

***THOMAS HAWKES
TANNER***



***MEMORANDA
ON POISONS***

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TOXICOLOGICAL MEMORANDA.

INTRODUCTION.

CHAPTER I.

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DEFINITION AND MODE OF ACTION OF POISONS.

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Toxicology (τοξικὸν poison, and λόγος discourse,) is that branch of medical science which treats of the nature, properties, and effects of poisons.

It appears scarcely possible to give any definition of a poison which will bear a critical examination; insomuch that some have preferred to deal with the evil effects of any substance, that is *poisoning*, rather than with the substance itself, the so-called *poison*. Most medicines are poisonous in improper doses; and even common salt (chloride of sodium) has caused death.[\[A\]](#) Dr. Guy defines a poison to be any substance which, when applied to the body externally, or in any way introduced into the system, without acting mechanically, but by its own inherent qualities, is capable of destroying life. A cherrystone may cause death by becoming arrested in the vermiform appendix, and thus producing peritonitis; boiling water may cause death also; but neither are poisons: the one acting mechanically, the other by its heat merely.

Any substance which can injure the health or destroy life is regarded as a poison, if given with the *intent* to do mischief. The words of the statute (1 Vict. c. 85, sec. 2) are —“Whoever shall administer, or cause to be taken by any person, any poison, or other destructive thing, with intent to

commit murder, shall be guilty of felony, and being convicted thereof shall suffer death." Sometimes poisons are administered, not for the purpose of destroying life, but of causing some slight injury or annoyance. An Act passed in March, 1860 (23 Vict. c. 8), provides for the punishment of a guilty person under these circumstances. If life be endangered, or "grievous bodily harm" result, the administrator may be found guilty of felony, and sentenced to penal servitude for a term not exceeding ten years. If the intent be only to "injure, aggrieve, or annoy," the crime is reduced to a misdemeanor, punishable with an imprisonment for not more than three years.

In accordance with the Pharmacy Act certain substances have been defined as poisons within the meaning of the Act, so as to put some restriction on their sale to the public.

Poisons may be introduced into the body in various ways and in various forms. Thus they may be administered by the mouth or by the rectum, and they may be given in the form of solids, liquids, or gases, uncombined, or mixed with various matters. Some agents are more readily absorbed than others; whilst some textures permit of absorption taking place more quickly through them than other tissues. Thus, the most diffusible poisons prove most rapidly fatal, especially when introduced directly into the circulation by a wound in a vein, or when they are injected into the subcutaneous connective tissue. Their action is also speedy when applied either in a gaseous state to the pulmonary air-cells, or as a fluid to that of the stomach or intestines. The serous membranes, too, possess an activity of absorption almost superior to that of the mucous membranes; while

absorption through the skin is slow, on account of the cuticle. Poisons taken into the stomach when that viscus is empty, necessarily act much more speedily than when it is full. It is remarkable that the agents which most affect the nervous system do not appear to act at all when applied directly to the brain or trunks of nerves. There are also some poisons, as that of the viper, which, although most deadly when introduced into the blood through a wound, are harmless when swallowed.

The effects of poisons may be considered as *local* and *remote*.

The *local* effects are mainly of three kinds, viz., *corrosion*, or chemical decomposition, as is seen in the effects of the strong mineral acids and alkalies; *irritation* or *inflammation*, varying from simple redness, in its mildest, to ulceration and gangrene, in its most severe degree, such as may result from the use of corrosive sublimate; and *a local specific effect*, produced on the sentient extremities of the nerves, as is felt on the local application of prussic acid, aconite, &c.

The *remote* effects are those influencing organs remote from the part to which the poison has been applied. These may be either common or specific; *common*, such as the constitutional indications of inflammatory fever, however produced; *specific*, like the constitutional effects of opium over and above its local influences in relieving pain, &c. Various narcotic poisons produce but little local change, though their remote effects are very remarkable. For example, belladonna, in whatever way it may be introduced into the system, paralyzes the ciliary nerves and so causes dilatation of the pupil. Many substances have both a local

and remote action, as is well seen in the influence of cantharides upon the part to which they are applied, and their remote effects upon the urinary organs.

These remote effects must be induced by one of two modes, or, as some contend, by both: by *absorption*, that is, by the passage of the poisonous particles into the blood; or by *sympathy*, that is, by an impression transmitted through the nerves.

In the present day every one allows that poisons may become absorbed, and that, provided they produce poisonous effects at all, they are absorbed, in whatever way they may have been applied to the body. But it is sometimes asked, Is this absorption necessary for their action? The following evidence may be briefly noticed as in some degree affording an affirmative answer to this question. Magendie divided all the parts of one of the posterior extremities of a dog, the artery and vein being reconnected by quills, so as to preclude the possibility of the effects being conveyed by the nervous filaments supplying the coats of the vessels; on applying a portion of upas tieuté to a wound in the foot, the symptoms of poisoning occurred, and death took place in ten minutes. If the veins leading from a poisoned part be tied, the arterial and nervous communication being complete, the symptoms of poisoning do not occur. Mr. Blake introduced some prussic acid into the stomach of a dog, through an opening in its parietes, after he had ligatured the vessel entering the liver (the vena portæ, which, directly or indirectly, receives the gastric veins); no effect ensued until the removal of the ligature, within one minute of which proceeding the poison began to act. And

lastly, not only has prussic acid been discovered in the blood of an animal which perished in thirty-five seconds, but in some experiments made by Mr. Erichsen, in a case of extroversion of the bladder, prussiate of potass was found in the urine within one minute of its being swallowed on an empty stomach.

The chief argument in favor of a *sympathetic* or direct nerve action, is the almost instantaneous manner in which some poisons act; fatal effects occurring, it is said, before sufficient time has elapsed to allow of absorption. It has, however, been proved that the round of the circulation may be accomplished much more speedily than has been imagined. Thus, the ferrocyanide of potassium injected into the jugular vein of a horse was discovered throughout the entire venous system in twenty-seconds; and Mr. Blake has inferred from his experiments that a poison may be diffused through the body in nine seconds. It may therefore be concluded that in most instances poisons act by being absorbed and conveyed with the blood to the different organs which they impair, or the nerve centres which rule the functions of these; some paralyzing the heart when they reach it, some affecting the brain or the spinal cord, some stopping the play of the lungs and others acting upon the different glands. Nevertheless, in view of the extreme rapidity with which death is brought about in a few instances, the possibility of a direct shock to the nervous system causing death must not be overlooked.

The action of a poison may be variously modified, and the modifying circumstances must be carefully taken into

consideration in the formation of a prognosis and in suggesting a line of treatment.

The *quantity* or *dose* is the most important of these; many substances which are deadly in large doses being exceedingly useful as remedies in small quantities; such are prussic acid, opium, digitalis, arsenic, &c. Then again, the *mechanical* and *chemical* state of aggregation are all-important; a solid being usually much less active than a fluid or a gas, and a pure substance much more active than one mixed with insoluble materials. Even more important is the chemical constitution of the poisonous agent; as already pointed out, poisonous effects result from absorption of the poisoning body and absorption implies solution; the more soluble, therefore, the compound is, the more speedy are its effects, whilst compounds insoluble in water or any of the juices of the body are inert. It is not, however, enough that the substance be insoluble in water; it must be so also in the gastric juice, or it may give rise to characteristic symptoms. Thus, calomel is insoluble in water, yet it is a powerful medicine; orpiment is insoluble in water, yet when swallowed, it may give rise to symptoms of arsenical poisoning, and so on. As already pointed out, the mode in which the poison is introduced into the body is of great consequence in estimating its effects. Then again the *mental* and *bodily condition* of the recipient must be taken into account. Thus, in excited maniacs doses of medicines may be given without producing any effect which in ordinary individuals might give rise to serious consequences. The bodily condition, especially as influenced by habit, is still more important. It may be broadly stated, that by gradually

increasing the dose of a substance ordinarily poisonous, in course of time enormous quantities may be borne without producing immediate ill effects. This is especially seen in the practice of opium eating and smoking, and in a less degree in arsenic eating, as practised in Styria. The latter instance is, however, contrary to the usual rule; for whereas with vegetable substances, such as opium the dose requires to be constantly increased to keep up the effects, with minerals, the contrary seems to be the case, especially with antimony and mercury, which cannot be long given without danger to the recipient.

CHAPTER II.

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DIAGNOSIS OF POISONING—DUTIES OF THE PRACTITIONER.

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The chief characteristics of poisoning mentioned by authors of repute are, that the symptoms commence suddenly after taking any substance or fluid into the stomach, the individual being in a state of health; that they increase steadily, and are uniform in their nature throughout their course; and that they prove rapidly fatal. There are many exceptions to these rules. Thus if the stomach be loaded the appearance of the symptoms will often be delayed some few hours. Sleep, according to Dr. Christison, may retard the action of some agents; so that if a person fall asleep soon after swallowing arsenic or strychnia, for example, no effect may ensue for four or five hours. Intoxication will mask the effect of narcotics. Again, the individual poisoned may possibly be suffering from disease, and an agent may be given which will only aggravate existing symptoms. The fact must not be forgotten that sometimes a poisonous draught is substituted for a harmless medicine. And lastly, after a poison has manifested its effects the symptoms often remit for a time.

When poison is administered with a criminal intent it is generally in such a dose as to take immediate effect, although this is by no means necessary, as there are numerous substances which accumulate in the system, and when given in small and repeated quantities, ultimately prove fatal. It must also be remembered that there are many diseases, as malignant cholera, internal hemorrhage, &c., which commence suddenly, and rapidly run to a fatal termination. In inflammation of the stomach or intestines the symptoms often set in suddenly, and might be mistaken for poisoning; such is also the case in intestinal obstruction, and especially in ulceration and perforation of the bowels. So also in organic diseases of the heart, where the symptoms may have remained latent for some time, death often occurs suddenly from syncope. The diagnosis of the effects of irritant poisons is not so difficult as it is in the case of narcotics or other neurotics, where the symptoms are very similar to those produced by apoplexy, epilepsy, tetanus, convulsions, or disease of the brain.

Generally speaking, a person may be supposed to be suffering under the effects of a poison, if soon after taking food or drink, he be seized with violent pain, vomiting, disorder of the alimentary canal, and convulsive movements: or if he be attacked under the same circumstances with vertigo, delirium, or great drowsiness. It must not be forgotten, however, that poisons may be introduced into the body, not only by the mouth, but also by means of suppositories and enemata, or in females by vaginal injections, or by inhalation, or by subcutaneous injection, or through the true skin after the removal of the

cuticle. Should death ensue, the presumption of unfair play will of course be strengthened by the discovery of post-mortem appearances similar to those known to be produced by the poison from which the person apparently suffered.

The post-mortem appearances, however, except in a few instances, are not very characteristic; nevertheless they may be of great *negative* value in proving that a certain poison has not been administered, or that the patient died from the effects of disease. Two symptoms, excessive lividity of the body and early putrefaction, formerly supposed to indicate death by poison, are now known to frequently follow other modes of death. It may nevertheless be remarked, that the appearances after death which may be produced by poisons are, in one great class, the signs of inflammation of the alimentary canal; in another, the signs of congestion of the nervous system; and in a third, a combination of the two.

The detection of poison in some of the food which has been left untaken or in the matters vomited would seem to be conclusive evidence of the administration of poison; but it is to be recollected that designing persons have mixed noxious materials with food or rejected matters, in order to feign poisoning, or to cast unjust imputations upon others.

When called to a case of supposed poisoning during life the practitioner's duty is two-fold. His first aim must of course be to preserve life (see next chapter); his second, to forward the interests of justice. But if he reaches the spot too late to save life his duties are undivided, for he has but to see that justice is done, and in order that there be no failure it is important that all his observations be committed