Neglected Opportunity: Part-time Medical Consultation To Small Industry

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NEGLECTED OPPORTUNITY: PART-TIME MEDICAL CONSULTATION TO SMALL INDUSTRY*

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I was just discussing lead poisoning with our fourth year medical students in the seminar on occupational medicine, when I was called to the telephone. "Doctor, I'm poisoned", said a man's voice. "My family doctor says I have lead poisoning. He says I must see you at once." A foreman and part owner of a small metal foundry employing 6 to 8 men suddenly realized that there was a serious toxic hazard in his shop. Previously, he had been pouring small zinc castings where the only problem was an occasional harmless though uncomfortable zinc chill or zinc "shakes". Then with scant notice he had been asked by a customer to pour brass containing ten percent lead. When I saw the process first hand the man who operated the metal furnace was nearly enveloped with a gray smoke. This tasted sweet to me like lead fume. The furnace was heated to 2300°, that is to say, well past the fuming point of lead of about 1000°. Not knowing of any worker danger, the proprietor had set up no ventilation equipment and no prophylactic medical control program.

With some difficulty I persuaded the foreman that I did not need to see him that minute, but that he should go to my hospital out-patient department for some simple blood studies, including hemoglobin and stippled cell determination, as well as qualitative tests of urine for coproporphyrin III. Later that afternoon I saw the patient and five of his workers at the hospital. When the boss himself is sick, one obtains surprisingly quick cooperation in a similar occupational illness involving his employees. All had abnormal stippled cell and coproporphyrin levels, while one had a lead line of the gums, all evidence of lead absorption, after an exposure to lead fume of only six weeks. Upon prompt treatment with calcium EDTA, given intravenously in the hospital out-patient department without seriously interfering with their working hours, the lead absorption was soon markedly decreased. None of the cases progressed to serious disabling lead intoxication. The slight weakness produced by a mild lead anemia had prompted the boss to see his own family physician whose technician found some stippled cells. The doctor guessed at lead poisoning. Because he himself was very busy and getting along in years, he had referred the case to me.

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After my preliminary physical and laboratory examination of the boss and workers, together with a rapid study of the plant area itself, I suggested that the brass pouring operation be stopped at once pending engineering and environment air investigation of the process by the Industrial Hygiene Division of the Wisconsin State Health Department. Their study revealed a concentration of lead fume in the air well over the safe limits of the lead MAC or maximum allowable concentration. With prompt application of proper suction and ventilation equipment recommended by the state engineers, the plant was soon ready to reopen. The level of lead absorption in the men went down with the reduction of lead concentration in the air to well within the safe limits. A medical control program for periodic examination of these brass workers was then put into effect. Because the family physician and a nearby internist to whom I offered the opportunity of part-time medical consultation to this small industry thought themselves too busy to undertake this responsibility, I had to carry it through myself.

Another example of the average physician's lack of interest in occupational health problems is shown in the following experience.

"Doctor, I don't know what to do. All my men are vomiting." So called a plant nurse to her surgical consultant. He was not interested in such a purely medical problem, and so in desperation she phoned the insurance company. They in turn asked me to investigate. The lacquer lining of returned beer barrels, I was told, had to be cleaned out. When I went into the brewery, I found a real "Rube Goldberg" contraption for this purpose. A loosely built cabinet, into which the barrels were rolling as they whirled, suddenly seemed about to explode as steam and solvent spouted in all directions. A maintenance man acting as an amateur engineer had rigged up this apparatus to squirt a lacquer solvent into the barrels and then rinse them out with jets of steam. There was no semblance of protective suction or ventilation. I took one or two good sniffs and demanded that they turn off the novel cleaning equipment. I was already sure that I knew why the men had been vomiting. The solvent, itself extremely volatile, had been made more so by the steam. Worst of all, the solvent, though cheap and most effective, was one of the most dangerous available. It was a material which many well-informed industries have banned completely from their workships. As a widely used cleaning fluid, it is sold over the counter, however, without question and with no appreciable warning except in very fine print. Sometimes a statement implying danger does suggest that "the vapor should not be inhaled heavily in a closed space without ventilation". Can you guess what the solvent was? Yes, it was CC\textsubscript{14}, carbon tetrachloride, "safe" only from the point of view of inflammability.

It was indeed fortunate that the concentration of CC\textsubscript{14} was so intense that the men were so nauseated there was literally a trail of vomitus leading to the first aid room. Thus the unsuspecting workers dramatically called the prompt attention of the first aid department to their sad plight. Because this concentrated toxic exposure was quickly stopped there were none of the often fatal systemic effects of carbon tetrachloride intoxication, such as a slow onset of kidney shut-down due to lower nephron nephrosis.
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Figure 1
Lead line of the gums. Note series of black dots along gingival margin.

Figure 2
Section of lead line of gums. Black dots are deposits of lead.
How much better if this plant had had a rule never to institute a new chemical process without first seeking the advice of a competent, interested, and at least part-time medical consultant.

At present the number of men receiving three years’ training in occupational medicine after obtaining an M.D. degree and completing an internship, is barely sufficient to satisfy the demand for full-time medical directors in large industries, with over 500 to 2500 employees. Only a handful of postgraduate medical schools offer this training in occupational medicine. On the other hand, the need for competent medical advice in small industries employing perhaps four to 400 men is overwhelming. Moreover it is this great group of small industries that employs 80 to 90 per cent of our working population. It is tragic, too, that frequently neither employer nor employee in the small industry has the remotest idea of the potential dangers of the toxic materials with which they may be working. Too often, no one, not even the average physician, realizes the hazard until the worker becomes ill or even expires.

The general physician whether he be general practitioner, internist, or other specialist, must be awakened to the urgent need for his medical interest and his self-education in the rudiments of occupational medicine.

Beside the very slowly increasing interest in teaching this subject in a few undergraduate medical schools, there are only four or five schools offering short term courses of from 8 to 12 weeks. The bulk of the physicians competent to give adequate medical advice to the small industry must therefore come from those who are determined to make themselves proficient in this field. Contrasting the great dearth of common sense references available on this subject 25 years ago, they will now find much of practical as well as of research help readily at hand in two or three modern textbooks and specialty journals available in county, state, and American Medical Association package and medical school libraries. In addition, the Council on Occupational Health of the American Medical Association has made available excellent compact “guides” which the general physician can have free of charge. These give suggestions for his first-hand plant surveys of the occupational environment, as well as guiding principles for medical examinations in industry with criteria for diagnosis and treatment of conditions involving occupational health. (see references)

As an example of simple diagnostic techniques readily available in every physician’s office or laboratory I am herewith detailing a practical schema including four easily performed tests for evaluating one common aspect of occupational medicine, namely lead absorption.

The first thing to look for is a lead line of the gums. (Figure 1 and 2)

I. Lead Line of Gums

   Equipment necessary: Head mirror plus hand lens.
   Significance: Considerable lead absorption, probable.
II. Stippled Red Cells

*Equipment necessary:*
- Microscope, oil immersion lens.
- Wright stain.
- Serial record of number per 50 fields preferably by successive study every one to ten days.

*Significance:*
- 10 to 30 cells per 50 fields — considerable lead absorption.
- 20 to 50 cells or over — impending lead intoxication.

III. Hemoglobin determination (Percent or grams) (Figure 3)

*Equipment necessary: Hemoglobinometer.*

*Significance:* If hemoglobin relatively high, over 70 to 80 percent, and also associated with many stippled cells, almost diagnostic of lead intoxication.

IV. Coproporphyrin III in Urine (Qualitative study, 1 to 4+)

(Figure 3)

*Equipment necessary: Few reagents, ultraviolet light source.

Let stand ½ hour in dark room.

*Significance:* 3 to 4+ probable indication of lead absorption. Earlier and more sensitive sign even than stippled cells.

**REMARKS:** Above four simple tests: 1. are non-specific but valuable guideposts for evaluation. 2. use equipment available in every physician's office. 3. taken singly, are suggestive of lead absorption, but 4. no one test is diagnostic of lead intoxication or lead poisoning.

**DIAGNOSIS:** 1. When all four tests are correlated with evidence of lead exposure by plant tour plus characteristic symptoms, they are very suggestive of lead intoxication. 2. If two or more tests are positive, plus history of lead exposure and symptoms, and if confirmed by quantitative estimation of lead in blood and urine, diagnosis of lead intoxication is almost certain for medical-legal purposes.

**PERSONAL COMMENT:**

Quantitative urine and blood determinations for lead are expensive, however, somewhat prone to contamination in collection, and in techniques too complicated for performance by ordinary hospital laboratory, and in the end are of no greater practical significance than the inexpensive and simple qualitative tests for lead absorption described above. Furthermore, even the quantitative tests of themselves are simple tests of lead absorption. As with the other four tests, consideration of the whole picture is required to make a diagnosis of lead intoxication.

What can be done to arouse the medical profession to its urgent responsibility and neglected opportunities as part-time medical consultants to small industries? You have just heard about two instances where physicians were either too busy or too indifferent to rise to their potential stature as protectors of uneducated humanity, whether employers or employees. They are also missing fair sources of sure income.
which often could carry much of the overhead of their own practice. Above all if they grasped these opportunities, it would be to the inestimable enhancement of their professional image in the eyes of the public.

Thirty-five years ago I saw a handful of lead cases, as some of you may remember, here at Ford Hospital. There were exactly six. Because of my initial friendship and companionship with several Henry Ford Hospital physicians, my experience with lead absorption has multiplied to several hundred cases of lead absorption and I have become involved in the whole broad field of occupational medicine. When one of these friends saw my interest in those first six cases of lead absorption, he loaned me his personal copy of Aub’s monograph on lead poisoning which had just come out in 1926. A copy of this monograph is still one of my most cherished possessions. Though a few of its basic theories have since been shown to be somewhat open to question, its method of clinical approach by emphasis on physical and simple laboratory examinations together with detailed occupational history, buttressed by actual first hand plant tours still makes it stand as a monumental contribution to the practice of medicine. Joseph C. Aub, now past full professor of medicine at Harvard University School of Medicine, had early deigned to consider it worth his time to take several years of his life away from his prime interest, cancer research, to study all possible ramifications of lead absorption and lead intoxication. The ostensible reason that impelled the American Cancer Society to support this study was a desire to examine a theory of Blair

Figure 3

Three stippled cells stained with Wright's stain, giving a count of 150 per fifty fields.
Accordingly I have tried to unearth in the shops of craftsmen, for these shops are schools whence one can depart with more precise knowledge, whatever may appeal to the taste of investigators, and, which is the main thing, to suggest medical precautions for the prevention and treatment of such diseases as usually affect the workers. “When you come to a patient’s house, you should ask him what sort of pains he has, what caused them, how many days he has been ill, whether the bowels are working and what sort of food he eats”. So says Hippocrates in his work Affections. I may venture to add one more question: What occupation does he follow?

Figure 4

Ramazzini, accomplished clinician, admonished physicians to study the worker’s environment 261 years ago.

Bell of England. Bell, knowing that lead is most toxic to young, growing tissue such as the fetus or the central nervous system, postulated that colloidal lead given intravenously might attack and overwhelm young cancer cells. I, as a young second year Henry Ford Hospital intern, was given the opportunity to try out this theory. I found that the lead treatment was not only ineffective, but that it made the terminal weeks and months of the cancer victim even more miserable than otherwise. After his much more careful study, Aub had never advised the use of intravenous colloidal lead for treatment of cancer patients.

Another friend, to whom I owe a great debt was also a resident here. When I left Henry Ford Hospital in 1927, after a second year internship and two years of assistant residency, I became an assistant to an able internist in Milwaukee. Due to the dogged insistence of this clinician, I was forced to prepare a clinical research paper as part of my credentials for membership in the Milwaukee Academy of Medicine, a group of qualified specialists in various fields. I recalled the six cases of lead poisoning that I had had under my control at the Henry Ford Hospital. I then appealed to this second resident to obtain these records for my review. After three months of silence, he sent me a thick package, the longhand copy of the six records. With this information at hand, together with a review of the current literature on the subject, I was able to prepare a paper on the control of lead poisoning in the worker, qualifying me for membership in the Academy. A year later a surgeon who had heard my presentation called to tell me that a relatively
small company in town making lead storage batteries was having increasing trouble with industrial lead poisoning. "Would you be interested in calling the manager regarding their difficulty?", he asked. I had never made any analysis of such a practical industrial medical problem, but I did not confide that to the manager, nor the fact that I knew of no published precedents for making such a study. In a split second, I decided that I would find and make my own method of attack. I complied with the manager's request that I confer with him the following morning. Somehow I sensed that this was an opportunity.

I did not neglect this opportunity as a possible part-time medical consultant to industry. During the night I had planned how to make a plant tour, how to make a systematic physical and laboratory study of the level of lead absorption in each lead worker, all largely based on my experience with the six cases of lead poisoning from the Ford storage battery plant, and all founded upon the method learned from Aub's monograph. Much of my determination and courage to undertake this project I feel I owe to my training in internal medicine in the Henry Ford Hospital under the guidance of Frank J. Sladen. On numerous occasions, as in the case of others of his residents, he had inspired me to study and put into action other projects of clinical research. I feel therefore that it is peculiarly appropriate for this whole program to be dedicated to the stimulating leadership of Frank J. Sladen, our honored Emeritus Chief of Medicine.

For the first time in public I have here given a statement of the debt I owe to my training and to my friends at the Henry Ford Hospital. I do so with a sense of humility and in the hope that other beginners in the practice of medicine may grasp the ever enlarging opportunities of occupational and preventive medicine, particularly as part-time medical consultants to small industries. It is well known that the bulk of our modern working force and therefore the majority of their future patients are engaged in small industry. I am proud and grateful that nearly all my professional life has been spent in internal medicine learned at Henry Ford Hospital, with a considerable portion applied as part-time consultant to various small industries with the multitudinous hazards inherent in modern industry.

I sincerely hope that many physicians both young and old will accept the stimulating challenge of occupational medicine and experience the thrills of unraveling its diagnostic problems. Certainly all physicians would do well to take to heart the counsel of Ramazzini when he wrote 250 years ago "These shops are schools" and urged every physician to remember to ask his patient, "What is your trade?" (Figure 4)

REFERENCES

3. Most useful for the physician:
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Useful reference for special research:


(b) Industrial Hygiene Association Journal, editor, Dohrman H. Byers, 1014 Broadway, Cincinnati 2, Ohio.


Aub, J. C., and others: Lead Poisoning, Baltimore, Williams & Wilkins, 1926.


Correction

In the article, “Allergy to Leeches”, by T. J. Heldt on page 507, Vol. 9, No. 4, December 1961, Figure 1, “fusca” should read “fusca”. On page 509, Figure 2, “ventral” should read “dorsal” and “dorsal” should read “ventral”.