

APPLICATIONS OF AMINES IN FORENSIC CHEMISTRY

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Crimes are committed by people. For the commission of crimes the criminals have to make use of things and places. They never intend to leave behind any clue which may lead to their identification. This aversion to leave behind any proof of identification clearly stems from their desire to avoid punishment. But in view of the inevitable aspects inherent in the commission of a crime it is virtually impossible on the part of a criminal to not to leave behind at least some proof of identification..

INTRODUCTION

The factors which constrain criminals to inadvertently create and deposit the proofs of their identification at the scenes of crime and elsewhere are manifold. A criminal commits a crime for profit or revenge. But motive part, a criminal falls into one of the two broad categories. Either he commits a crime under a spell of intensely provocative or enticing moment or he does it with premeditation, all the time being fully aware as to what he is doing.

A crime committed on the spur of the moment implies absence of premeditation and hence precaution, on the part of the criminal. Thus the immediate psychological aftermath in a person after committing such a crime is utter terror and confusion. The culprit is fully aware that he has just done something for which he has to pay to the society. The cost may be too dear to pay. As the full impact of the consequence of his crime comes upon him, he comes panic stricken. The very fact that he committed a crime in the heat of the moment indicates that he lacks self control beyond a certain point of emotional strain.

However, the automatic defence mechanism of self preservation inherited from his primitive ancestors and just dormant inside his subconscious mind goads him to try and cover up clues leading to his identification and capture. He tries hastily to cover up his trail with only a small fraction of his intelligence and reasoning power to guide him while the rest of his mortal faculties remains still shrouded under the gripping mist of terror and confusion.

The result of all these efforts on the part of the criminal is that he usually leaves behind a broader and clearer trail of himself than the original one he was trying to cover up.

A criminal of the second category, who commits crimes deliberately with premeditation, also faces hurdles equally difficult to surmount. The aim of all his prethought and preparation is to commit the crime and avoid punishment for the same. To achieve this feat he needs a vast amount of intelligent planning, stamina, circumspection and above all, complete self control before, during and after the commission of the crime. Besides these points, it is necessary for him to be quick-witted enough to be able to stand up to any situation arising out of emergency. No amount of pre-planning can guarantee an absolute perfection. The course of events may change at any moment and the situation may take a turn unforeseeable at the time of planning.

Under such circumstances the criminal has to count only on his ability to take swift and on the spot decision.

Besides, the above different extension factors are some common internal factors which handicaps the criminal of both the categories while trying to cover up their tracks. They work under great emotional strain because of their perpetual flash of detection. Their concentration in planning is continually eaten up at the roots by the feeling of guilty. They know of experience that although their crimes may not purport the capital punishment, yet their lives will be at stake. A criminal caught "red handed" at the crime has no sympathizer. Brutal beatings by the captors often leads to his permanent debilitation or even death. Even his confederates may turn against him to save their own skins at this expense. All the above factors feed on the stamina, concentration and confidence of a criminal and drastically cut down the chance of his safety. He is torn between strong and conflicting urges. A criminal under such mental strain is a desperate person with high strung nerves. He is capable of committing any atrocity including suicide.

The aforesaid factors culminate in the single, most important result that the criminal commits mistakes. In a nut shell, the criminal leaves behind his mistakes as physical evidences of his crimes.

If scientists are seekers and compilers of factual truth, the crime investigator is somewhat more than a scientist. An investigator applies science for his investigation of crimes and identification of criminals. In addition to the above, he has to testify before a court of law, under oath, as to the truth he has found out in connection with the point under reference. His testimony, when accepted by the court, is found to change, or even terminate, the course of life of a person under trial. Even his opinions are regarded and recognized as expert opinion by the courts and influence the course of justice. Hence a miscalculation on the part of an investigator may lead to the escape of criminals or, far worse, the conviction of the innocent. There is yet another effect of a miscalculation of the investigator. The acceptance of a testimony by the court of law depends on the fact of its being established as a truth beyond all reasonable doubts supported by physical evidences. The question of acceptance, or rejection, of even an expert opinion by the court of law is significant. It is to be borne in mind that no evidence, not even an expert opinion, may go unchanged at the court. It is the legal right of every person under trial to put up a defence. The counsel on either side is a formidable assessor of evidences capable of ripping open and laying bare any testimony with the slightest inconsistency. Even a single discrepancy in the testimony drawn out by the counsel on either side may lead to its rejection as evidence. Rejection of an expert opinion by the court implies the inconsistency of the opinion with truth. Repeated rejections of expert opinions of the same investigator carry the ominous potential of a structure from the court. Thus an investigator must take all precautions while forming an opinion on a point of reference.

Formation of expert opinion depends on recognizing physical evidences and drawing out the vital information contained in them. This information, when correctly interpreted, becomes the basis of the expert opinion. It is necessary to emphasize on correct interpretation of the information drawn out of physical evidences. Physical evidences are things and facts resulting from the criminals mutual contamination with his environments. Experts in the field of criminology assert that physical evidence can not perjure, can not be wholly absent and can not be wrong. Only erroneous investigation may distort it.

A very large number of articles may appear, singly or collectively, as physical evidence. They can be categorized in various ways, into sets of things having some common feature or origin. Such a set of physical evidences comprises of body fluids. The biological products like

blood, semen, urine, sweat etc. which frequently come across a crime investigation as physical evidences are known as body fluids.

Of all the body fluids that an investigator is called upon to examine, and often testify by, before a court of law, blood clearly stands out as the most important item. The unique importance of blood as physical evidence is due not only to the frequency of its occurrence as a point of reference in the process of crime investigation, but also to the immense diversity of scope it provides in proving or disproving a point and consequently, the guilt or innocence of the person under trial.

An investigator's duty includes detection, collection, preservation, typing and analysis of blood. The four important tests for the detection of the presence of blood are :

1. Benzidine test
2. Lucomalachite Green test
3. Phenolphthalein test
4. Luminol test

Out of these, benzidine test is the most sensitive, least time-consuming and widely used by the investigators the world over. This test is based upon the fact that benzidine, when oxidized in acidic solution turns the colour of the solution blue. Hydrogen peroxide oxidizes benzidine and brings out the blue colour in 30 minutes. But haemoglobin in blood, when added to the said solution, acts as a very rapid positive catalyst and brings about the blue colour in thirty seconds [9].

Attempts have been made to further intensify the colour in a benzidine test by the use of other catalysts in addition to haemoglobin. Eleven amines belonging to the primary, secondary and tertiary groups have been tested with. The standard procedure followed for the tests was as follows.

Strips of filter paper were soaked with blood. The amines were added first. After one minute, the acetic acid solution of benzidine was added followed by 5 drops of hydrogen peroxide. The colour developed within 30 seconds was noted. The result is recorded in Table I. This standard test with each individual amine was followed by the same test with a clean strip of filter paper without blood stain to ascertain if the particular amine under investigation has any property of interference in addition to that of intensification [5]. The results are recorded in Table II.

That, these two amines gave no colour in absence of blood. Addition of pyridine, quinoline and dimethyl aniline intensified the colour obtained by benzidine test. But the intensity of colour brought about is lesser than that obtained by N-butyl amine and iso-propyl amine.

Pretreatment of blood stains with dimethyl amine, diethyl amine, piperidine and aniline in benzidine tests check the intensity of the final colour. Addition of triethyl amine and diethyl aniline did not have any effect.

Blood detection tests are meant to either confirm or negate the presence of blood by tests carried out in the laboratory or field. Crime investigation, as already mentioned, is a post-facto process. Usually hours and days or sometimes even months may elapse before an investigator is even apprised of the commission of a crime. After the appraisal the investigative machinery is set in motion.

By this passage of time some physical evidences lose their value as such partially or entirely by interference of the environment and interaction with the natural elements. Under

the circumstances the investigator is left with no option but to make use of the best available information and evidences. As a result, in addition to the obvious physical evidences, he collects some items, which may be termed as potential physical evidences, for confirmatory test in the laboratory.

Thus it so happens that while one person supplies the data, it is quite another person who carried out the tests and testified before a court of law basing his opinion on the tests he made. Unless there is complete coordination and mutual understanding about the interfering factors in a test, the testifying officer can not get a true and reliable result.

In case of a benzidine test, interferences may come in two forms. By the latent action of the interfering factors, the test may give a positive result while actually there is no blood or it may give a negative result when there is blood. Moreover, the interference may come from within or without the laboratory. As shown earlier, contamination of the testing sample with methyl amine gives a very positive result in a test without the actual presence of blood.

Some strong oxydising agents like KMnO_4 give false positive results in benzidine test. Their presence is checked by omitting peroxide or perborate from the reagent in which case these materials give a positive reaction where as blood does not. A few other uncommon chemicals may react positively with one or more of the four most common tests. But none of them so far tested reacts in all four. These chemicals however are unlikely to occur at scenes of crimes and being almost always in careful hands, do not pose a grave problem in interference.

The other type of things which interfere in the tests with a false positive result are large in number, occur abundantly in nature and are most likely to interfere in tests. The role of the investigator collecting evidence from the scene of crime is very crucial. He must have complete knowledge of these interfering items and must be extremely circumspect so as to safeguard his collections against interference, particularly when one or more such factors are in the vicinity of his operation and in a position to contaminate the physical evidence collected by him. He must also report the presence of the interference to the laboratory, where the physical evidences are to be tested, mentioning each individual interfering factor he encountered during collection of evidence. The list of known interfering factors is given in Table III.

Table – III

	Name of interfering items	Effect on benzidine test
1.	Horse radish	Slower and weaker than blood
2.	Radishes	-do-
3.	Oranges	-do-
4.	Lemons	-do-
5.	Grape Fruits	-do-
6.	Grass and other green leaves	-do-
7.	Water Lemon	-do-

Further work has been done to find out the possible existence of interfering elements in common plants [10]. Out of 10 nos of plants tested, only five were noted to interfere positively in the benzidine test. The results are listed in Table IV.

Table – IV

	Name of Interfering items (Juice)	Effect on benzidine test
1.	Calotropis gigantean	Negative
2.	Tabernaemontana divaricata	Positive
3.	Jatropha curcas	Negative
4.	Musa paradisiacal	Positive (very faint)
5.	Musa sapientum	Positive (very faint)
6.	Carica papaya	Negative
7.	Michelia champaca	Negative
8.	Licopersicum esculentum	Negative
9.	Ipomoca cornea	Positive
10.	Artocarpus intergrifolia	Positive

The other category of items are those which interfere negatively in a benzidine test, *i.e.* give negative result even in the presence of blood. Experiments conducted in this line showed that only three of the commonly used laboratory chemicals interfere negatively in benzidine test. Those three chemicals are :

1. Piperidine
2. Aniline
3. Benzaldehyde

The first two in the list are amines which the third is an aldehyde.

Experiments to neutralize the effect of these interferences did not have any effect. As such, it appears, if the blood stains are contaminated with the above interfering agents, they are irrevocable spoiled and would no longer respond to benzidine test. Unless one is aware of the contamination, the negative in benzidine test will misguide the investigator to infer that there is no blood involved.



