

Sample collection planning for hematology and/or clinical chemistry testing:

Step 1: What sample type do you need?

- a. **Hematology only:** Submit anticoagulated (unclothed) whole blood in **EDTA**. Blood should be submitted within 1-2 hours of collection, or refrigerated for a maximum of 4 hours prior to submission. Mix immediately after draw to reduce potential clotting.
- b. **Chemistry only:** Submit serum or Lithium Heparin plasma for most routine chemistries. View “Sample Type” on Page 2 of desired analytes. Whole blood can be submitted in the required tube for serum harvesting at the diagnostic lab if submission is within 2 hours of blood collection. Prolonged serum/plasma contact with RBC’s will alter some analytes. If samples are being separated in your lab, please consult us for appropriate sample handling & storage strategies.
- c. **Hematology and chemistry:** submit a) anticoagulated whole blood in EDTA for hematology, and b) serum or plasma for chemistry (as above, serum or plasma can be refrigerated up to 24 hours prior to submission, or frozen in many cases – check with us first).

Step 2: What sample volume do you need?

- a. **Hematology:**
 1. A full CBC or any automated hematology test requires 250 μ L of EDTA-anticoagulated whole blood. CBC’s can be performed with a minimum of 150 μ L of EDTA-anticoagulated blood in a microtainer, however, the blood to EDTA ratio will be off and may affect RBC morphology and MCV.
 2. A blood smear for differential or cellular morphology only requires 10 μ L of EDTA-anticoagulated whole blood.
- b. **Chemistry:**
 1. To calculate the volume of serum or plasma needed, start with 50 μ L (the “dead space” volume).
 2. To 50 μ L, add the volume(s) needed for each test or panel (see Table page two).
 3. This is the total volume of serum or plasma needed. To calculate the volume of whole blood needed to obtain this amount of serum or plasma, multiply the number by 2.5.
*Example: If a liver panel will be ordered, add 50 μ L (dead space volume) to 82 μ L (volume needed for liver panel) = 132 μ L of serum or plasma is needed.
For whole blood draw volume, multiply this by 2.5: 132 μ L x 2.5 = 330 μ L of whole blood is needed.*

Notes about obtaining a good blood sample:

- 1) A good, clean, quick flowing blood draw is best for both CBC and chemistries. Slow draws can lead to clotting before the blood can be placed into the EDTA microtainer and also can contribute to hemolysis.
- 2) It is ok to draw a SMALL amount of heparin (1:1000 or more dilute) to “flush” the needle. We recommend filling the needle hub about halfway, no more. Our studies have shown that this small amount of heparin does not likely affect the platelet count, as long as the sample is placed into an EDTA tube for hematology. Ideally an EDTA “flush” can be used for hematology samples ONLY (EDTA is not acceptable for several chemistry analytes).
- 3) Be sure to fill anticoagulant tubes to proper volumes. The EDTA and lithium heparin microtainers should be filled between the lower and upper fill lines. Under-filling tubes may cause artifacts. Over-filling tubes can lead to sample clotting and rejection of the sample.
- 4) **Blood drawing training videos can be found at: [Place link to website training videos](#)**
- 5) If you need help with animal procedures, contact our veterinary staff at 650-724-5524 or visit <http://vsc.stanford.edu/services/vetmed.html#vettech>

| Panel or test | Analyte(s): | Volume (µL) | Sample type |
|----------------------------|--|-------------|---------------------------------------|
| Complete Chemistry Panel | Alb, TP, AlkPhos, ALT, AST, GGT, Cholesterol, GLU, BUN, Creat, Ca, Phos, Bilirubin, Lytes, CO2 | 177 | Serum, Plasma (LiH only) |
| Cardiac BioMarker Panel | BNP, CRP, Troponin I | 40 | Serum, Plasma (LiH, NaH) |
| Electrolyte Panel | Na, K, Cl, CO2 | 45 | Serum, Plasma (LiH only) |
| Lipid Panel | Chol, Trig, HDL, LDL | 13 | Serum, Plasma (LiH, NaH) |
| Liver Panel | AST, ALT, Alk Phos, GGT, Bilirubin | 82 | Serum, Plasma (LiH, NaH) |
| Metabolic Panel | Glu, BUN, Creat, Lytes, CO2 | 71 | Serum, Plasma (LiH only), Urine |
| PreClinical Toxicity Panel | Chemistry Panel plus CK, Triglyceride, Urine S/G | 245 | Serum, Plasma (LiH only), Urine |
| Renal Panel | BUN, Creatinine, Phos, Alb, Lytes | 74 | Serum, Plasma (LiH only), Urine |
| Individual Tests: | AST | 20 | Serum, Plasma (LiH, EDTA) |
| | Albumin | 3 | Serum, Plasma (LiH, EDTA) |
| | Alkaline Phosphatase | 7 | Serum, Plasma (LiH, NaH) |
| | Amylase | 10 | Serum, Plasma (LiH, NaH) |
| | ALT | 20 | Serum, Plasma (LiH, EDTA) |
| | Bilirubin - Total | 10 | Serum, Plasma (LiH, EDTA) |
| | Bilirubin - Direct | 10 | Serum, Plasma (LiH, EDTA) |
| | BUN | 3 | Serum, Plasma (LiH, EDTA), Urine |
| | Calcium | 5 | Serum, Plasma (LiH, NaH) |
| | Chlorine (includes Na & K) | 40 | Serum, Plasma (LiH only), Urine |
| | Cholesterol | 3 | Serum, Plasma (LiH, EDTA) |
| | CO ₂ Enzymatic | 5 | Serum, Plasma (LiH only) |
| | BNP | 8 | Serum, Plasma (LiH, NaH) |
| | Na/K (includes Chlorine) | 40 | Serum, Plasma (LiH only), Urine |
| | CK - Total | 14 | Serum, Plasma (LiH, EDTA) |
| | Creatinine | 20 | Serum, Plasma (LiH, NaH, EDTA), Urine |
| | CRP (C-Reactive Protein) | 12 | Serum, Plasma (LiH, EDTA) |
| | Electrolytes (potassium, sodium, and chloride) | 40 | Serum, Plasma (LiH only), Urine |
| | Fructosamine * | 18 | Serum, Plasma (EDTA) |
| | GGT | 15 | Serum, Plasma (LiH, EDTA) |
| | Globulin | 13 | Serum, Plasma (LiH, EDTA) |
| | Glucose | 3 | Serum, Plasma (LiH, NaH, EDTA), Urine |
| | HDL | 3 | Serum, Plasma (LiH, NaH, EDTA) |
| | Hemoglobin A1C * | 200 | EDTA Whole Blood |
| | Iron, Total | 25 | Serum, Plasma (LiH, NaH) |
| | Lactic Acid * | 4 | Serum, Plasma (NaF only) |
| | LDH (Lactate Dehydrogenase) | 8 | Serum, Plasma (LiH, NaH) |
| | Lipase | 3 | Serum, Plasma (LiH, NaH) |
| | LDL | 3 | Serum, Plasma (LiH, NaH, EDTA) |
| | Magnesium | 4 | Serum, Plasma (LiH, NaH), Urine |
| | Microalbumin | 17 | Urine |
| | Phosphorus | 3 | Serum, Plasma (LiH, EDTA), Urine |
| | Protein, Total | 10 | Serum, Plasma (LiH, NaH, EDTA) |
| | TIBC (Total Iron Binding Capacity) | 25 | Serum, Plasma (LiH, NaH) |
| | Triglycerides | 4 | Serum, Plasma (LiH, NaH) |
| | Troponin I | 20 | Serum, Plasma (LiH, NaH) |
| | Uric Acid | 10 | Serum, Plasma (LiH, NaH, EDTA) |

*Call the laboratory prior to collection and submission.