1254. IT WAS REPORTED THAT ONE-FOURTH MILE BELOW OUR PLANT OUTFALL, 40 PPB OF PCB WAS PRESENT. AT THE BRIDGE AT HIGHWAY 90, 0.5 PPB WAS REPORTED. THE STATE AND UNIVERSITY IN DOING FURTHER SAMPLING REACHED IN BEHIND THE SKIMMERS ON THE OUTFALL OF OUR PLANT AND FOUND ²⁴⁰20 PPB.

AS A FURTHER EXAMPLE OF THE POSSIBLE SOURCES FROM OUR CUSTOMER PLANTS, THIS TRANSPARENCY SHOWS EARLY REPORTS OF SAMPLES FROM LAKE MICHIGAN. WATER SAMPLES HAVE SHOWN PARTS PER TRILLION TO PARTS PER BILLION OF THE HIGHER CHLORINATED BIPHENYLS. WHEN WE BROUGHT THIS BACK TO OUR MARKETING GROUPS, THEY QUICKLY POINTED OUT THAT ONE COULD ALMOST PIN-POINT OUR CUSTOMER USAGE ALONG THE SHORES OF LAKE MICHIGAN.

THESE THREE INSTANCES REFLECT WHAT MIGHT BE TERMED DIRECT CONTAMINATION. AS YOU WILL HEAR, THE POSSIBLE SOURCES OF INDIRECT CONTAMINATION MIGHT BE RELATED TO EVERY SINGLE USE OF OUR PRODUCTS WHETHER THE USES BE IN ELECTRICAL APPLICATIONS, OTHER INDUSTRIAL FLUIDS, OR PLASTICIZER USAGE.

THE SCIENTISTS WHO HAVE PUBLISHED THEIR FINDING OF THE PCB'S IN NATURE HAVE IN EVERY INSTANCE MENTIONED THE POSSIBLE SOURCES AS THE LIQUID MATERIALS AS INDUSTRIAL POLLUTANTS AND THE PLASTICIZER USES WHERE IN THE MANUFACTURE OF A PLASTIC MATERIAL SOME VAPORS ARE LOST TO THE ATMOSPHERE AND ULTIMATELY END UP IN THE OCEAN AS CHEMICAL FALL-OUT.

The PCBs
WE HAVE THE HONOR IF IT BE SUCH OF HAVING THIS QUOTED IN THIS NEW BOOK ON CHEMICAL FALL-OUT. *Scientists* THEY HAVE POSTULATED ALSO THAT SINCE THE PCB'S ARE VIRTUALLY INDESTRUCTIBLE, EVERY POUND EVER MANUFACTURED ULTIMATELY HAS ESCAPED INTO THE ENVIRONMENT AND REMAINS THERE.

AS FAR AS FUTURE ACTION IS CONCERNED, THE MEDICAL DEPARTMENT PROPOSES TO CONTINUE A PROGRAM, AND I MIGHT ADD--AN EXPANDED

PROGRAM--WHICH WE HOPE WILL PERMIT THE CONTINUED USE OF AROCLORS 1254 AND 1260 IN THOSE APPLICATIONS WHERE ESCAPE INTO THE ENVIRONMENT CAN BE POLICED AND PREVENTED.

SECONDLY, WE HOPE TO DEVELOP DATA THAT WILL SHOW THAT THE LOWER CHLORINATED BIPHENYLS, THAT IS--AROCOR 1242 AND THOSE LOWER IN CHLORINATION, ARE DEGRADED IN THE ENVIRONMENT AND THUS DO NOT PRESENT A THREAT TO WILDLIFE.

THERE IS SOME INDICATION FROM WORK UNDERWAY IN RUABON THAT AROCLOR 1242 WILL INDEED DEGRADE BIOLOGICALLY. THERE IS A PUBLISHED REPORT FROM THE UNIVERSITY OF UTRECHT WHERE 1242 FED TO QUAIL SHOWED VIRTUALLY COMPLETE DEGRADATION. AS I HAVE MENTIONED EARLIER, EXCEPT FOR ONE OR TWO INSTANCES AROCLOR 1242 HAS NOT BEEN IDENTIFIED ALONG WITH THE PESTICIDE RESIDUES. THIS IN ITSELF SUGGESTS THAT THIS MATERIAL IS DEGRADED.

WE WOULD HOPE THEN THAT OUR EFFORTS WILL PROTECT THE CONTINUED SALE AND USE OF AROCLORS 1242, WHICH AS MR. BERGEN AND MR. SPRINGATE WILL INDICATE; MAKES UP A MAJOR PORTION OF OUR AROCLOR BUSINESS.

WE WOULD BE LESS THAN HONEST, HOWEVER, IF WE DID NOT POINT OUT THAT THE SCIENTIFIC DATA TO BE DEVELOPED FROM OUR OWN RESEARCH AS WELL AS BY ANY NUMBER OF THE 50 GOVERNMENTAL OR UNIVERSITY LABORATORIES THAT HAVE REQUESTED SAMPLES OF AROCLORS MAY NOT BE FAVORABLE REGARDING AROCLOR 1242.

IN SUMMARY, THE MEDICAL DEPARTMENT FEELS THAT LONG-RANGE, THERE MAY BE LESS THAN A 50% CHANCE OF SUCCESS IN PROTECTING

THE MARKETS FOR THE POLYCHLORINATED BIPHENYLS. WE FEEL THE ODDS DEPEND ON AT LEAST FIVE FACTORS BEYOND OUR CONTROL:

1. WE MAY FIND THAT THE PREVENTION OF ESCAPE OF THESE MATERIALS TO THE ENVIRONMENT IS IMPOSSIBLE-- EXCEPT IN VERY LIMITED APPLICATIONS.
2. ALTHOUGH, AS I HAVE INDICATED EARLIER, THERE IS SOME EVIDENCE THAT THE LOWER CHLORINATED MATERIALS SUCH AS AROCLOR 1242 ARE BIODEGRADABLE, FURTHER RESERACH SPONSORED BY MONSANTO OR OTHERS, MAY PROVE THAT THIS IS NOT THE CASE.
3. WE CANNOT CONTROL THE EFFORTS OF THE CHLORINATED PESTICIDE MANUFACTURES WHO--IN DEFENSE OF THEIR PRODUCTS, DDT AND THE OTHERS--HAVE BEGUN TO EMPHASIZE IN GOVERNMENT HEARINGS AND SCIENTIFIC SEMINARS THAT THE PAST AND CURRENT RESIDUE ANALYSIS MAY BE UNDULY ALARMING BECAUSE OF THE PCB INTERFERENCE.
4. IT WILL BE DIFFICULT--IF NOT IMPOSSIBLE--TO COUNTERACT THE EFFORTS OF OUR COMPETITORS IN THE FUNCTIONAL FLUID APPLICATIONS WHO HAVE BEGUN TO BROADCAST THE POTENTIAL PCB PROBLEM--NOT ONLY TO OUR CUSTOMERS BUT TO REGULATORY AGENCIES SUCH AS THE MICHIGAN DEPT. OF NATURAL RESOURCES, AND
5. WE MAY FIND IT IMPOSSIBLE TO COUNTERACT THE EFFORTS OF THOSE SCIENTISTS AND PSEUDO-SCIENTISTS NOW INVOLVED IN THE U. S. AND EUROPEAN WILDLIFE CONSERVATION EFFORT WHO--TO PUT IT MILDLY--DO NOT ALWAYS REACT RESPONSIBLY.

HAVE ASKED US FOR SAMPLES MAY NOT BE FAVORABLE TO
AROCLOX 1242.

AS YOU CAN IMAGINE, WE IN THE MEDICAL DEPARTMENT HAVE
BEEN CONCERNED DURING THESE MANY MONTHS ABOUT THE
POSSIBILITY OF LEGAL AND FINANCIAL LIABILITY WHICH
MAY FACE MONSANTO IN THIS SITUATION. *Dr. H. Miller*
~~BOB FRENCH~~ IS
NEXT ON THE PROGRAM TO DISCUSS THIS ASPECT OF THE
PROBLEM.

F A C T S

- 1) THE 5 AND 6 CHLORINATED BIPHENYLS--OUR AROCLORS 1254 AND 1260--ARE PRESENT IN THE ENVIRONMENT, IN BIRDS, FISH, AND OTHER AQUATIC LIFE.
- 2) THESE, IN PART OR SOLELY, ARE AFFECTING REPRODUCTION OF SOME SPECIES OF BIRDS.
- 3) PCB'S ARE PARTICULARLY TOXIC TO SHRIMP.
- 4) THERE ARE STILL MANY UNKNOWNNS BUT SPECULATION AS TO THE ROLE OF PCB'S IS RAMPANT.
- 5) SPECULATION IS LEADING TO CONCERN WHICH MAY GROW TO ALARM.

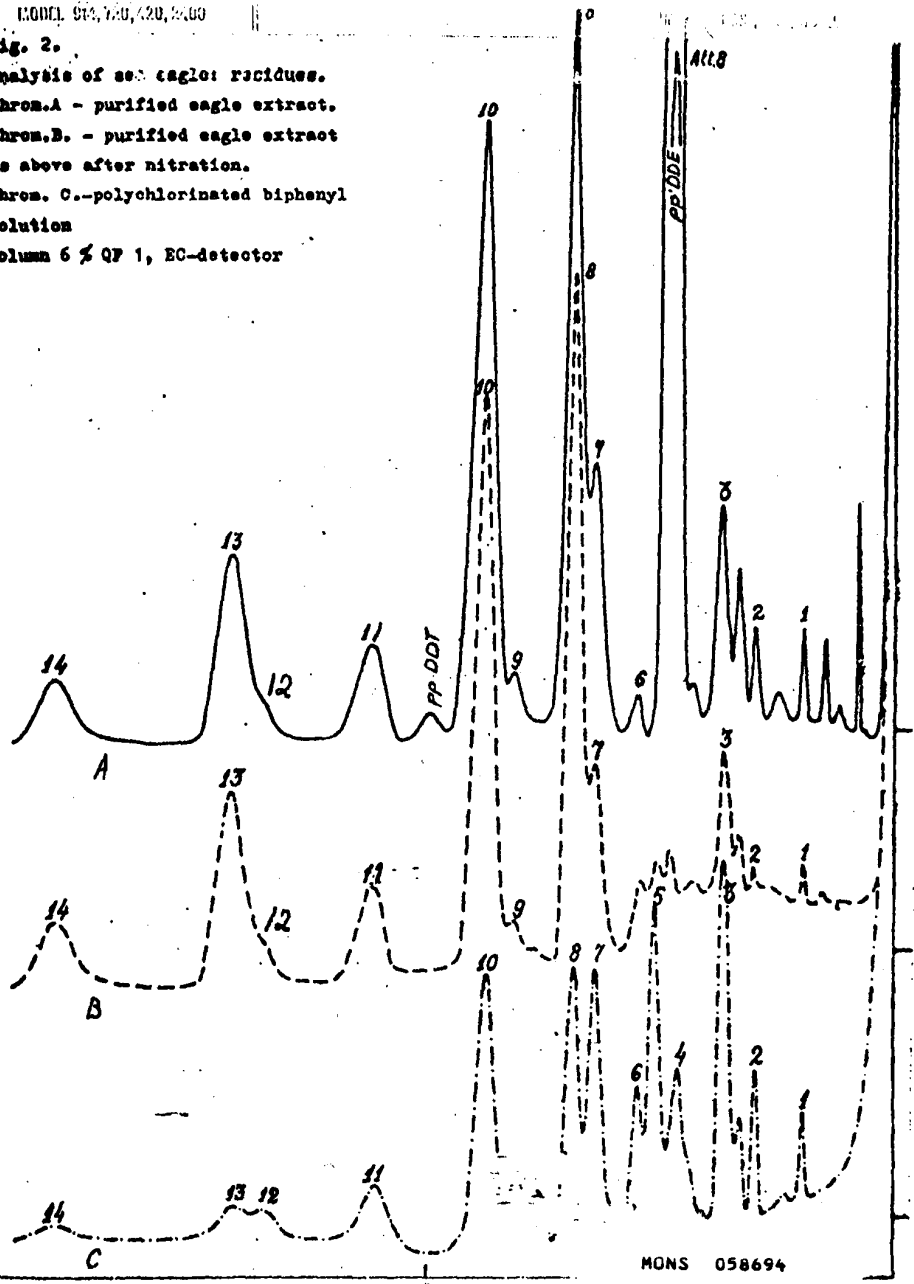
Fig. 2.

Analysis of sea eagle: residues.

Chrom.A - purified eagle extract.

Chrom.B - purified eagle extract

as above after nitration.

Chrom. C.-polychlorinated biphenyl
solutionColumn 6 $\frac{1}{2}$ QF 1, EC-detector

1 PART PER MILLION --- 1 DROP IN 90 FIFTHS

1 PART PER BILLION --- 1 DROP IN 90,000 FIFTHS

OR --- 1 OUNCE IN 1,000 TANK CARS

