HAEMOLYSED SAMPLES: A MAJOR CHALLENGE FOR FORENSIC SCIENCE LABORATORIES


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ABSTRACT

In Forensic Science Laboratories, so many cases are received under various crime heads. In Biology Division, cases are received under IPC.302, 307, 323, 363, 366, 376, 377, 498 etc. All cases are Medico-legal cases. In these cases, blood samples are major constituents for detection of blood groups. But unfortunately, some of these samples get haemolysed due to various reasons. Haemolysed samples are rather frequent occurrence in forensic science laboratories. In most of the cases, blood samples get haemolysed due to preanalytical sources related to incorrect procedures or failures to follow procedures for collection, handling, storage of the samples and delay for the examination. Since, haemolysed samples are often an important cause of inconclusive blood grouping; also it hampers the success rate of conviction. The objective of this study is to discuss the cause of haemolysis and success rate of the biological analysis.

KEYWORDS: Haemolysis, IPC, Blood group, Conviction rate.

INTRODUCTION

Hemolysis also spelled Haemolysis (hemo, haemo) means blood and (lysis) means “loosing”, “setting free” or “releasing” is the rupturing of erythrocytes (red blood cells) and release of their contents (cytoplasm) into surrounding fluid. (eg. blood plasma). In other words, Haemolysis is the breakage of red blood cells (RBC) membrane, causing the release of haemoglobin and other internal components into the surrounding fluids. Haemolysis is visually detected by showing a pink to red tinge in serum or plasma.\(^1\)

Haemolysis can occur from two sources. In-vivo haemolysis may be due to pathological conditions, such as autoimmune haemolytic anaemia or transfusion reaction\(^1, 2\) In-vitro
haemolysis may be due to improper sample processing, or sample transport.\[1,\ 2\] so there is a need to discuss about proper collection of samples, proper processing as well proper transport, so that the forensic analyst doesn’t face the problems. It is essential to develop effective processes for systematically collecting and handling the samples in forensic laboratory and also maintaining the good relations between forensic laboratory and law enforcement authority.

MATERIAL AND METHODS
The Current study was carried out at Directorate of Forensic Science Laboratories Biology Div. Mumbai, State of Maharashtra. Total one year’s Medico-legal cases were examined. A standard protocol was prepared which include ABO grouping. ABO blood grouping of samples were done by normal antigen-antibody agglutination.

RESULT AND DISCUSSION
After thorough analysis some observations are made
1) In case of post mortem blood of deceased: In some cases, blood samples sent by the medical officers, were already at various stages of decomposition. In case of haemolysed and decomposed blood samples, the blood grouping antigens on surface of red blood cells loose their structure. This results into improper and unreliable blood grouping results. So there was no way that these samples were to be reported as conclusive blood group.

2) In some cases, blood samples of injured/accused /victim, were collected by medical officers as control blood samples for matching in murder and rape cases, proper preservative was not added by concerned medical officer at the time of collection. (As proper preservative should be added by concerned person.)( Table 1).

3) While studying the cases, it was observed that, after collection of blood samples by medical officers, the police authority has not immediately forwarded these samples to forensic laboratory. The time lapse between the date of collection and date of deposition of these samples at FSL was more than 10 days. ( Table 2).

4) As there is time lapse and non-compliance of proper preservative addition, the samples get haemolysed and it became difficult to get proper blood grouping results.

5) Prolonged contact of serum or plasma with cells may results in haemolysis.\[2\]
6) Exposure to excessive heat or cold can cause RBC rapture and haemolysis.[3, 4]

7) In some cases, at the time of Liquid blood collection the dried blood stains on the sterile cotton cloths or gauze pieces were taken by concerned medical officers; these cotton cloths were packed in wet condition by medical officers, as the blood grouping antigens get deteriorated resulting in improper grouping results.

8) Besides Biology Division, test results from other division disciplines can be affected by haemolysis, especially in general analytical division. Haemolysis may cause certain analyses to be increased due to leakage of red cell constituents (eg. lactate dehydrogenise and potassium), or may cause interference in the test method (eg. spectrophotometer methods). The amount of interference will depend on degree of haemolysis and on the specific test method being used.[6, 7]

Table 1: Cases of Biological samples analysed from June 12 to June 13.

<table>
<thead>
<tr>
<th>Name of Region</th>
<th>No of exhibits analysed</th>
<th>No of Exhibits giving negative results</th>
<th>No. of Exhibits giving conclusive ABO grouping</th>
<th>No. of Exhibits giving inconclusive ABO grouping</th>
<th>Haemolysed blood samples</th>
<th>Delay in deposition of the cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mumbai</td>
<td>28590</td>
<td>9666</td>
<td>9896</td>
<td>9003</td>
<td>3369</td>
<td>199</td>
</tr>
<tr>
<td>Nagpur</td>
<td>23910</td>
<td>10886</td>
<td>7727</td>
<td>5297</td>
<td>791</td>
<td>130</td>
</tr>
<tr>
<td>Pune</td>
<td>25936</td>
<td>10573</td>
<td>6820</td>
<td>8543</td>
<td>4182</td>
<td>120</td>
</tr>
<tr>
<td>Aurangabad</td>
<td>16166</td>
<td>6188</td>
<td>6904</td>
<td>3094</td>
<td>662</td>
<td>545</td>
</tr>
<tr>
<td>Nasik</td>
<td>13488</td>
<td>5595</td>
<td>3336</td>
<td>4557</td>
<td>1134</td>
<td>1090</td>
</tr>
<tr>
<td>Amravati</td>
<td>12403</td>
<td>4736</td>
<td>3332</td>
<td>4304</td>
<td>966</td>
<td>668</td>
</tr>
</tbody>
</table>

- There are various reasons for getting inconclusive blood grouping but haemolysed blood samples were the major reason for getting inconclusive results.

Table 2:

<table>
<thead>
<tr>
<th>Reasons for inconclusive ABO blood grouping</th>
<th>Percentage on inconclusive blood grouping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of preservatives or time lapse and p.m. blood</td>
<td>40%</td>
</tr>
<tr>
<td>Delay in forwarding the sample from M.O &amp; I.O.</td>
<td>30%</td>
</tr>
<tr>
<td>Packing of wet blood stains resulting in fungal growth</td>
<td>20%</td>
</tr>
<tr>
<td>Inconsistent results</td>
<td>10%</td>
</tr>
</tbody>
</table>

CONCLUSION

Taking into consideration, all above mentioned observations, forensic laboratories takes due precautions to help the cause of law by proper analysis of whatever evidence material it
receives from concerned authorities. As the forensic science laboratory is the third agency after 1) medical officer and 2) police authority, to get the receipt of biological evidence material. It is always not possible to give conclusive findings.

Hence the meaningful factors associated with haemolysis rate includes lack of proper preservative addition in the samples which resulted in the haemolysis rate of 30 %. In addition, use of wet gauze piece and cotton cloths resulted in a haemolysis rate of 10%. (Table 2).

The time interval between the date of collection and date of deposition of the samples to FSL has statistically significant which causes higher haemolysis rate than the other factors which are mentioned in above discussion.

The rate of haemolysis is remarkably higher in the samples which were obtained in post mortem cases.

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