April 2, 1935

Doctor Alfred von Frisch
I. Helferstorferstrasse 4
Vienna, Austria

My dear Doctor von Frisch:

I am pleased to have the opportunity to write you with regard to the consultation work which you have agreed to carry out in the medical supervision of workmen who are to be engaged in mixing Ethyl Fluid with gasoline in Austria, Hungary and Czechoslovakia. I shall try to outline for you the general problem associated with this work as I see it, and acquaint you with my point of view, and with the information which has accumulated over a period of years.

It has been my purpose to so provide against the dangers of this type of work that no cases of lead poisoning would occur anywhere. The first problem has been to provide equipment for mixing that would limit the exposure to negligible proportions and to set up such specifications and regulations as would give assurance that the equipment was being used in the proper manner and maintained in an effective condition. This has been accomplished in a generally satisfactory manner. The next measure has to do with the selection of reliable men who could be trusted to understand and follow the prescribed technique, and whose general health was good at the start, thus making it possible to avoid, to a large extent, difficulties due to non-occupational diseases which might be confused with lead intoxication. Moreover, I hoped to be able to eliminate largely, the unusual susceptibility to lead which might be associated with the existence of organic diseases of the circulatory system and of the digestive system, particularly the liver.

Accordingly I have advised the selection of workmen who are free of definite organic disease, and who have no history of previous exposure to lead compounds in industry. Liver, kidney, and circulatory disease are, in my opinion, particularly disadvantageous, not only because they influence susceptibility, but also because they result in disability which may be inextricably confused with plumbism. Chronic sepsis, especially of dental origin is also a disadvantage, and it is my practice to refuse to accept men whose condition is especially bad, unless I can arrange for the correction of the oral pathology.

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Men heavily addicted to alcohol are undesirable, not only because of their generally bad physical condition, their predisposition to carelessness and unreliability, but also because acute alcoholism can only with difficulty be differentiated from acute tetraethyl lead poisoning. Moreover, I advise the selection of men between the ages of 21 and 50.

As to lead exposure it is pertinent to point out that some petroleum refineries use litharge and alkali to treat sulphur containing products, thereby giving some lead exposure to workmen so employed. It is necessary to see that such men are not engaged in handling Ethyl Fluid.

Medical examinations in our hands consist of a thorough physical examination, blood examination (always a determination of the hemoglobin, and a count of basophilic stippled erythrocytes; a red and white cell count are made if suggested by any suspicious findings), an analysis of the urine for albumin, sugar, specific gravity and acidity, and in specific cases which indicate the necessity other tests are made. (We make it a point to examine blood smears for stippling of the erythrocytes on every subsequent examination, using a method that is essentially quantitative.) In cases of illness of any type in men under our care we make use of whatever means is required to arrive at a diagnosis, in the belief that nothing short of the best facilities should be made use of in the care of these men. We have not had any cases of plumbism in this occupation and I believe there is no reason to suspect that we shall have such cases, but if they were to occur we should spare no expense to give them the most adequate medical care.

With regard to lead analyses where indicated for diagnostic purposes, I have been developing a means whereby reliable results can be obtained by any of our European consultants. The facilities are not yet available, but will soon be and I shall communicate with you later in that regard. However, you will scarcely need aid of such type, at least, for some time.

It is important in my opinion to explain the dangers associated with the work to the men, as a means of informing them and warning them against carelessness. On the other hand it is also important to show them that they are completely protected against danger if the equipment is properly maintained and if they follow instructions. I repeat that we have never had a case of poisoning in this work, and we should never have. At the start, at least, examinations should be repeated at quarterly intervals. This may be changed, if there are no legal regulations to the contrary, as conditions and the judgment of the physicians dictate. It must be recognized, however, that the visits of the doctor are an insurance against relaxation of care as no other measure of control is. Therefore the physician should look into the question of the care and quality and cleanliness of equipment, and inquire as to the observance of the regulations on every visit.

I shall not go into the question of the signs of lead absorption, but I do wish to make one point. Brief ex-

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posure to high concentrations of tetraethyl lead vapor, or massive skin absorption, as well as brief exposure to crystalline triethyl lead salts suspended in the air (such as may occur if a storage tank used for leaded gasoline is cleaned in a dry state without protection against inhalation) may result in the sudden onset of acute symptoms, such as are described in one of the articles sent to you by Mr. Bevan of London, - symptoms which bear little or no resemblance, and which give none of the usual clinical signs of plumbism. On the other hand, prolonged exposure to smaller amounts of these organic compounds, gives the usual picture of chronic lead absorption, although lead is excreted somewhat more rapidly under these conditions, than it is when the more common lead compounds are absorbed.

In addition to the care of men who do the work of mixing, you may be called upon to examine individuals who, for one reason or another, believe they have been poisoned by gasoline containing tetraethyl lead. Here, again, it is our purpose to exhaust all the logical means available for diagnostic purposes, in order to ascertain the true facts. No cases of poisoning have been seen or demonstrated to have occurred from this cause, and the evidence is, I believe, quite adequate to indicate that no such cases will occur. However, I and my associates have maintained an unbiased and open judgment on this point, and we approach every suspected or alleged case as though it were the first. One must not forget, in this connection, however, that there have been more than ten years of experience in this country, without a single case of lead poisoning or demonstrable lead absorption as a consequence of the handling and use of leaded gasoline. The history of exposure to leaded gasoline, therefore, cannot be regarded as a significant item in a diagnosis. Rather the diagnosis must be established, if at all, on sound clinical evidence, and supported by specific evidence that lead has actually been absorbed in abnormal amounts.

For your general interest and information, I am sending to you, under separate cover, a series of articles which represent the results of our studies of the general problem of lead absorption over a period of years. Some of them relate to tetraethyl lead, but for the most part they are of importance to the larger problem of lead poisoning in general.

I should be glad to hear from you from time to time, and if any special difficulties arise I should like to be informed promptly. Moreover, if I can be of any service to you in matters of specific or general information, I shall be pleased to do so.

Cordially yours,

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Robert A. Kehoe, M.D.

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(see next page)

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P.S. The supply of my reprints of one of our articles on tetraethyl lead is exhausted. I am sorry because it is the most interesting article which we have published on the subject. It can be found in the American Journal of Hygiene, Vol. 13, p. 478,1931, and is entitled "The Behavior of Lead in the Animal Organism II Tetraethyl Lead"by Kehoe and Thamann.

I am writing an article now on a very detailed study of the lead absorption of filling station attendants and garage mechanics, which has just been completed, I will send you a copy of it when it has been published.

RAK