FIELD SURVEY OF GATES RUBBER COMPANY DENVER, COLORADO

JANUARY 10-11, 1972

N.I.O.S.H. PERSONNEL

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I. BACKGROUND:

In the near future NIOSH will be responsible for development of criteria and the recommendation of a standard for occupational exposures to benzene. DFSCI, in its role of epidemiological research, conducted from January 10 to 11, 1972 an investigative field study of the Gates Rubber Company in view of its reported volume of benzene usage.

The purpose of the field study was an evaluation of the suitability of this plant for criteria development for occupational exposures to benzene:

(1) To determine the types of benzene exposures and number of workers involved.

(2) To inquire as to any known history of benzene-related blood disorders in current and past employees.

(3) To examine medical records of selected current employees with benzene exposure.

(4) To examine the suitability of medical and personnel records for epidemiological research.

Bobby Gunter, Ph.D., industrial hygienist, Region VII, made preliminary arrangements for our visit and consulted with Mr. Ray Brennan, Division of Occupational and Radiological Health, Colorado State Health Department. Benzene usage charts were requested, with specific amounts per operation, along with lists of specific jobs with benzene exposures.

Dr. William M. Johnson, Acting Deputy Director, DFSCI, explained the purpose of the field study to the company safety director by telephone the week prior to the field visit.

Upon our arrival at the plant, Dr. Gunter introduced us to company representatives and medical personnel.

II. MANAGEMENT:

Throughout our survey the management personnel were extremely cooperative and helpful, specifically Ernie Karger, Chief Environmental Engineer and Ted Conti, Environmental Engineer, who answered our questions and showed us around. Indeed any evaluation would have been impossible in a plant of this size without their assistance. In addition to the usage charts, we were given blueprints of the factory with the layout of each floor and the specific position of all solvents. Blueprints, usage and job lists are filed in DFSCI-Cincinnati files for reference.

III. UNION:

After our initial walk through of the plant, we met with local union president, Harold Terry, and one of his aides Bob Rothbauer, to explain our visit. The union and management apparently have a well organized system of safety evaluation; spot checks are made periodically by members of the union safety committee, and their findings are sent to management for corrective measures. We were given copies of the latest survey performed and the company's response. These have been placed in DFSCI-Cincinnati files for reference. Most of the complaints were in the safety area, rather than health, but several questionably toxic substances were brought up for investigation. Lou Beliczski, industrial hygienist for the International United Rubber Workers, in a recent walk through survey reported the existence of a benzene hazard. The company responded that they realize benzene is a dangerous substance and are presently making efforts to phase it out completely.

In our talk with Mr. Terry, he pointed out one area of benzene use that had been previously overlooked, the Cement House, where the various solutions are prepared and which indeed (see below) appeared on later visual inspection to have probably one of the highest exposure levels of the various locations.

In addition, we were invited to the safety committee meeting the evening of January 18 at union headquarters.

Drs. Gunter, Spiegel, and Finnegan, union officers, about 20 workers and the International's Director of Education Jim Sherman attended. NIOSH functions and operations were outlined; and, in response to questions, the biological effects and dangers of benzene and other chemicals were explained.

In light of the fact that reference had been made to the possibility that there were workers with benzene-induced disease, the workers were pressed for specific names. None were known. The NIOSH representatives left shortly thereafter when the meeting went on to its usual business.

IV. MEDICAL FACILITIES AND RECORDS:

The plant's medical facilities are housed in a separate multistory structure in the Gates compound and functions as a complete total-care medical clinic to employees, dependents, and the community. There are approximately 20 full-time and 40 part-time physicians covering probably all the specialities. The patient population is reportedly 30,000 with about 30% Gates employees, 25% local residents not affiliated in any way with Gates and the rest dependents.

The facilities themselves were modern and very adequate. The laboratory has three technicians doing CBCs, routine urinalysis, and cultures. Blood and urine chemistries are sent out to commercial labs. There are no screening tests being done for benzene exposure.

The employee records are not separated from the other patients, and no special marking is on the charts, so that for any employee chart review, the records would first have to be pulled by name.

We spoke with Dr. Russell Evans, the clinic director, who explained the operations to us and was very cooperative in giving us any information we requested. He personally knew of no reports of benzene-induced blood dyscrasias, but suggested we contact Dr. Ratcliff, the clinic hematologist, when he returns from vacation and get more definitive information. Dr. Herwitt will be returning to Denver shortly on other business and will contact Dr. Ratcliff.

After going through usage lists, a sample of 16 employees, working in the heaviest usage areas, was ascertained, and the medical records of these men pulled and reviewed for evidence of benzene-related illness. No evidence of such was found.

V. PERSONNEL RECORDS:

We met with people in the personnel department to learn retrievability of work histories. Every employee has a single card with each position held listed with dates. Employees whose jobs are terminated and later rehired are relisted on their old card. The cards are kept for five years after the worker has left Gates in alphabetical file, them microfilmed and filed alphabetically by year of job termination.

We were informed that there is a relatively low turnover rate at the plant, that most workers with seniority have remained in the same department, and usually the only time of job shifting is during and after layoffs.

VI. THE PLANT:

The Gates Rubber Company facilities in Denver, first built around 50 years ago, cover 52 acres and employ approximately 5,200 people, about half of which are involved in production. The company has several other plants usually specializing in one line of products, but this is by far their largest facility. The production areas are divided into four major divisions: belts, hose, tires, and molded rubber goods. About 230 employees have some degree of direct exposure to exposure to benzene or a solution containing it at the present time. During the walk through there appeared to be no significant exposure to workers who were not using a benzene solution at their own position. Approximately 70 tons a year are used at the Denver works. This annual usage was broken down by specific solution and by division, i.e. the pounds of benzene and gallons of solution used were given for each solution in each of the four divisions and in the "millroom," whose products are used by all of the divisions. To aid in estimating exposure, we have further ascertained the relative concentrations of benzene in each solution by using the plant figure for benzene (or benzol - the plant uses these terms interchangably) of 7.3 lbs/gal. (virtually identical with chemical table density of 0.89 gm/cc).

The following is a list of these figures accompanied by a detailed job description from our notes on the plant tour (with some inaccuracies inherent).

A. Cement House Benzene Usage - All

This is a shed-like structure adjacent to one of the factory buildings in which all the plant solutions are mixed. The ventilation is poor. Benzene/benzol is dispensed from a pump identical to those used in gas stations. A long hose is attached so the worker can reach and fill all the mixing tanks from one pump. There are four employees working this area during the day shift only. Although the exposure is intermittent, we felt it was probably one of the highest because of the amounts used and poor ventilation. Of note was also the presence of isocyanates used for preparing solutions, possibly some T.D.I.

B. Millroom

1. Formula 10960 - 87,500 lbs of benzene used in 13,840 gal. - 87% solution

a. Dept. 56, Unit 10-8-B, Blueprint Drawing C19221

Almost 2/3 of all benzene usage is in this operation. There are two large machines about 15 yards long called "10-cord dryer" and "40-cord dryer." At one end there is an open tank about 2 feet x 2 feet x 2 feet through which a latex cord is drawn to pick a coating of the solution on its way into the dryer. There is one man working each machine, each shift; total involved: 6 people. They are rarely, however, in the immediate vicinity of the tank. Most of their time is spent at the opposite end, where the cord is spooled (and a T.D.I. solution sits) or at the control panel located about 10 yards from the benzene. Although the general air circulation in the area is good, the only ventilation duct over the tank is at least six feet above it and the exhaust is ineffective at this distance.

C. Molded Rubber Goods

1. Formula 10039 - 2960 lbs of benzene in 476 gal. - 86% solution.

a. Dept. 1, Unit 8-1, See Drawing C19211

Two "diaphragm builders" during day shift, one in evening to total of 3 people. Solution sits in open can at worker's bench, is brushed-on type of "potter's wheel" as tackifier before each diaphragm, also used occasionally as cement between layers.

No specific ventilation.

b. Dept. 1, Unit 7-2, See Drawing C19213

One "hog paddle builder" only day shift, total: one person. Works at this only intermittently when an order comes in. Open can at table, brushed-on as cement between layers.

2. Formula 32-8405 - Pure benzene amount?

a. Dept. 1, Unit 7-1, See Drawing C19211

One "paper cutter" each shift, total: 3 people. In can at table with top, brushed-on for cleaning machinery and occasionally tackifier. Apparently not essential or frequent since day shift worker did not use it and did not know what it was for. Amount used not tabulated.

D. Hose

1. Formula 10960 - 5370 lbs of benzene in 850 gal. - 87% solution

a. Dept. 13, Unit 25-3-2, See Drawing C19328

Thirteen hose builders each shift for total: 39 people. Brushed-on between layers from can at table.

b. Dept. 76, Unit 10-7-2, See Drawing C19248

One person, one shift sits at desk dipping radiator hose in can of solution to seal fabric. Only does this 3 - 4 times a year for a few days.

c. *Dept. 6, Unit 10-3 and 4-4, See Drawing C19244 and 5

Five wire hose builders, three shifts for 15 people total. Solution in large containers at worktable. Worker periodically puts on rubber gloves, dips sheepskin into container and then wipes on coating on outside of entire tube for each one made. Probably one of the highest exposures.

d. *Dept. 6, Unit 10-4 and 6-4, See Drawing C19245 and 7

Numbers 2 and 3 mainline builder, one man each, 3 shifts for total 6 people. Do not remember seeing these workers. Apparently infrequent use for cleaning of table, used occasionally on cover for tackifier. Other solutions available for same purpose.

2. Formula 10214 - 223 lbs of benzene in 45 gal. - 68% solution

Dept. 3, Unit 25-3-1, See Drawing C19293 and 4

Twelve wrappers, three shifts for 36 people. Solution in cans at worktable, some open, others covered. Used as tackifier by some, but not all, of the workers doing the same job, and then usually infrequently.

3. Formula 10113 - 26,600 lbs of benzene in 10,270 gal. - 37% solution

a. *Dept. 6, Unit 10-4-4, See Drawing C19245

As cord is pulled through braiding machine, it is drawn through a tank (about 1 x 2 x 2 feet) of solution for coating. The machines were not in operation during inspection, but ventilation ducts were operating about 2 feet above open tank with reasonable exhaust.

Three braiders, 3 shifts for 9 person total.

b. *Dept. 6, Unit 10-4 and 6-4, See Drawing C19245 and 7

One man at each "mainline dip tank" (Numbers 2 and 3) for 3 shifts - 6 person total.

Same work as described in wire hose builders (D.,1.,C.). Slopping on solution with sheepskin rag.

E. Belts

1. Formula 10124 - 87 lbs of benzene in 15 gal. - 80% solution

a. Dept. 54, Unit 10-4-3, See Drawing C19238

Label station: one worker for two shifts for total 2 workers. Use solution as label cement; in a closed can at workstand, brushed-on back of label and matching surface of belt.

2. Formula 10113 - 6,000 lbs of benzene in 2125 gal. - 37% solution

a. Dept. 4, Unit 10-1 and 2-3, See Drawing C19236

b. Dept. 68, Unit 10-1, See Drawing C19243

Builders - a has 17, b has 5, all 3 shifts for total 66 people. All have open can at worktable, paint solution between layers only on certain products.

3. Formula 10960 - 9,750 lbs of benzene in 1,320 gal. - 87% solution

4. Formula 10135 - 32 lbs of benzene in 5 gal. - 87% solution

5. Formula 32-8405 - Pure benzene amount?

(* Job descriptions especially in Dept. 6 may be misplaced, not fitting the proper label).

6. Formula 10039 - 2380 lbs of benzene in 380 gal. - 87% solution

   a. Dept. 45, Unit 11-3, Drawing C19253

      This unit uses the above four formulae. It is a special section of 7 workers, only one shift, who do special orders. They use these solutions as tackifiers and cements between layers of specific products; as elsewhere, they are in an open can at table, brushed on. At certain times, on special products, the worker at the cement table pours the solution on products out of a can, then sets them to dry. This was not being done during inspection.

      No specific ventilation.

F. Tire

   1. Formula 10003 - Unknown quantity

      Dept. 34, Unit 10-1 and 2-3, See Drawing C19229

      Eight truck tire builders, 3 shifts for total of 24 people. As in other operations, brushed on from open can. Used as drum tackifier when building process. Amount used inadvertantly overlooked.

VII. SUMMARY:

The field study went well and much data was obtained. We received good cooperation from union, management, and medical personnel. The medical facilities were excellent but complicated severely from our standpoint by the fact that only 30% of the patients are Gates employees and a general record review is not possible. The records of a representative sample of the workers involved in heavy exposure were examined and found to be negative. No routine screening tests are made for benzene exposure by the clinic. Personnel records are kept in convenient form and work histories could be easily obtained. A walk-through of the plant concerning the areas of benzene use was made and a fairly comprehensive

listing was made of the types and manner of exposure. Quantitative information was obtained to give some estimate of the amount of exposure but no sampling was done. In certain areas, ventilation was felt to be inadequate and in some the use of benzene solution seemed obviously not essential.

Benzene has been steadily phased out at the plant over the years. Reasonably accurate information is available on quantities used at different operations at this time, but estimating past amounts is difficult. Management can obtain for us figures on total benzene used each year and which division utilized the largest amount, but no further breakdown by operation is available.

Finally, no evidence of benzene-related disease was discovered.

VIII. CONCLUSIONS AND RECOMMENDATIONS:

A. Future Field Investigations

The use of this facility in studies to establish dose-response relationships is limited. However, in view of the past widespread use of benzene, a retrospective cohort study could examine the association between benzene exposure and risk of leukemia and site-specific cancer. A prospective cohort study to examine future leukemia and site-specific cancer incidence of the approximately 230 current employees with benzene exposure is a possibility, even if benzene use is abandoned completely as planned, in view of the radiomimetric effects of benzene and the corresponding expected five- to ten-year latency period.

Certainly, a cross-sectional medical and environmental study is indicated in any case to evaluate possible hazard. NIOSH-DFSCI is considering and planning the following evaluation:

(1) Air sampling for benzene especially in areas of highest exposure

(2) Urine phenols and/or inorganic/total sulfate ratio on benzene workers

(3) CBC, differential, and platelet count on all workers with positive or equivocal urine studies. (DFSCI will consider contract with medical clinic).

(4) Comprehensive walk-through survey by industrial hygienist

B. Benzene Exposure

The company has already stated it intends to phase out benzene entirely as soon as possible; particular reference was made to the solution used by the millroom machines, which alone accounts for almost two-thirds of the plant's total benzene usage.

In addition, certain measures could be easily taken to reduce exposure immediately:

(1) All the numerous workbench cans should be fitted with tops or covers.

(2) In several areas the use of benzene solution seemed unnecessary, some workers used it, others did not, with apparently simply the preference of the skilled workman as the deciding factor. Examples are the 36 wrappers in hose (C,2,a) and the 3 paper cutters in MRG (C,2,a). In these areas the solutions should be removed now.

(3) Most of the people involved, although not most of the volume, are using the solutions as "tackifiers" or "cements" for which a substitute could probably easily be found.

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15. Supplementary Notes

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16. Abstract (Limit: 200 words)

Worker exposures to benzene (71432) were evaluated in a survey at the Gates Rubber Company (SIC-3011) in Denver, Colorado, on January 10 and 11, 1972. The facility was under consideration for inclusion in a criteria developing program for occupational benzene exposures. The factory's medical facilities were modern and adequate. Personnel records containing work histories were retrievable. Spot checks for safety evaluations were performed by the union's safety committee and the findings were sent to management for corrective action. About 230 workers were exposed to benzene or products containing benzene. Medical records of a representative sample of workers exposed to benzene indicated no evidence of benzene related disease. The author recommends the facility for inclusion in a retrospective cohort study to examine the association between benzene exposure, leukemia risk and site specific cancer.

17. Document Analysis a. Descriptors

Region-8, Aromatic-hydrocarbons, Occupational-exposure, Health-protection, Recording-instruments, Safety-measures, Sample-testing, Blood-disorders, Carcinogens

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