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PRELIMINARY REPORT ON THE MEDICAL EXAMINATION OF 288 EMPLOYEES
AT THE PVC PLANT, NORSK HYDRO a.s, PORSGRUNN FABRIKKER,

by

LEIF HILLESTAD

0000379

INQUIRY CARRIED OUT AT THE HEALTH DEPT., PORSGRUNN FABRIKKER,
BY THE COMPANY DOCTOR E. LØKEN, E. THIS-EVENSEN M.D., AND
HEALTH DEPT. PERSONNEL IN COOPERATION WITH ST. JOSEPH'S
HOSPITAL, PORSGRUNN HOSPITALS:

In the spring of 1974, there arose international concern
for health hazards in PVC producing industries. This was
primarily due to the occurrence of a rare type of cancer of
the liver. It was soon discovered that a worker at the PVC
plant in Porsgrunn had died of this illness in 1972. He had
been heavily exposed to vinyl chloride during a period of
many years.

Against this background of dramatic events, Dr. E. Løken, the
Company Doctor at the Porsgrunn Fabrikker, addressed himself
to me on April 2nd of the same year. He requested the
assistance of St. Joseph's Hospital in order to undertake a
comprehensive examination of 150 employees at the PVC plant.

The task, already at this point, appeared a large one in
relation to the facilities in our command at the hospital.
However, because of a tradition of good cooperation between
the local industries and the Porsgrunn Hospitals and because
St. Joseph's Hospital was in a position to carry out the
necessary tests, we accepted the assignment. As the hospital
was in the fortunate possession of a genetic laboratory, we
also agreed to undertake chromosome analyses upon a limited number
of the employees. We had no idea at this point of the impor-
tance these tests would later assume.

The very next day, April 3rd, a letter was sent from the hospital
to the Health Dept. at the Porsgrunn Fabrikker, accepting the
assignment and agreeing to carry out the necessary examinations
including post examinations and possibly

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Preliminary report on the medical examination of 288 employees at the PVC plant, Norsk Hydro a.s., Porsgrunn Fabrikker.

Report by The Medical Commission on the Production of PVC. Norsk Hydro a.s.

RECEIVED MAR 24 1975

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R. F. E. Kogstad

March 21, 1975



**Norsk Hydro
Sales Corporation**

800 Third Avenue
New York, New York 10022
Telephone: 212 688-6606

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The conditions were a more clearly defined work distribution and that Nørsk Hydro a.s. should cover all expenses. All of our conditions were met.

During Easter 1974 the necessary preparations were carried out. On April 16th, we announced that we were ready to start, and the examinations began on April 22nd. The task was carried out as quickly as possible to allay the understandable anxieties of the employees at the PVC plant. The examinations called for a great deal of extra work, especially for the laboratory personnel during the holidays, entailing a good deal of overtime and extra work on weekends. However, because of the importance of the assignment, for the employees and therefore for the whole district, all persons involved worked with admirable loyalty. This is a point which I feel is worthy of being stressed.

A vital factor in an experiment of this kind, is naturally prompt reporting of results to the employees. To satisfy this need, one day each week was set aside for conferences and evaluation of examination results. Our purpose was to report the results as quickly as possible to those involved.

In the course of events, it appeared that the total of those examined would exceed the original 150 employees. On checking with the Company Doctor at the Health Dept., I was informed in the autumn of 1974 that as far as he could judge, the final number would probably be about 238 employees. It was agreed that the report would be prepared as soon as the examinations of all 288 had been carried out.

However, the number continued to increase so that at the beginning of January 1975, we had reached a total of 349 employees. We are still not sure of whether this represents the final figure. This report, therefore, should be considered as preliminary.

Of the 288 examined, 6 were women and 282 were men. Of the employees under 60, all age groups were evenly distributed, whereas the number of employees above 60 was small.

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As was to be expected, the length of employment at the PVC plant increased with age, but without direct proportionality. Many in the relatively young age groups had comparatively lengthy employment in the PVC plant. Approximately 60% of the employees had worked in the PVC plant less than 10 years, while the remaining 40% had worked there from 10 to 24 years.

Of the 288 examined, 59 persons or 20,5% required follow-up examinations. In the majority of cases, the abnormal test results were due to mild, passing illnesses. In evaluating the examination results of individual cases, the regular health reports available at the Health Dept., Porsgrunn Fabrikker, were of invaluable help.

In all, 6 persons or 1,7%, required further observation at the hospital.

The final results show that 2 persons died at the PVC plant before the present examination took place. Both cases were directly caused by exposure to vinyl chloride. The first death in 1958 was that of a young man, who died of acute vinyl chloride poisoning. The other case occurred as already mentioned in 1972, where a worker died of angiosarcoma of the liver after lengthy exposure to vinyl chloride. The death rate at the PVC plant calculated from these cases, would be 0,7%.

During the present examination of 288 employees, no cases of death have occurred. The morbidity rate, which can be regarded as caused by vinyl chloride is 0,4%, which is quite low. The morbidity rate from other causes is 2,1%.

It is therefore documented that work at the PVC plant in Porsgrunn, as was to be expected, involves health hazards with death and disease. However, the number of diseased persons was, as our present examinations show, relatively low.

In addition to the above mentioned clinical examinations, chromosome analyses were also carried out on a certain number of PVC employees.

consideration because of its importance and also because of the kind of publicity such studies have received in the press and other news-media.

Chromosome analyses are very time consuming and have proven to be of great help in the clinic. Right from the start it was obvious that such an examination of all the 150 employees, as originally intended, would be impossible. Therefore I recommended that 15 employees should be chosen at random for these examinations. When the employees were offered this suggestion, they insisted that a comparable number of persons chosen by them, according to length of employment, should be added to the number of persons examined. This suggestion was accepted, and with the addition of other special cases, the number of persons examined to date has come up to 39. A total of 101 chromosome tests have been made on these people. At the same time 29 analyses have been made on a control group of 16 persons.

After Dr. Selikoff at an ICF meeting in Geneva in October 1974 presented results of a chromosome study of alarming import, the chromosome studies at St. Joseph's Hospital were taken up again for reevaluation. All agreed that the study should be expanded and that the sample should be increased. Norsk Hydro a.s. unconditionally placed all the necessary economic means at our disposal.

Of the 39 chromosome analyses which have so far been evaluated, there are proven deviations in 6 persons. These deviations are not large in any of these persons, but definitely abnormal according to internationally accepted criteria and in relation to the control group. There are also 2 proven cases of congenital chromosome anomalies. In addition, there are certain persons who in this connection are borderline cases. However, in many cases previously known disorders explain the findings. Every case showing definite or possible chromosome aberrations will of course receive adequate medical follow-up examinations.

Without being able to present definite proof, it is difficult to avoid concluding that

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are due to exposure to vinyl chloride. The important question is which consequences these findings may have.

In an attempt to answer this question, the Head of the genetic laboratory at St. Joseph's Hospital has tried to contact international experts to the extent that the work pressure has allowed. Furthermore, experts from Oslo Universitet and Norsk Hydro's Kreftforskningssinstitutt, were called to a meeting at St. Joseph's Hospital January 23rd, 1975. The conclusions which at present can be drawn regarding the observed chromosome changes are as follows:

The chances for transferring the proven genetic damage to progeny are minimal. The chance that the proven genetic damage can be the precursor of illness does exist and further medical supervision is therefore necessary. However, there is a chance for reversion or a complete disappearance of the genetic damage, when exposure to vinyl chloride ends or is considerably reduced.

Based on the observations made at St. Joseph's Hospital, which, as far as is known, are the largest and most comprehensive undertaken anywhere in the world up to now, it would appear absolutely necessary that the genetic studies are continued. With the modern views on employee working conditions and health, it also appears important to increase the area of study. This is an opportunity to find out to what degree industrially used chemicals can cause genetic damage and what such damage can imply in the long run. Plans for just such a genetic study expansion at St. Joseph's Hospital have been discussed, but the resources available at the present time are not sufficient.

The examination of PVC plant employees will continue until all employees are examined. Furthermore, total incidence of illness of the regular staff during the past 24 years will be evaluated more closely on the basis of a control series. The study of the health hazards, which are involved in working in the PVC plant, thus are not concluded. Bearing these reservations in mind, it would appear in order, however, on the basis of the examination of 288 employees to

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Disease which can be blamed on exposure to vinyl chloride is proven in a limited extent. Genetic damage, which might have been caused by exposure to vinyl chloride is established. The extent of this damage, however, is much more limited than one was led to expect by the other 2 studies which are available at this time. The material compiled at St. Joseph's Hospital so far, is the most comprehensive known in the world to-day.

On the whole, the examinations show deviations in various laboratory tests of 21 persons or 7,3% of the total. Many have illnesses not related to vinyl chloride, which can explain the observed deviations. All will be subjected to adequate follow-up examinations.

During the course of this study contact with international experts has been maintained as far as possible. As studies in other countries are completed, more light will probably be cast on the problems in the course of 1975. For the time being there is a lack of internationally accepted rules for, among other things, the continuing medical supervision of persons who have been employed in PVC industries. On the basis of the experience so far gathered during the examination of the employees at the Porsgrunn Fabrikker, one can however present the following recommendations:

Until further notice, an expanded yearly medical check on the employees of the PVC plant should be undertaken. As the latent period before the outbreak of illness caused by exposure to vinyl chloride can be long, this medical check should probably be carried out over a period of many years. It would be desirable to simplify these medical examinations. However, so far there is little information on how this could be accomplished.

When taking on new employees, the Health Dept. should not accept those who may be disposed for acquiring vinyl chloride disorders.

For a special group of employees it would be necessary in

accordance with what has already been mentioned, to carry out particularly thorough examinations.

Genetic studies should be continued and expanded.

Should it be desirable that the Porsgrunn Hospital continue this work, it would be necessary to have a prompt evaluation of the increased resources, which the Hospital then will require.

Porsgrunn, January 31st 1975

Leif Hillestad M.D. (s.)

Head of Medical Department
St. Joseph's Hospital, Porsgrunn.

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