Arsenical poisoning by wall-papers and other manufactured articles / by Jabez Hogg.

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ARSENICAL POISONING BY WALL-PAPERS AND OTHER MANUFACTURED ARTICLES.

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IT has been very generally recognised that some persons are never well in any given place, or particular locality, long together. In such a case it is commonly said this or that place, or locality, does not agree with them, and, after failure of remedies, change of air is tried with marked improvement; but this proves, in the majority of cases, to be only of a temporary nature. The amount of distress inflicted in this way, in a large number of households, is of no light or insignificant character, and the cause long remained concealed from observation. It is only of quite modern date that a clue has been obtained to certain of the "mysterious illnesses" referred to, and which for years were vaguely assigned to some inexplicable cause, —an "idiosyncracy," "antipathy," or peculiarity of constitution.

It is now known that many remarkable and insidious forms of disease are entirely due to certain insanitary influences; that the lurking poison which infests our homes by night and by day may at one time, from defective drainage, find its way into the house through the sewer, to be absorbed in the drinking-water, or, by putting on other kinds of disguises, may for a time baffle the most observant and learned expert.

Who would, indeed, have thought that a deadly poison could lurk in a pretty and attractively coloured wall-paper, a newly-painted decorated room, an attractive article of dress, the chintz of the window-curtains, the stockings, the gloves, the playing-cards of the whist party, the candles and lamp-shades, the children's toys, and the "sweeties." Yet in all of these, and many other articles in domestic use, arsenic enough has been found to produce a large amount of disease, and in some cases death.

It is an unquestionable fact that the health of the community is mperilled by the large use of arsenical pigments and other poisons in the manufacture of articles in general

use among us. There is no longer room for doubt of the truth of this assertion in the minds of those who have carefully inquired into the subject. Nevertheless public feeling has not been aroused, at least to an extent sufficient to produce any very marked effect in diminution of the evils which the physician and the chemist have from time to time endeavoured to bring prominently into notice.

In the investigation of an obscure or hidden disease the medical man, in any and every case, is given to associate facts and group together symptoms; and should he find that these recur in pretty much the same order, in a number of cases, and if some distinct or special pathological condition is seen to underlie them and constantly reproduce them, then he considers that he is justified in regarding them as an unmistakable indication of cause and effect. By careful observation it has been found that wall-papers coloured by arsenical pigments will produce, and do produce, a series of symptoms of poisoning which are not only significant, but perfectly conclusive of poisoning by their agency.

It is a well-recognised fact that those persons who are "susceptible" to the action of such potent toxic agents as arsenic, and who may be compelled to occupy a bed-room the walls of which are covered by an arsenical paper, will certainly suffer in health therefrom. That this is so receives additional strength from the fact that immediate relief from a series of distressing symptoms is experienced on removal from the room and its surroundings, and which always recur on their returning to the apartment, or even to the house.

It is a fact, then, that sufferers from arsenical wall-paper poisoning invariably experience perfect relief from all their distressing symptoms on trying change of air,—nay more, by changing one room for another. Any permanent change produces a cure. But on their returning to the influences or surroundings which were the original cause of the illness, they just as surely experience the same train of distressing symptoms which in the first place was the cause of the "mysterious illness."

It may readily be surmised, from these few introductory observations, that the question of arsenical poisoning is in many respects an important one for individuals and for households. From the large number of cases of poisoning already made known by the medical profession and by analytical chemists, I gather that the evil is widespread, and the danger arising therefrom can in no way be exaggerated.

The late eminent chemist and toxicologist Dr. Alfred Taylor was the first to put the public on its guard against

secret poisoning by arsenic. He appeared as a witness before the Select Committee of the House of Lords in 1857, at the time the "Sale of Poisons Bill" was under discussion. Dr. Taylor desired to get a clause inserted in this Bill which should regulate the use of arsenic by manufacturers, but it was urged on their part that it would hamper and injure trade. But although he failed to accomplish his object, he succeeded in arousing the attention of the medical profession to the question. Up to this time even medical men were not fully aware of the danger to health. From this moment very many cases of chronic poisoning by wall papers were discovered and made known,—illnesses of an inaccountable and perplexing nature were at once understood. Curiously enough, among the greatest sufferers from arsenical papers were several well-known medical men, including Dr. Hinds and Dr. Halley. These gentlemen, happening to read Prof. Taylor's evidence, came to the conclusion that their own distressing symptoms were the result of chronic slow-poisoning by arsenic. In a short time their surmises were corroborated by the great change brought about in their symptoms by simply stripping off the bright green papers hanging on the walls of their consulting-rooms. About the same time the wife of a London surgeon died after much suffering from symptoms which Prof. Stenhouse, after analysing the wall-paper of her room, pronounced "highly arsenical." Dr. Lauder Brunton was inclined to think the evils said to arise from arsenical poisoning much exaggerated. Soon after, and from bitter personal experience (his study having been papered with arsenical paper), he changed his opinion.

In 1879 a Committee of Inquiry was appointed by the Medical Society of London, of which I was Chairman. In the course of a few weeks no less than fifty-four reports of cases reached me of arsenical poisoning by wall-papers, twenty-four of these occurring in the persons or families of the medical men themselves. This, I think, is strong evidence of the difficulties attending the diagnosis or recognition of this form of illness, poisoning, and tends also to show that the better opportunities for observation afforded to a medical man in his own house may lead to the detection of mischief, which in the person of a patient would escape attention, mar his diagnosis, and mislead him as to its proper treatment. This is so because the gastro-intestinal irritation that attends the internal reception of the poison is mostly absent. It has been discovered, too, that different individuals exhibit very different degrees of suceptibility, so

that one person will merely complain of chronic sore throat, another suffer from inflamed eyes and excessive nervous prostration, while it more rarely occurs that the virulent nature of the arsenical poison produces so rapid an effect as it did in the case of Mr. E. H. Corbould, the accomplished water-colour painter. This gentleman was summoned to Osborne to execute a particular work for the Queen, and for which only a very short space of time was allotted; he was therefore obliged to take up his abode at an hotel near the palace. In a couple of days he was a sufferer, as he thought, from a severe cold in the head: this he attributed to the damp state of the bed-room, the wall-paper (a green one) being a good deal discoloured. Her Majesty, hearing of his illness, with her usual consideration for the comfort of those about her, gave instructions to an attendant to have him removed and lodged in Victoria Cottage, close to Osborne, and, furthermore, to see that a good fire was lighted in his bed-room early in the evening. These instructions were carefully carried out, and he found a warm room, a cheerful fire, and every comfort on his arrival. The bed was well covered with the best Witney blankets, and a couple of spare ones ready to hand. After partaking of a little hot brandy and water he gladly crept into bed: in a few minutes a chill seized him, and he was glad to pile on another blanket. He still felt cold, and drew the second blanket over his bed; but in vain,—the chilly feeling caused "his teeth to chatter"; sleep was out of the question. He bethought himself of his well-lined Spanish cloak lying on a chair near the bed, and made an effort to reach it: to his horror he could not move his legs; he was paralysed, and could neither move arms nor legs. He made a violent effort to put his legs out of bed: this produced a painful cramp of the bowels, and was immediately followed by sickness; soon after he lost consciousness, and remembered no more of what occurred. At 8 o'clock the following morning he was aroused from his insensible condition by a loud knocking at his bed-room door; he was scarcely able to say "Come in," or ask for a cup of tea. In a few minutes the servant returned with the tea, and pulled up the blind: he opened his eyes, and, seeing the brilliant green of the paper on the bed-room walls, excitedly exclaimed "I am poisoned." The servant, in great surprise, declared she had given him "nothing but the best tea." He explained, as he drank it, that he alluded to the paper on the wall. He made an attempt to get out of bed, and

his legs gave way under him, and he staggered about like a drunken man. As soon as he could he opened his door and got out, and reeled to a window that stood open in the corridor. The fresh cool air of the morning seemed to infuse new life into him; he breathed more freely, and gained power over his limbs; in a few minutes he was able to make his way out of the house. As he walked up the green sward every disagreeable symptom vanished. The Queen was waiting for him, and remarked he was late, and he was obliged to confess that illness was the cause; at the same time he stated that he had been poisoned by the wall-paper of his bed-room. Her Majesty expressed great sympathy, and at once commanded an attendant to have a piece of the paper stripped from the wall of the bed-room and brought to her. This was submitted to chemical analysis, and found "highly arsenical." This interesting case shows the extraordinary susceptibility of some persons to arsenical wall-paper poisoning. At the same time the remarkable activity of the toxic agent may have been gently promoted by the temperature of the room, and its having been occupied for the first time after re-papering and painting. The poison doubtless entered the circulation through the lungs in a gaseous form (hydrogen arsenide), thus producing anæsthesia, then followed arrest of the heart's action, and paralysis of the nervous centres. In some cases, coma and death ensue.

In the greater number of cases arsenical poisoning takes place slowly and insidiously; it begins with headache, dry cough, oppressed breathing, giddiness, and sleeplessness; the limbs are painful, feeble, trembling, and benumbed. In other instances it attacks the surface of the body, causes chronic skin disease, or the fingers and arms are covered with painful sores. In an establishment where a hundred young girls were constantly employed making artificial flowers and leaves, the greater number of them suffered from eruptions and painful cracking of the skin of the fingers and flexures of the arms. Twenty-six of them presented other symptoms of chronic poisoning, and one died, after months of great suffering, from ulcerations attacking various parts of her body.

Workmen while engaged in stripping off old wall-papers from rooms, preparatory to re-papering, are frequently obliged to leave their work from attacks of diarrhœa and other stomach derangements. Hundreds of instances of dangerous illnesses have been published, from time to time, which fully confirm what has been stated with regard to the

reckless use made of arsenical pigments in various manufactures, and the dangers arising therefrom.*

On the other hand, it has been said that some exaggeration has taken place with regard to the numbers of the sufferers from arsenical poisoning, and that the subject has been hitherto treated too sensationally.

We have been credibly informed, also, that the men employed in the manufacture of arsenic in no way suffer from arsenical symptoms, and that on the whole they enjoy good health. The Inspector of the Cornwall and Devon mineral mines, Mr. R. Hunt, says the miners are a healthy set of men, and those engaged in arsenic mining make no complaint of the unwholesomeness of the work. The miners of Upper and Middle Styria are actually given to chew small pieces of crude arsenic, and believe in it, as men do who smoke and chew tobacco. It is said to relieve hunger, and give increase of strength. It is also supposed to be a protective against the fumes arising from the reducing-furnaces.

On careful enquiry by competent persons the conclusion come to is that there is some exaggeration in these statements.† It is, however, quite probable that men do chew minute pieces of crude arsenic with impunity; but then crude arsenic is insoluble, and may pass through the stomach without having been acted upon by its secretions. Many cases have been published that prove the truth of this assertion. But the case is very different when we have to deal with a perfectly soluble salt of arsenic, as the trioxide. Of the many arsenical preparations used in our manufactures the most dangerous, because the most extensively employed, is the trioxide. This is the principal ingredient in Scheele's green, a pigment composed of 1 part of arsenic trioxide and 2 parts of cupric oxide. Schweinfurt, Brunswick, Vienna, or emerald green, aceto-arsenites of copper, are all rather extensively used, mixed and unmixed.

Another pigment, composed of chromic and ferric arsenate, is much employed, while arsenic acid enters into very many manufactures, aniline dyes in particular. Roseine, for instance, is produced by the arsenic acid process.

In wall-paper printing, as in many other textile fabrics, the arsenical pigment is invariably mixed with zinc and some

* For further details of numerous interesting cases of poisoning by arsenical pigments see a paper of mine in "The Sanitary Record" of April 25, 1879, and "Medical Press," 1879; also Mr. Henry Carr's useful work, "Our Domestic Poisons," published by Ridgway and Co., and in which appears a list of numerous other publications on arsenical poisoning.

† It is well known that miners do suffer very much both from the dust and the fumes of arsenic.

organic matter. This is done with the object of causing the colouring-matter to adhere to the paper, muslin, or calico, and in consequence its mischievous effects are likely to be augmented, for the fabric on becoming thoroughly dry will be detached by rude handling; the surface cracks, and the pigment is loosened, when considerable quantities of arsenical dust are set free.

In the case of a wall-paper hung on the walls of a room, every increase of temperature will liberate a quantity of the surface-dust, which settles on the furniture; or the arsenious acid, which is of an extremely volatile nature, may be changed into hydrogen arsenide and diffused by every movement of the air. But I am reminded by an objector that the quantity of dust thrown off under any circumstances is far too small to produce dangerous and disagreeable effects in the human economy such as I have spoken of. This, at least, is a hasty conclusion to jump to. Professor Taylor found that from each square foot of an arsenical wall-paper he could obtain from fourteen to seventeen grains of arsenic, and that from some flock-papers he actually obtained as much as fifty-nine per cent of arsenic. Other chemists have succeeded in eliminating a quantity of hydrogen arsenide from wall-papers, and have in fact obtained from each cubic inch of gas one grain of arsenic. Dr. Fleck, of Dresden, repeating his experiments, satisfied himself that the element of greatest danger is found in the evolution of this gas by the joint action of heat, moisture, and the organic matter used in printing and hanging the paper. Professor Sir H. Roscoe takes a similar view; and Dr. Hamberg, of Stockholm, who was himself a sufferer from arsenical wall-paper poisoning, having repeated Dr. Fleck's experiments, convinced himself that the respiration of hydrogen arsenide in a comparatively short time will produce symptoms of poisoning. Within the body this gas or dust may produce other poisonous compounds by decomposition of albumen. Professor Selmi discovered that a volatile arsine was formed by contact of arsenious acid and albuminous matters, and that the new compound formed exhibited a toxic action differing from that of arsenious acid; he further expresses his belief that a similar product may be formed from the size used in making the wall-paper and the paste employed in fixing it to the wall, and if so, the moisture of the air would play an after important part in the formation of a poisonous material, *arsine*.*

* The enormous volatility of the arsenious tri-chloride necessitates special precautions in its preparation. The gas evolved is driven off at a very low

But whether the greater activity of the arsenical wall-paper poison is due to the crystalline particles separated, thrown off, from the surface of the wall-paper, or liberated by albuminous decomposition or recomposition, as hydrogen arsenide, it is scarcely possible to say. This after all is a question of far less moment to the public than to medical men and chemists. At all events the difficulty is just as great with regard to lead poisoning. It is almost impossible to conceive, much less explain, why a person sleeping in a newly-painted room should find himself unable to move hand or foot on waking. He at once becomes a sufferer from lead paralysis, and no one has yet detected either carbonate or oxide of lead, or other subtile agent, diffused throughout the air of the room. Nevertheless, it must be so.

If, then, as I have shown, arsenical wall-paper poisoning constitutes a serious and pressing danger to health it will surely not be denied that the use of arsenic in our manufactures should be placed under some restrictions. By the intervention of the Foreign Office we are in a position to say what is done in this respect by the Governments of other European nations. As regards Germany, the use of poisonous pigments in wall-papers, and in other fabrics and materials likely to affect health, are absolutely prohibited by law. By an imperial Law issued in 1879, all colours deemed poisonous are fully enumerated. The use of Scheele's green and of all other arsenical and poisonous colours for wall-papers and clothing are therefore prohibited, not only by the laws of Prussia, but by those of nearly every minor State. An exception was subsequently made in the case of papers, &c., intended solely for exportation, so that German manufacturers might not be placed at a disadvantage in competeing with French firms; but the restrictions imposed on the use of arsenic were found so onerous and harassing that the manufacturers themselves found it the more profitable course to discard arsenical colours altogether.

In the kingdom of Saxony legislation has been of a piecemeal character: the use of a green precipitated copper carbonate on cotton yarn having been forbidden in 1840; of a Brazil or Munich red, an arsenical colour in 1856; of Schweinfurt green for fabrics and papers in 1860; and a warning issued to the public against the use of arsenical colours in sleeping or much frequented rooms, and in forms

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temperature, and will pass over before a single drop of condensed liquid enters the receiver. So difficult is it to obtain in solution, that Hufschmidt convinced himself that every trace of the trichloride remains in the receiver, whether it be filled with water or solution of potash.

easily detached. In Saxe-Cobourg and Gotha ducal edicts have been in force since 1839 prohibiting the use of arsenical pigments for all domestic purposes, and a scheduled list of dangerous articles given which must not be introduced into articles of food or drink. The Hessian Criminal Code of 1855 is more stringent, and specifies a number of colours which, though not coming within the category of direct poisons, are of a poisonous nature and injurious to health; it not only regulates their use but prohibits their sale by chemists and others, thus far more nearly corresponding to the "Sale of Poisons Act" of this country.

In Bavaria a law of 1863 enacts that arsenic is not to enter into colours and paints for house decorations, window blinds, wire gauze for meat safes, artificial flowers, &c. In Sweden the question of arsenical colours has been the cause of much discussion at home, and of negotiations with the Governments of other countries. The ordinance of 1876, which regulated the manufacture, storage, and sale of poisons of all kinds, unconditionally prohibited the use of arsenic in wall-papers, cloths, blinds, artificial flowers, and wares of all kinds, as well as in lamp-shades, sealing-wax, wafers, and candles. It was thought carpets were not included, but the Courts ruled these as an accidental omission and they were accordingly included, carpet sewing having in some cases produced arsenical poisoning. By the Act every purchaser of an article possibly arsenical can have it analysed and certified by the Government chemist. It also fixes the limit of security in wall-papers, namely, that the metallic arsenic deposited in a glass tube of $1\frac{1}{2}$ to 2 millimetres internal diameter from 440 square centimetres of these articles, or from 220 square centimetres of textile fabrics and 21 grains of other articles, by the Babo or Fresenius process, shall not produce a black brown, or even a partially opaque arsenical mirror.

Denmark and Holland stand next in point of stringency of their regulations on the use of arsenic and other poisons in the arts. In Denmark a law has lately come into force based upon that of Germany, and which prohibits the use of arsenic in wall-papers, carpets, window blinds, artificial flowers, and fabrics of all kinds, and in all descriptions of paints, distemper, or colouring for walls, or decorative purposes. 2. The use of lead in toilet articles, and in enamelling or tinning cooking utensils, or of oxide of lead or zinc in india-rubber for infants' feeding-bottles, toys, &c. For the use of arsenic, antimony, lead, chromium, cadmium, copper, cobalt, mercury, lead, zinc, and of gamboge in toys,

or for colouring confectionery, foods, and drinks. Colour-boxes containing any of the above are to be labelled "poisonous colours."

Holland has just passed a law which makes it a crime to sell any article of merchandise of a poisonous character without giving the purchaser full information as to its precise nature. If any article be sold without this notification the vendor is subjected to a fine not exceeding 300 florins, or imprisonment for a term not exceeding six months. Should death follow as a consequence of the sale, the seller is liable to imprisonment for a term not exceeding one year if he were ignorant of its nature, and to various other terms—even for life—if he knew the nature and the probability of such a result.

In France the use of poisonous colours is prohibited in articles of food, but as to others not intended for consumption no prohibition is in force, and the Government contents itself by the issue of a circular cautioning manufacturers of the responsibility they incur in case of poisoning, and their liability in consequence under the penal code.

In Italy the sale of poisons is strictly regulated by law. The sanitary code of the Commune of Venice includes among its poisonous colours the juice of the phytolacca, much used in Portugal for colouring port wine. It forbids also the use of lead or copper in the manufacture of articles not tinned and polished, in utensils for the preperation of articles of food and drink. In pewter-pots and metal tea-pots not more than five per cent of lead or of antimony must enter into their composition.

In Greece and in Roumania poisons are not allowed to be sold by other persons than registered chemists. The use of poisonous colours is prohibited in certain articles scheduled. In Servia the Government medical officers and analysts may at any time enter and inspect all places where poisons are used, manufactured, or sold; and if fatal consequences ensue on a breach of the law, the offender is made amenable to the criminal courts.

In Switzerland the Federal laws bearing on this subject are very variable. In some cantons the laws simply regulate the sale of poisons. Geneva, Berne, St. Gall, and Zürich alone have very explicit legislation on the subject. In the first-named all poisonous colours, inorganic or vegetable, are prohibited in articles of food, in wall-papers, and fabrics of all kinds.

In Berne, arsenic, aniline containing arsenic, and metallic colours generally are forbidden to be used in food, toys,

wall-papers, and textile fabrics. Copper utensils are also required to be tinned. In other cases paints for internal decorations, and all articles of domestic use, are included and enumerated. The most complete regulations are those met with in Zurich, where, for the colouring, painting, and ornamentation of articles of food, drink, and clothing, the paper envelopes of food used in confectionery, toys, wall-papers, window blinds, wafers, &c.; the employment of colours containing any compound of arsenic, lead, copper, antimony, zinc, mercury, or bismuth are absolutely prohibited. Imported articles containing any of these prohibited colours are not allowed to be sold.

In Austro-Hungary there is an Imperial law forbidding the sale of poisons, but it imposes no restriction on their use in trades and manufactures, while in Spain and Portugal there are no laws whatever bearing on the question of poisons. From what we know of the backward state of therapeutics and medicine in these countries this is not surprising. It is seen, then, that the more enlightened European Governments have arrived at the conclusion that arsenical pigments are poisonous, and ought not to be used indiscriminately, and they have accordingly placed them under more stringent restrictions than those applying to the sale of adulterated articles of food and drinks.

It is but right to state that harmless pigments of proved utility and value have been prepared to replace arsenical colours in the manufacture of wall-papers in this country, and that every precaution is now taken by the larger firms of wall-paper printers to prevent as far as possible the use of poisonous colours, or those likely to be injurious to health, being introduced into their printing works. They buy only colours guaranteed free from arsenic, but there is a considerable trade carried on with France in wall-papers, many of which are arsenical.

Some months since the Council of the National Health Society appointed a Committee of medical men, chemists, and others to collect information as to the effects on health of poisonous pigments and colours in articles of home decoration, domestic use, and wearing apparel, with a view of obtaining legislative action on this important subject. A Bill has been framed, which, it is hoped, will be early introinto the New Parliament, and without much further loss of time placed on the Statute Book.