

# CITRATE ANTICOAGULATION

<b>Mechanism</b>	Regional citrate anticoagulation chelates calcium required for the coagulation cascade to create clotting factors involved in thrombus formation.
<b>Cautions</b>	Hypocalcemia will occur, requiring supplemental calcium during use; metabolic complications including hyponatremia, metabolic acidosis and citrate toxicity can occur. <i>Note:</i> Blood products are preserved in citrate to prevent clotting; transfusion of a large amount of blood products or use of systemic citrate infusions can lead to hypocalcemia and reduced blood pressure unless concurrent calcium supplementation is provided.
<b>ACD-A Solution</b> (224 mmol/L sodium, 112.8 mmol/L citrate)	<ul style="list-style-type: none"> <li>• Dextrose 2.45 g/100 mL</li> <li>• Sodium citrate 2.2 g/100 mL</li> <li>• Citric acid 730 mg/100 mL</li> </ul>
<b>Catheter Flush</b>	4% citrate solutions have been assessed in maintaining catheter patency, but are not commercially available in large quantities; ACD-A solution has been used as an alternative; more concentrated citrate solutions have been explored for additional antimicrobial properties but can lead to metabolic effects if instilled into the systemic circulation.
<b>Renal Replacement Therapy</b>	Regional citrate is one option to heparin to prevent thrombosis of the hemodialysis circuit; protocols for its use should be developed in advance and persons responsible for managing trained; protocols will vary between dialysis circuits; in general, citrate anticoagulation can maintain circuits and preserve filters longer than heparin-related anticoagulants.

(continued)

<p><b>Example Citrate and Calcium Protocol</b> (using ACD-A solution in CRRT)</p>	<p>Citrate infusion:</p> <ul style="list-style-type: none"> <li>• Rate = circuit blood flow x 0.03</li> <li>• Check ionized calcium q 6 hr</li> <li>• Adjust rate according to circuit ionized calcium level (1.0–1.4 mg/dL (e.g., if rate 200 mL/hr, increase rate 30 mL/hr if &lt;1 mg/dL, decrease by 30 mL/hr if &gt;1.4 mg/dL))</li> </ul> <p>Calcium infusion:</p> <ul style="list-style-type: none"> <li>• Make a calcium gluconate IV solution of 12 g in 0.9% NaCl total volume of 250 cc (or 24 g in 500 cc 0.9% NaCl)</li> <li>• Infuse 30 mL/hr via the central line</li> <li>• Calcium level every 6 hr (target ionized calcium of 3.7–4.4 mg/dL)</li> <li>• &lt;3 mg/dL: stop citrate for 30 min; give 4 g calcium gluconate IV over 2 hr via central line; increase calcium infusion by 20 mL/hr and decrease citrate infusion by 30 mL/hr</li> <li>• 3.0–3.19 mg/dL: give 2 g calcium gluconate IV over 1 hr via central line; increase calcium infusion by 15 mL/hr</li> <li>• 3.2–3.6 mg/dL: increase calcium gluconate infusion by 10 mL/hr</li> <li>• 4.5–4.8 mg/dL: decrease calcium gluconate infusion by 10 mL/hr</li> <li>• 4.9–5.6 mg/dL: decrease calcium gluconate infusion by 15 mL/hr</li> <li>• &gt;5.6 mg/dL: hold calcium infusion</li> </ul> <p>At very low or high levels, physician notification should be considered.</p>
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hr: hours, IV: intravenous, min: minutes, NaCl: sodium chloride, q: every

Source: Bury LD, Tung DD, Hallett D, et al. Regional citrate anticoagulation for PrismaFlex continuous renal replacement therapy. *Ann Pharmacother.* 2009;43:1419–1425.