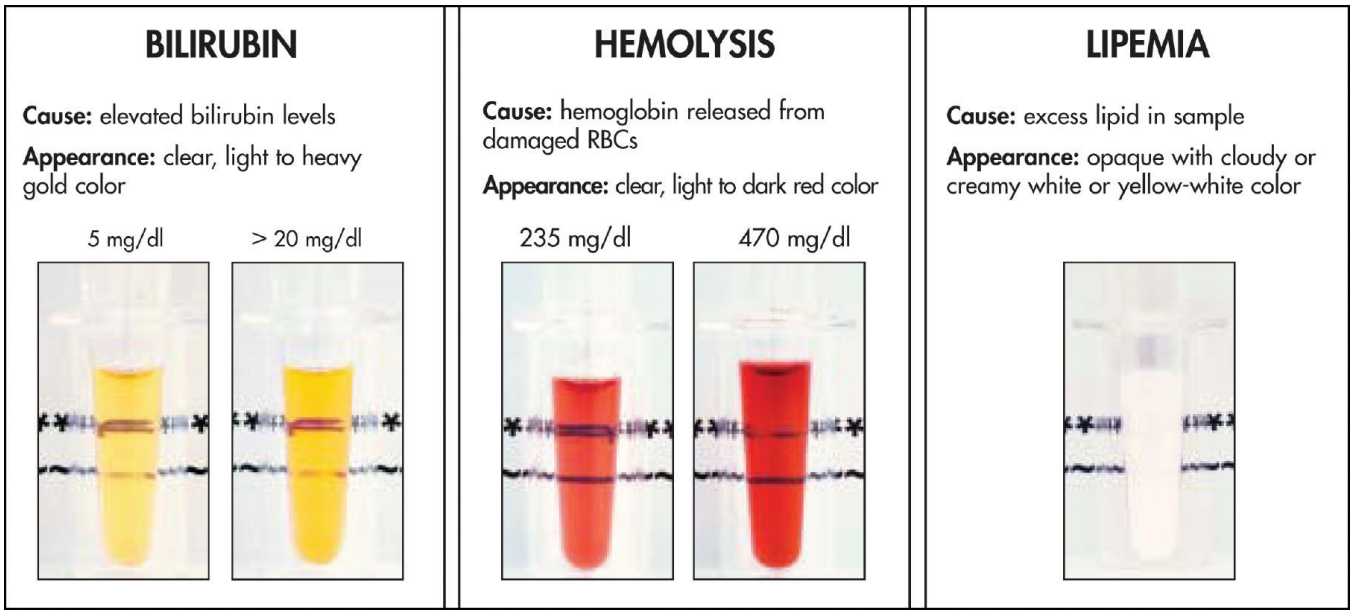
Common Interfering Substances in Clinical Chemistry

Background

Lipemia, hemolysis, and icterus (hyperbilirubinemia) are common interferents in all clinical chemistry systems. The purpose of this document is to provide background on interferents and to characterize which biochemistry test reactions on Element DC® and DRI-CHEM® Veterinary Chemistry Analyzers may be altered by interferents to a degree that influences data interpretation. Such alteration is defined as a change of >10% in the test result.

For visual reference, the pictures below indicate the gross appearance of serum samples with major degrees of interferent present. The background helps visualize the presence or absence of transparency.



Lipemia is the most common problem on liquid chemistry systems, including rotor systems, because the turbidity associated with lipemia scatters light in the measurement of absorption by the reactant fluid. Dry chemistry systems such as the Element DC and DRI-CHEM Analyzers are not affected by lipemia because reflectance, rather than absorbance, of the color reaction is measured.

Because hemolysis and hyperbilirubinemia can introduce background color there is potential for interference with clinical chemistry measurements done by colorimetric technique.

Summary of Interferents for Heska's Veterinary Chemistry Analyzers

Chemistry reactions were tested on the analyzers with increasing concentrations of common interferents. Results are summarized below:

1. Lipemia: None of the reactions on the analyzers are affected by lipemia.
2. Icterus: One test is affected by hyperbilirubinemia. The amylase activity may be decreased modestly when the total bilirubin concentration is greater than 5 mg/dl and may decrease 20–30% if the bilirubin concentration is in the range of 20 mg/dl; a bilirubin concentration this high is a rare occurrence.

3. Hemolysis: Interferences caused by hemolysis are minimal on Heska's Analyzers. The few reactions affected by hemolysis are summarized below.
    - GGT: Hemolysis will cause falsely high GGT values. Levels above normal range can occur starting with hemolysis resulting in 75 mg/dl hemoglobin, or approximately 0.5% hemolysis. The false high levels are caused by substances released from the cells, and are unrelated to hemoglobin itself. With hemolysis resulting in hemoglobin levels of 400 mg/dl the GGT value can rise to approximately 40 U/L. Excessive gross hemolysis can yield GGT values in excess of 200 U/L.
    - Total Bilirubin: The hemoglobin absorbance will overlap with the bilirubin absorbance. False high increases in total bilirubin begin at 100 mg/dl of hemoglobin from hemolysis related to sample collection or handling. The increase has an appreciable effect only on samples with normal bilirubin concentration. The magnitude of total bilirubin values anticipated from visible hemolysis to gross hemolysis may range from about 0.4 to 1.5 mg/dl. In the presence of true hyperbilirubinemia of 4 mg/dl or higher, the effect of hemolysis on bilirubin measurement becomes negligible.
    - Total Protein: Grossly visible hemolysis is expected to contribute positively to the total protein measurement because hemoglobin is a protein measured in the total protein reaction in all systems. The total protein is anticipated to increase by the amount of hemoglobin present. This is typically in the 0.1 to 0.5 g/dl range (100–500 mg/dl hemoglobin).
    - Albumin: Hemolysis may cause a modest false high albumin value when hemoglobin concentration in the sample is 400 mg/dl or higher. This may be due to dye binding to the hemoglobin molecule.
    - Magnesium: Hemolysis may cause a modest false high magnesium value when hemoglobin concentration in the sample is 400 mg/dl or higher.
    - Amylase: Hemolysis may cause a modest false low amylase activity when hemoglobin concentration in the sample is 100 mg/dl or higher. With gross hemolysis of hemoglobin concentrations of 400 mg/dl or higher, the magnitude of decrease may be 20–30%.
    - ALP: Hemolysis may cause a modest false low ALP activity when hemoglobin concentration in the sample is 100 mg/dl or higher. With gross hemolysis of hemoglobin concentrations of 400 mg/dl or higher, the magnitude of decrease may be 20–40%.
4. Electrolytes: Because electrolytes are measured by potentiometry rather than colorimetry, common interferents do not affect them. Chloride concentrations will be falsely increased when bromide concentrations are 7 mmol/L or higher.