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Hemolyzed blood test

As a library, NLM provides access to scientific literature. Inclusion in an NLM database does not imply endorsement of, or agreement with, the contents by NLM or the National Institutes of Health. Learn more: PMC Disclaimer | PMC Copyright Notice . 2020 Sep 2;35(1):e23561. doi: 10.1002/jcla.23561 Although the effect of hemolysis has been extensively evaluated on clinical biochemical tests, a practical guidance for laboratory staff to rapidly determine whether a hemolyzed blood sample is acceptable and how to interpret the results is lacking. Here, we introduce a chart as a convenient reference for dealing with such samples. Serum samples with 0.1%, 0.3%, 1%, 3%, and 10% hemolysis were prepared from sonicated endogenous red blood cells and received 35 wet and 22 dry clinical biochemical tests, respectively. The contributing part in the biochemical test result at each hemolysis condition was derived by subtracting the original test result of this sample with no hemolysis. The net results were used for analyses and preparation of the reference chart. The reference chart displayed the analytically calculated hemolysis interference and related statistical analyses. The chart also provided the color appearance of serum samples at each hemolysis condition for clinical staffs to determine whether a hemolyzed sample could be accepted. In clinical laboratories, preparation of such a reference chart is extremely useful in dealing with hemolyzed blood samples for clinical biochemical tests.Keywords: clinical biochemical test, hemogram test, hemolysis, hemolytic index In clinical laboratories, hemolysis is one of the major problems that interfere with biochemical tests, 1 , 2 , 3 representing a frequent reason for blood sample rejection. 4 , 5 , 6 For example, the normal range of serum potassium ion (K+) concentration is 3.5 ~ 5.5 mmol/L, while the intracellular potassium ion (K+) concentration is approximately 150 mmol/L. Therefore, even 1% of red blood cell hemolysis in the serum will add 1.5 mmol/L to the K+ result, yielding a cautious K+ value that might initiate unnecessary medical actions. Indeed, it is commonly known that K+ measurement is affected by hemolysis. Similar problems also occur with measurements of lactate dehydrogenase (LDH) and creatine kinase-MB (CK-MB), which are critical for the diagnosis of emergent cardiac events. Hemolyzed samples are often rejected for some routine biochemical. However, this is problematic when patients are in unfavorable conditions, and redrawing a blood sample is not feasible, or when hemolysis is an actual medical condition in some patients. 7 , 8 The impact of hemolysis on clinical chemistry tests has been extensively investigated, 9 , 10 , 11 and quantitative analyses have been provided in numerous reports. 2 , 3 , 12 Additionally, the appropriate management of these samples in clinical laboratories has been suggested. 13 , 14 , 15 However, handy practical guidance as a convenient reference for clinical technicians to ascertain whether a hemolyzed sample for routine biochemistry testing is acceptable and how to interpret the results of these samples after analyses is urgently needed. Therefore, we performed this study to provide a chart that can be easily used as a reference by clinical laboratories when dealing with hemolyzed blood samples during routine clinical biochemistry tests. Blood samples were collected from individuals during a routine physical examination for health screening at our clinical laboratory. Samples with an increase in the white blood cell count, positive HBsAg, or any other signs of infectious conditions were excluded. All samples were further screened for HIV, HCV, and syphilis antibodies, and the results were negative. For the serum samples, the biochemical test results covered the relatively low, moderate, and high range as much as possible. Additionally, EDTA-anticoagulated whole blood samples (used for the routine blood cell count test) were collected from the same individual in a sufficient amount for artificial hemolysis preparation. This ensured the condition of endogenous hemolysis and avoided a possible aggregation resulting from unmatched blood types. Finally, 20 serum samples, with corresponding EDTA-whole blood samples, were collected. Briefly, 1.0 mL of the EDTA-anticoagulated whole blood samples was centrifuged to retain the red blood cells (RBCs) and then washed with saline three times until the saline became clear. Deionized water was added to the RBCs to achieve a volume of 1.0 mL. As this was insufficient to break down RBCs completely, the sample was then sonicated by a microtip at 30% amplitude for 5 seconds three times, at 5-second intervals. Complete hemolysis was confirmed under a microscope. The same sonication condition was applied to a serum sample in a preliminary study to ensure that the sonication imposed no impact on the clinical biochemistry analytes because sonication might denature the biochemical enzymes, generating false-negative results. Next, 0.1, 0.03, and 0.01 mL of the above prepared hemolyzed sample were added to a 0.9, 0.97, and 0.99 mL serum, respectively, to achieve 10%, 3%, and 1% hemolyzed samples. Additionally, 0.3% and 0.1% hemolyzed serum samples were prepared from the 3% and 1% hemolysis samples. Hemoglobin concentrations in the samples were measured using OC-SENSOR IO (Eiken Chemical Co., Ltd.) with appropriate dilutions. Before and after the hemolysis preparation, all samples received biochemical tests on the analyzer AU5400 (Beckman Coulter) and the Vitros FS 5,1 dry chemistry system (Ortho Clinical Diagnostics). The results were corrected based on the amount of lysed RBCs added. For example, for the 1% hemolysis sample in which 0.01 mL hemolyzed red blood cells were added to 0.99 mL serum, the measured result was divided by 0.99 (99.0%) to adjust the volume dilution. For each sample, the test results of each analyte at different hemolytic conditions (0%, 0.1%, 0.3%, 1%, 3%, and 10%) were derived by subtracting the original level (the test result at 0% hemolysis). The net results were considered contributions from the hemolyzed RBCs and were summarized in the chart with statistical analyses for use as a reference. For example, the ALT measurements of the first sample after volume dilution correction were 43.10, 43.44, 42.93, 41.11, and 38.14, 29.56 U/L at 0%, 0.10%, 0.30%, 1%, 3%, and 10% hemolysis, respectively. After subtracting 43.10 U/L (0% hemolysis), the results were 0.00, 0.34, −0.17, −1.99, −4.96, −13.54 U/L for summarization in the chart and analyses. The statistical analyses included one-way ANOVA, linear regression, and correlation coefficient, excluding results beyond the detectable range. P