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BY

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THE phrase—*post-mortem imbibition of poisons*—literally signifies the imbibition of poisons into an animal body after death. To the toxicologist, however, it has a more distinct, specific meaning—namely, the infiltration into the different organs and tissues of the body of a poison which has been introduced after death either into the stomach, the rectum, the abdominal or the thoracic cavities, and which has subsequently penetrated by transfusion into the adjacent viscera.

The whole scientific interest and importance of this subject centre in the fact so essential to the toxicologist—that in his search for a poison in a dead body, in a criminal case, the grand object of the analyst is not merely to discover this poison in the stomach (since there is always the *possibility*, at

[1] A paper read before the Medical Jurisprudence Society, of Philadelphia, by special request at the stated meeting Nov. 12, 1889.

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least, of its having been introduced here after death), but rather to detect its presence in the various organs and tissues of the body, as the liver, kidneys, spleen, heart, lungs, brain, spinal cord, and even the muscles and bones, into which it had been carried and deposited by the circulation during life, and where its remains may often be discovered a long time after death.

Now, the detection of this *absorbed* poison—as it is rightfully named—in any of the organs of a dead body has hitherto been universally regarded as the most positive and satisfactory proof that the poison had been taken during life, and that it was undoubtedly the real cause of the death, in the absence of all other obvious causes, revealed by the post-mortem examination. Certainly, it would seem, there could be no other legitimate conclusion. But it will be at once apparent that if it can be shown that by introducing a poisonous solution into the stomach, rectum, abdominal or thoracic cavities, or bloodvessels, *after* death, this solution will pass through the walls of these cavities, by the well-known physical law of osmosis, or transfusion, and will gradually but surely penetrate into the adjacent viscera—first into the nearest ones, and subsequently into those more remote, so as to be discovered in them by chemical analysis; then I submit that a most serious and vital difficulty might present itself, fraught with no little danger, namely, the risk of confounding or mistaking the one condition for the other, in a case of alleged criminal poisoning, where the issues of life and death are at stake, and where

the evidence for conviction might be dependent chiefly or solely on the chemical analysis. For, as is evident, there is absolutely nothing in chemistry alone to distinguish between them; the same tests must be applied to both, and they must yield the same results.

Those persons who have given no special attention to this subject may be surprised to learn that such a question should ever be raised in a criminal trial for poisoning; but cases not a few have occurred, and their number is increasing, where the whole question of the guilt or innocence of the prisoner may hinge simply upon this very point—whether the poison that has been discovered in the organs of the deceased may not possibly have been first introduced into that body after death, for a wicked and fraudulent purpose—either to create a false impression that the deceased had actually been poisoned, although his death had been correctly attributed to other and natural causes, or else in a case of actual criminal poisoning, where the guilty criminal has sought to cover up his work, and escape detection, by injecting the same poison into the body of his dead victim (for example, a solution of arsenic, or of corrosive sublimate) under the specious guise of embalming or preserving the body; but, at the same time, armed with the guilty knowledge that the poisonous liquid thus introduced would speedily be diffused through the different organs of the body, and would thus render abortive the subsequent attempts of the toxicologist to prove that the death had been caused by poison. Cases of this latter

character have more than once been brought to my notice.

The bare fact that a dead body may imbibe a poison was first clearly demonstrated by Orfila, more than sixty years ago, by experiments made first on the bodies of the lower animals, and then upon the human body. He found that when a mineral solution was injected into the stomach or rectum after death, it was speedily diffused throughout the various viscera; the completeness of the diffusion and the number of the organs affected being always in proportion to the strength of the poisonous solution, and the length of the interval between the injection and the examination of the body. This is precisely what we might have expected.

Orfila also distinctly exposed the fallacy of the prevalent popular idea that a dead human body might possibly absorb the poison if buried for a long time in an arsenical soil. Now, as this is a question of some medico-legal importance, I will dwell upon it for a moment. It is well known that the soil of certain cemeteries contains traces of arsenic—more frequently in Europe than in this country. Hence it occasionally happens in a trial for alledged arsenical poisoning, where the evidence against the accused is chiefly of a chemical character, that the counsel for the prisoner, driven to extremities, will take refuge in the now exploded idea that the arsenic found in the body of the deceased was really due to absorption from the soil of the cemetery, more especially if the body had been interred for

many years, so as to have given time for the coffin to fall to pieces, and the remains to come into actual contact with the poisoned soil.

But, as I have just observed, Orfila distinctly proved the fallacy of this notion. He showed by experiments that imbibition from an arsenical soil can never happen, and for the very sufficient reason that the arsenic existing in the soil of cemeteries is never in a soluble state, and consequently could never be absorbed. This opinion of Orfila is now universally adopted by toxicologists; and I believe that no well-instructed criminal lawyer of the present day would hazard his reputation by urging such a plea before a court and jury.

The experiments of Orfila already alluded to, to prove the *fact* of the imbibition of poison after death, have since been frequently repeated by other investigators, among whom is myself. Some years ago I instituted a series of experiments at the University of Pennsylvania, or rather I supervised those made at my suggestion by Dr. George McCracken, of this city, a member of my class. My paper, containing the results of these experiments, was read before the College of Physicians of Philadelphia, and was published in its *Transactions*, 1877.

The animals whose bodies were employed were cats and dogs. The poisons used were solutions of arsenious acid, corrosive sublimate, and tartar emetic. These were injected through a tube, into the stomach, and the bodies were then buried in the earth for periods varying from three to seven weeks. On subsequent examination the clearest possible proofs

of the diffusion of the poisons into adjacent viscera were afforded; they were detected in the lungs, diaphragm, spleen, kidney, heart, and urinary bladder, by chemical analysis; and also rendered visible to the eye by the deposit of characteristic colored spots of the respective sulphides in the peritoneum and mesentery—*yellow* in the case of arsenic, *orange* in that of antimony, and *black* in that of mercury. These experiments also confirmed another fact mentioned by Orfila, namely, that this post-mortem imbibition is progressive, depending upon the length of time elapsing between the injection of the poison and the examination of the body.

I regret to say that at this time no examination was made by me of the brain and spinal cord; because I did not, at that date, believe that a poison thus imbedded could possibly pass through so many intervening tissues, and at last penetrate the thick bony casements enclosing the brain and spinal marrow. Moreover, at that time no experiments had been made to ascertain this fact; and I then even ventured to express the opinion that such a result could hardly be expected; so that the discovery of a poison in the brain or spinal cord after death might be regarded as pretty sure proof of ante-mortem poisoning, whilst its detection in any of the other organs could not be received as such incontrovertible evidence, inasmuch as they might possibly have become contaminated by a post-mortem imbibition.

But certain experiments conducted subsequently to my own, especially those by Dr. George B. Mil-

ler, of this city, another member of my University class, and by Professor V. C. Vaughan, of the University of Michigan, and others, seem very positively to establish the fact that *arsenic* certainly (and other poisons presumably) does really reach both the brain and spinal cord after previous injection into the stomach of a dead animal. I have as yet no data to prove that this result would follow the injection of the poison into the rectum, or into the abdomen or thorax, but I have very little doubt that such would be the case.

Thus it has happened that this lately ascertained fact, although deeply interesting from a scientific point of view, proves to be unfortunate in another respect, inasmuch as it destroys completely what otherwise would have been a most valuable and trusty means of diagnosis.

We all know that it is much more difficult for the toxicologist to detect the poisonous alkaloids—strychnine, morphine, nicotine, etc.—in the organs after death, in a case of genuine ante-mortem poisoning, than it is to discover the mineral poisons, arsenic, mercury, antimony, lead, etc. Of course, the difficulty would be proportionately increased in the attempt to detect these alkaloids in the viscera when injected into the body post-mortem. So far as I am aware, no experiments in this line have been made, or, at least, have not yet been published, until those recently performed by my friend, Dr. Miller, whom I have already quoted. He has within the past few years made a series of investigations to test this fact, more particularly with the

alkaloid strychnine, taking it as a type of the alkaloids. He has kindly exhibited to me the results of his experiments, which were performed upon the dead bodies of rabbits. A strong solution of strychnine in water (ten grains to one fluid-ounce) was carefully injected into the stomach by means of a tube passing through an incision made in the œsophagus, this mode of injecting being adopted in order to avoid any possibility of the poison regurgitating from the syringe through the posterior nares, and thence through the sphenoid and ethmoid cells directly into the brain. The animals were examined at various periods after interment, varying from twelve days to several weeks; and, as the result, Dr. Miller feels perfectly sure (and I can see no reason to doubt the accuracy of his results) that he has detected strychnine imbibed post-mortem in the *liver*, *spinal cord*, and the *urine* remaining in the bladder. In the brain, however, he has not, thus far, succeeded in finding it.

I think, then, that we may regard it as an established fact that *all* poisons—organic as well as mineral—at least all those susceptible of solution, do undergo the process of imbibition or transfusion into the various organs and tissues of a dead body; and, further, that in every criminal trial for poisoning this important fact should always be kept in view for the benefit of the accused, and that in every toxicological examination of a dead body the possibility of the post-mortem transfusion should never be forgotten.

We are now naturally led to consider the impor-

tant question whether there is any means by which, in the case of death from alleged criminal poisoning, we can positively discriminate between the poison administered before death and that which may have been injected into the body designedly after death. This is, of course, a question of momentous importance. Several cases have come to my knowledge where the whole question of the guilt or innocence of the accused hinged on this very point. For instance, an old man has died from some ordinary disease, but with no symptoms leading to the suspicion of poisoning. Previous to his death he had made a will, bequeathing the bulk of his property to his housekeeper, whom he had lately married, and leaving his children comparatively penniless. Now, these disappointed heirs restrained by no moral principle, might determine to thwart this unnatural act of their father, and to effect their wicked purpose they hesitate not to hatch a most diabolical scheme, viz., to charge the woman with the horrid crime of poisoning her husband for the purpose of obtaining his money. Armed with the fatal knowledge of the post-mortem imbibition of poisons, they secretly gain access to the buried body of their parent, and with no great difficulty succeed in introducing a solution of arsenic into the stomach, and, after quietly waiting for a few weeks or months, they begin to whisper the suspicion that there was a mistake as to the cause of the old man's death, and that there was a strong suspicion that he had been poisoned. This allegation would be rendered the stronger if any of the symptoms at the time of his

death had happened to resemble those of an irritant poison. Very soon the tongues of gossip and slander would spread the flame of suspicion throughout the community, until it reached the ears of justice, when, forthwith, the exhumation of the body and an judicial examination follow. As the result of the latter, the presence of the dreaded arsenic is discovered in the different viscera of the body. And what follows? Sad to relate, the arrest and possible conviction of a perfectly innocent woman, around whom has been insidiously woven a net of suspicious "circumstances," through the meshes of which it seems almost impossible for her to escape. This is no mere fancy sketch; its counterpart is believed to have occurred more than once.

But take another illustration, of an altogether different nature, and one much more likely to occur. A husband, prompted by some base motive, determines to get rid of his wife by poison. It is administered to her secretly, and in small doses, so as gradually but surely to accomplish the desired end. The physician who may be called in, as well as the attendants upon the sick woman, may be entirely deceived as to the real condition of things, and the poor victim is treated for some supposed disease, until death ensues. Immediately afterward the designing husband, with a full knowledge of the consequences, and under the specious pretence of embalming the body of his wife, injects into the abdomen a strong arsenical solution—such as is often used by undertakers. Or, perhaps, he may even employ a physician or an undertaker to per-

form the job. The body is then duly buried, and the guilty husband hopes that his villany has been covered up; for, even if subsequently suspicion should be excited, and the wife's body should be disinterred and examined for poison, its detection in the different organs and viscera by the toxicologist might, as we have seen, be readily ascribed to its post-mortem imbibition, resulting from the embalming liquid. Again the important question presents itself—how are we to discriminate in such awfully intricate cases, in which the innocent may be made to suffer and the guilty may escape free? I answer, not by chemistry merely, since the results of a chemical analysis must necessarily be the same in both cases.

There are some considerations, however, which may possibly tend to throw light upon this confessedly intricate subject. As now understood, in every case of death from actual poison a careful toxicological examination of the body will usually reveal the remains of the poison which has been absorbed and retained by the different viscera, more especially by the liver and kidneys. In any such case, it is noted that the interior of the organ contains quite as much of the poison as the exterior, because it has been deposited there by the capillary bloodvessels during life; whereas, in a case where the organ has been contaminated by a post-mortem imbibition of a poison, the exterior of the organ should indicate a larger amount than the interior, and for a reason obvious on a moment's consideration. This may be regarded as one factor of the diagnosis, although perhaps not a very strong one.

Another circumstance worthy of greater consideration, although I believe it has never yet been thoroughly worked out, is that there is, probably, a histological and pathological change wrought in the tissues and organs impregnated with certain poisons, and visible only under the microscope. This alteration would be likely to occur only as the result of absorption of the poison into the circulation during life, and not from mere physical transudation after death. It is now well known that in cases of slow poisoning by arsenic, lead, and other metals certain neurotic symptoms are developed, accompanied by well-marked pathological lesions in the great nerve centres. In an address by Dr. Formad, of Philadelphia, before the International Congress of Medical Jurisprudence, lately convened in New York, upon this very topic, the opinion was expressed that there is always a very decided histological and pathological alteration in the mucous membrane of the stomach (he does not mention any other organ) produced by true arsenical poisoning, and differing from that caused by corrosive sublimate. He further asserts that "poisons introduced into the dead body do not induce any histological changes in the tissues whatever." This I believe to be the true direction in which to seek for the solution of this vexed question—the histological and pathological changes wrought in the tissues and organs by an ante-mortem poison; indeed, it may be regarded as the crucial diagnostic test, so far as it goes. We have, as yet, no evidence whatever of its application to the organic poisons.

But here I would guard against an error held by

some, that any mere pathological alteration discovered in a stomach after death is sufficient, of itself, to warrant the conclusion of death by poison, and this for the simple but sufficient reason that these same pathological changes are often produced by disease. I admit there may be a very few exceptions to this view, as, for instance, in poisoning by the strong mineral acids or alkalies; but with these exceptions, I should consider it extremely hazardous, in a capital case, to found an opinion as to death by poison *solely* on the post-mortem appearances of the stomach.

A third factor in the diagnosis is the examination of the urine *before* death in a suspected case. This examination ought never to be neglected by the attending physician. An analysis of the urine after death—especially long after death—is much less satisfactory, since it has been shown that a poison may penetrate from the stomach into the urinary bladder by a post-mortem imbibition, and so contaminate the urine.

After all, we must be compelled in such cases to fall back upon what are termed the "circumstances" of the case. One of the strongest of these circumstances is the symptoms manifested by the deceased before death. As is well known, most of the violent, irritant poisons, when taken in fatal doses, are accompanied by well-marked symptoms, which, to an experienced observer, are very suggestive. But it should be remembered, they are *merely suggestive:* they do not convey absolute *proof* by any means, because these very same symptoms are sometimes simulated by disease. Thus I have, more than once,

found large quantities of arsenic in the bodies of persons who were supposed to have died from cholera morbus, and who had been treated by physicians for this disease, and the cause of their deaths so certified by the physicians, so closely do the symptoms in both conditions resemble each other. But if the poison has been administered in small doses at intervals, then the symptoms are altogether different, and they may very readily be mistaken for those of some insidious disease.

And, finally, under this head, I should not omit to allude to those "circumstances" which, when they do occur, constitute a most important link in the chain of evidence: such as the existence of a strong impelling motive to the deed, on the part of the accused, or of some interest he may have had in the death of his victim—as, for example, the obtaining of a life-insurance claim. Likewise, the proofs of the purchase and actual possession by the accused of the very poison discovered in the body of the deceased; and, possibly, also the discovery of some implements belonging to the accused, such as, it might even happen to be, the very syringe and tube employed by him to inject the poisonous liquid after death, with enough of the remains of this liquid still adherent to the implements to be recognized by the toxicologist.

All these and many other such "circumstances" constitute invaluable material which an astute and judicious counsel will not fail to work up into most important testimony, either for or against the prisoner.

From what I have said, I think all must be impressed with the importance of the subject of the

post-mortem imbibition of poisons—especially to the toxicologist and the legal physician. My own mind has been especially directed to it in its relation to the unauthorized and indiscriminate use of poisonous mineral liquids, injected into the bodies of the dead, for the purpose of embalming or preserving these bodies, by several cases lately brought to my notice which occurred in neighboring States, and in which the ends of justice were completely foiled by this pernicious practice. In two of these cases the poisonous compound was injected soon after death into the abdominal cavity by an undertaker, apparently without any authority, or orders, but solely to follow out his own ideas, or to carry out his usual custom. Now, in both these cases, there was a strong suspicion of death by poisoning. I would ask, does not an undertaker by such unauthorized action, although perfectly innocent of any guilty connivance, render himself liable to a very strong suspicion of such guilty complicity? And might not even an innocent physician, performing this operation in kind compliance with the request of the real poisoner and, of course, without any suspicion of the true cause of death, thus subject himself to the terrible consequences of being accessory to the crime? The third case which was referred to me—strange to say, from the same State—was that of the wife of a clergyman, who had died under strong suspicions of poisoning by arsenic. The husband, very soon after the death, caused an arsenical solution to be injected into his wife's body, ostensibly with a view of preserving it, but doubtless with the intention of thwarting the ends of justice by thus

rendering the proof of poisoning impossible. The case was rendered stronger by the fact that this clerical Bluebeard had previously lost several wives, two of whom under precisely similar circumstances. The case, I learn, is still held under advisement, as the husband was not as yet under arrest, in consequence of certain family reasons.

Now, with a full knowledge of the above cases, and impressed with the danger and risk incurred by the community by this indiscriminate and unauthorized injection of dead bodies by undertakers and others, I some weeks ago sent a communication to our Board of Health, drawing their attention to the danger of allowing such indiscriminate embalming of the dead without proper authority, remarking, however, that I was not aware of any such cases occurring in this city, but that I knew of them elsewhere. My communication was intended to be merely precautionary: to call attention to an evil that did exist elsewhere, and which it was desirable to prevent getting a foothold here. I suggested the passage of an ordinance forbidding any undertaker, physician, or other person whatever, injecting any poisonous or embalming fluid into a dead human body, without proper authority, except for the preservation of subjects for dissection in medical colleges. I was glad to learn from a somewhat vigorous protest from one of our undertakers that such an indiscriminate use of embalming fluids was *not* common in this city. Still, the passage of such an ordinance might certainly be productive of good, since I have the most positive evidence that the practice alluded to is very common in other parts of our country.

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