

Hematocrit-Anticoagulant Adjustments

PRINCIPLE

Patient's blood with a high hematocrit will contain less plasma. As a result, when the blood is centrifuged, the plasma fraction will contain an increased concentration of anticoagulant. All coagulation procedures drawn in citrate tubes will be affected. Invalid prolonged results may result when the hematocrit exceeds 55%. Hematocrits drawn within 24 hours of the coag order are acceptable for use.

SAMPLE INFORMATION

3.2% citrated whole blood. Adjust citrate to proper level.

EQUIPMENT

pipets
pipet tips
3.2% Sodium Citrate (Blue top) tubes

QUALITY CONTROL

Specimen should be obtained using a non-traumatic venipuncture.
Process all coagulation specimens promptly.

PROCEDURE

1. The formula to calculate the appropriate sodium citrate volume is:

$$C = (1.85 \times 10^{-3})(100 - \text{HCT})(V_{\text{Blood}})$$

Where:

C is the volume of citrate remaining in the tube;

HCT is the hematocrit of the patient;

V is the volume of blood added (if a 5 ml tube is used, then the volume is 4.5 mL); and

1.85×10^{-3} is constant (taking into account the citrate volume, blood volume and citrate concentration).

2. Example: Patient has a hematocrit of 60%, and blood is to be drawn into a 5.0 mL blue-top tube.

Adjusted citrate volume is calculated as follows:

$$C = (1.85 \times 10^{-3})(100 - 60)(4.5 \text{ mL})$$
$$C = 0.33 \text{ mL}$$

Remove: $0.5 - 0.33 = 0.17$ mL of citrate

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- Using a pipette, withdraw the amount of anticoagulant indicated and discard.
- Mark the 5.0 mL volume line on the tube and notify personnel obtaining specimen of special instructions.
- Draw the patient using a syringe, remove cap and add blood to the 5.0 mL mark. Mix well.

Note: The chart below has some pre-calculated volumes.

Correction Chart — 4.5 mL tube		
HCT	Citrate Volume Needed	mL To Remove
57	0.36	0.14
60	0.33	0.17
63	0.31	0.19
66	0.28	0.22
69	0.26	0.24
71	0.24	0.26
74	0.22	0.28
77	0.19	0.31

- Example: Patient has a hematocrit of 59% and blood is to be drawn into a 3.0 mL blue-top tube.

Adjusted citrate volume is calculated as follows:

$$C = (1.85 \times 10^{-3})(100-59)(2.7 \text{ mL})$$

$$C = 0.20 \text{ mL}$$

Remove: $0.3 - 0.20 = 0.10$ mL of citrate.

- Follow steps 3 - 5 above using the 3.0 mL mark.

Note: The chart below has some pre-calculated volumes.

Correction Chart — 2.7 mL tube		
HCT	Citrate Volume Needed	mL To Remove
57	0.21	0.09
60	0.20	0.10
63	0.18	0.12
66	0.17	0.13
69	0.15	0.15
71	0.14	0.16
74	0.13	0.17
77	0.11	0.19

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8. Infant Samples:

- a. The hematocrit **must** be done on all infants with coagulation orders **before** coagulation tests are drawn.

9. Example: Patient has a hematocrit of 60% and blood is to be drawn into a 2.0 mL blue-top tube.

$$C = (1.85 \times 10^{-3})(100-60)(1.8 \text{ mL})$$

$$C = 0.13 \text{ mL}$$

Remove: $0.2 - 0.13 = 0.07 \text{ mL}$ of citrate.

10. Follow steps 3 - 5 above using the 2.0 mL mark.

Note: The chart below has some pre-calculated volumes.

Correction Chart — 2.0 mL tube		
HCT	Citrate Volume Needed	mL To Remove
57	0.14	0.06
60	0.13	0.07
63	0.12	0.08
66	0.11	0.09
69	0.10	0.10
71	0.10	0.10
74	0.09	0.11
77	0.08	0.12

REFERENCES

CLSI Guideline "Collection, Transport and Processing of Blood Specimens for Testing Plasma-Based Coagulation Assays and Molecular Hemostasis Assays; Approved Guideline – Fifth Edition," H21-A5 Vol. 28 No. 5, page 8