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THE PROBLEM OF POSSIBLE SYSTEMIC EFFECTS FROM CERTAIN CHLORINATED HYDROCARBONS*

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THE use of chlorinated naphthalenes and compounds of allied pharmacological possibilities is extremely wide, and with the steady growth of the use of electricity is certain to expand much farther. For years it has been known that many of these compounds cause a troublesome acne, and there is a large literature upon this phase of the subject. Our investigations have not been concerned with chloracne but with the possibility of systemic effects following ingestion or inhalation of such products. In the spring of 1936, the Halowax Corporation, a division of the Bakelite Corporation, called our attention to three fatal cases of jaundice in workmen using chlorinated naphthalenes and chlorinated diphenyl, and requested that the subject be investigated as

rapidly and thoroughly as possible.† In brief these cases were as follows:

Patient 1. Male, age 21. The previous medical history of this man was in no way significant except for the fact that he had an attack of jaundice about 6 weeks prior to his fatal illness. Late in December, 1936, he became badly constipated and had much abdominal pain and distention. When admitted to the hospital he was slightly jaundiced and was evidently very ill. He was somewhat anemic and his skin, particularly upon the arms, face, chest and back, showed many pustules. He died after a brief period in the hospital, and at autopsy was found to

† The Halowax Company makes many products besides chlorinated naphthalenes, and it has come to our knowledge that all of these products are indiscriminately called "halowaxes" by purchasers and users, and are lumped together as possible causes of acne and even of systemic disease. Since "halowax" is merely a trade designation, care should be taken to describe compounds by their chemical names and thus avoid connotations which are both troublesome and misleading.

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even my plan to follow that up with a further letter bringing the situation as we now know it as a result of Dr. Drinker's work, to the attention of users in this state. In that letter we shall unquestionably advocate the concentrations that Dr. Drinker has suggested this morning.

One point that I think is worth commenting on in that connection is the question of identification of the substances. It is extremely important from the state administrative point of view that employers using these substances should know what they are using. They are identified at present only by numbers. If we list these numbers in a warning letter which we send out, there are likely to be changes in these numbers. The Halowax Corporation is a progressive concern and it is going to be putting out bigger and better halowax all the time. The company's cooperation in this present investigation has been such that I feel assured that they will take the proper steps to see that we in the state office and also the users of the products will know what we are using.

I wonder whether Mr. Brown would care to say anything about that.

Mr. SARGENT THOMAS (President, Halowax Corporation, New York, N. Y.): There are some aspects of this situation on which I think I can enlighten the medical and state and civic authorities, with respect to the commercial and practical aspects. If you go to the research laboratories of any large chemical manufacturing company today you will find anything from one to a thousand different new chemical products which have not yet been put on the market. Some of those may or may not be toxic. The problem so far as the chemical manufacturer is concerned is a question of timing. You have heard this excellent presentation given this morning by the Drinker brothers as to the work that they have done here. Should you take a product of which you have developed, say, 5 or 10 gm. and spend \$50,000 on research to determine whether or not it is toxic or should you wait until you have determined whether you have a market for it?

If you are producing only one hundred substances a year you can see that that would run into boxcar numbers in the way

of dollars and cents before you ever sold any. That is the problem we have had in this case. It has been on the market for 25 years. Until within the past 4 or 5 years there has never been any intimation that it would cause any systemic effects. Thousands and thousands of workmen have dealt with millions and millions of pounds of certain of these materials, particularly the trichloronaphthalenes. Then we come to the higher stages, combined with chlorinated diphenyl and other products, and suddenly this problem is presented to us.

We had asked various authorities interested in public health going back over a period of 15 to 20 years, to investigate it but there wasn't much enthusiasm for it. Mr. Bowditch suggested that we take it up with the Drinker brothers at this institution, which we did. You know the results of that work.

Now so far as these changes are concerned, they are beyond our control to a certain extent. We will manufacture a product—let's call it 1234. It has certain chemical and physical characteristics. It is supplied to a cable manufacturer. It is composed of certain constituents. There may be some tetrachloronaphthalene, trichloronaphthalene, paraffin, a little pitch or bitumen, and possibly some chlorinated diphenyl. It does a certain job but he wants it to a little more plastic or he wants its viscosity or the specific gravity changed. Possibly by a change in those constituents of only 1 per cent we can get that particular property. We can't sell it to him as the same product so we put a new number on it. Basically, however, if the variation in the chlorinated naphthalene or the chlorinated diphenyl constituent hasn't changed, the toxic property of that will not change.

When it comes to a question of cooperating with the state authorities in that connection, if there were some major change made in a product, we would have no hesitancy in advising them and we would also advise our customers. Virtually every consumer of these materials at some time or another has been given their technical or chemical designation along with their various properties, whether they be physical or chemical.

Those are some of the practical problems

with which all manufacturers of chemicals are confronted today, particularly in the synthetic organic field where the development is so rapid that our sales departments can't even keep up with the research departments sometimes, in knowing what they are doing.

Mr. F. R. KAISER (Assistant to Manager, York Wireworks, General Electric Co., York, Pa.): I am certainly pleased to have this opportunity to say a few words with reference to the experience we have had at our York plant. I perhaps should say that again in this case, experience alone has been the best teacher. I have lived with the problem at York with the men who went through the experience from its beginning.

It is only 14 years ago that we had in the neighborhood of 50 to 60 men afflicted with various degrees of this acne about which you all know. Eight or ten of them were very severely afflicted—horrible specimens as far as their skin condition was concerned.

One man died and the diagnosis may have attributed his death to exposure to halowax vapors but we are not sure of that. There was an atrophied condition found as a result of the autopsy but we are not definitely sure that it was or was not connected with his work. Knowing the man I did when he was employed, with the subsequent examination that he had, he appeared to me very thin, pallid in his appearance, and I would not say from my poor knowledge of the physical make-up of the human being that he presented a healthy appearance. However, it was only for a 6 months' period from the time of his employment that he complained of this constipated condition and we advised that he see his home physician. It rapidly developed to the point where he was in the hospital and in a very short time he died.

More serious than that perhaps is the fact that we had 50 other men in very bad condition as far as the acne was concerned. The first reaction that several of our executives had was to throw it out—get it out of our plant. They didn't want anything like that for treating wire. But that was easily said but not so easily done. We might just as well have thrown our business to the four winds and said, "We'll close up," because

there was no substitute and there is none today in spite of all the efforts we have made through our own research laboratories to find one.

But we did develop—and I was most closely associated with it—and set up a routine for bringing these men back to normal health conditions. A number of them were sent to Dr. John H. Stokes and to Dr. O. H. Perry Pepper of the University of Pennsylvania Hospital, and the others to Dr. Isaac R. Pels at Johns Hopkins. Through their recommendations and studies, we employed a trained nurse and two local physicians and you might say established a small hospital and its facilities at the plant. Through the application of quartz light, x-ray, mechanical removal of comedones and the treatment of pustules that develop in later stages, an utterly strict routine where the worst cases were administered to each day for a period of 15 to 20 minutes, another group who were less serious three times a week, and still another group once a week, we have in this year and a half brought each and every man back to a normal skin condition. Those who were very seriously afflicted do show scars, but otherwise their skin is as healthy in appearance as my own. I tell you we are very proud of the fact that they are still all employed and the amount of halowax that we are using today is even greater in quantity and in types than we were using a year and a half ago.

With the adequate ventilation system we have installed, with the routine for change of clothing from street clothing to work clothing when they come to work and the reverse of that process, with the assurance that a shower will be taken before the street clothing is again put on, we have found no recurrence of this skin trouble. Each and every man working with halowax products, either from solution, from solid compounds or handling the wire insulated and treated with it, is examined twice yearly with a complete physical examination, including blood analysis and efforts to determine any liver damage.

However, there is the point which was very definitely brought out this morning. We do not know as yet when this thing starts. I believe it would be of great help

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