

CHILDHOOD LEAD POISONING TREATMENT GUIDELINES

GUIDELINE #3: INPATIENT CHELATION WITH CaNa²EDTA ALONE

CRITERIA FOR TREATMENT:

This protocol is appropriate for children with confirmed venous blood lead levels (VPb) **45-69 ug/dL** if the following conditions are met:

- 1) The patient is **asymptomatic**. If the patient has signs of acute encephalopathy treatment guideline #4 is recommended. A careful **history** should be taken for possible signs or symptoms of acute toxicity. **Symptoms** of lead poisoning include the following:
 - GI: Anorexia, constipation, abdominal pain, vomiting
 - CNS: Irritability (may be subtle), lethargy, change in sleep or behavior patterns, headache, decreased play, ataxia, decreased coordination, vomiting
 - Severe involvement: Seizures, coma, hypertension, papilledema, cranial nerve paralysis
- 2) They are **not candidates for oral chelation** with Chemet (usually because of use of CaNa²EDTA and BAL within the previous 2 weeks). The decision to use CaNa²EDTA or Chemet for inpatient chelation is multifactorial taking into account degree of VPb and ZPP elevation, acuity or chronicity of exposure, patient's age, and whether this is an initial or repeat chelation.
- 3) Absence of pre-existing renal or hepatic disease
- 4) Phone inpatient lab and pharmacy to assure adequate access to lab testing requirements and medications.

ADVERSE EFFECTS OF CaNa²EDTA:

- 1) Renal: The most common toxicity is kidney dysfunction. Tubular necrosis is dose related, generally reversible, and manifested as hematuria and proteinuria. Assure adequate hydration (either PO, NG, or IV) to keep the urine specific gravity < 1.020 at all times.
- 2) Cardiovascular: Adverse effects include hypotension and cardiac rhythm irregularities (bradycardia, AV block, ventricular dysrhythmias). ECG monitoring for arrhythmias during CaNa²EDTA infusion is necessary. **Consider cardiology consultation if a worrisome rhythm develops. Strongly consider PICU admission and/or telemetry during CaNa²EDTA infusion.**
- 3) Skin: Observe IV site carefully to monitor for infiltration, which may cause skin sloughing.

PRIOR TO TREATMENT:

- 1) A careful **history and physical exam** should be conducted to verify that the patient is **asymptomatic**.
- 2) **Exposure history**, including occupational history of parents, should be obtained and documented.
- 3) Obtain **BP, urine dip and specific gravity**. Confirm **height and weight**. Calculate Body Surface Area (for dosing).
- 4) Iron must be stopped during this time of chelation therapy.
- 5) **Laboratory**: see table below

Algorithms are not intended to replace providers' clinical judgement or to establish a single protocol. Some clinical problems may not be adequately addressed in this guideline. As always, clinicians are urged to document management strategies.

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PRIOR TO TREATMENT, Continued:**6) Radiologic Studies:**

Obtain an abdominal x-ray on any child with newly diagnosed lead poisoning or any child with known lead poisoning with an increase in lead level not consistent with a post-chelation rebound. X-ray evidence of lead in the gastrointestinal tract, particularly in the stomach and small intestine, indicates the need for gut decontamination. Lead has no appreciable absorption in the colon or rectum.

7) All families should be referred for a **social work assessment** (for housing assistance)

TREATMENT:

- 1) If there is x-ray evidence of lead in the gastrointestinal tract, GI decontamination should be carried out. Polyethylene glycol solution (GoLyteLy) can be used for lead densities in the stomach and/or small intestine. Lead has no appreciable absorption in the colon or rectum. The dose of GoLyteLy is 20-40 ml/kg/hr up to a maximum of 1000 ml per hour via nasogastric tube for a minimum of 4 hours and/or until the patient has a bowel movement.
- 2) After assuring adequate urine output, chelation is initiated with an intravenous CaNa²EDTA infusion for 5 consecutive days.
- 3) Dosing of CaNa²EDTA
 - For IV infusion, the total daily dose is 1000 mg/m²/day; it must be diluted in 250-500 ml of either 5% dextrose and water or in 0.9% saline solution.
 - The infusion must be diluted to a concentration of < 0.5% (5 mg/ml) in either 5% dextrose and water or in 0.9% saline solution. It is incompatible with any 10% dextrose solution, lactate Ringers, and other Ringers solutions. Each 5 ml ampule contains 1000 mg CaNa²EDTA in water (equivalent to 200 mg/ml). One ampule diluted in 250 ml of either 5% dextrose or 0.9% saline solution will give a concentration of < 0.4%.
 - The rate of infusion should be calculated to deliver the total dose in 24 hours. Because 250 ml and 500 ml IV fluid bags have a range of 20-50 ml overflow, the rate of volume administration must be adjusted such that 250 ml or 500 ml be administered over 20 hours; the residual should be administered over the remaining 4 hours.
 - FOR CaNa²EDTA DILUTED IN 250 ML OF VOLUME, the rate should be set at 13 cc/hr for 20 hours. Any residual volume can be delivered over the remaining 4 hours.
 - FOR CaNa²EDTA DILUTED IN 500 ML OF VOLUME, the rate should be set at 25 cc/hr for 20 hours. Any residual volume can be delivered over the remaining 4 hours.
- 4) IV fluids must be given to maintain adequate hydration - to keep urine specific gravity < 1.020 at all times.
- 5) Monitoring
 - ECG monitoring for arrhythmias during CaNa²EDTA infusion is necessary. It can be interrupted for brief periods when the daily infusion has completed.
 - Check BP with vital signs every 4 hours
 - Check urine dip stick on all specimens during chelation therapy for specific gravity, leukocyte esterase, hemoglobin, and protein
- 6) Laboratory Testing – see table for recommended schedule
 - The occurrence of symptoms or lab abnormalities during or prior to chelation indicates the need for more frequent lab surveillance.

<u>DAY 1 BASELINE</u>	<u>DAY 3</u>	<u>DAY 5</u>	<u>DAILY</u>
VPb (Venous Lead Level)	VPb obtain at least 2 hrs after infusion is completed	VPb obtain at least 2 hrs after infusion is completed	Urine dip and specific gravity each shift
CBC with differential ZPP (Zinc Protoporphyrin) Iron, Ferritin, TIBC	ZPP	ZPP	Urinalysis, if urine dip is positive for blood, protein, or LE
CMP	CMP	CMP	

VPb: 1 ml in lavender micro
ZPP: 0.2 ml in lavender micro
CMP: 0.6 ml in mint green micro

CBC: 0.5 ml in lavender micro
Iron studies - Iron, Ferritin, TIBC: 3 ml in gold

CRITERIA FOR DISCHARGE:

- The child must be discharged to a lead safe environment.** The lead status of the home will be determined for Maine patients by the Maine Childhood Lead Poisoning Prevention Program (MCLPPP), (207) 287-4311 or for New Hampshire patients by the Healthy Homes and Lead Poisoning Prevention Program (HHLPPP), (603) 271-4507 and (800) 897-5323.
- The parent or caregiver must be able to attend follow-up appointments and laboratory testing.

FOLLOW-UP:

- The first follow-up visit should be one week after chelation has been completed, and, then, again at two weeks after chelation has been completed. Follow-up should continue at monthly intervals until the VPb is < 15 ug/dL, then, every two to three months.
- The following labs should be obtained at each follow-up visit
 - VPb: 1 ml in lavender micro
 - ZPP: 0.2 ml in lavender micro

Rechelation is indicated if at any time after 2 weeks, the VPb is > 45 ug/dL, or > 40 ug/dL in the face of a large lead burden (elevated ZPP). Many children will require more than one round of chelation therapy.
- Continue monitoring until VPb is < 15 ug/dl on two occasions, three months apart
- All children with significant lead exposure, and, especially, those who have undergone chelation, require a neurodevelopmental assessment. This should be obtained within 2 months of completion of the initial course of chelation, and, then, yearly until the age of 6.

Important Contact Numbers

State Lab (for lead testing results): (207) 287-2727
Maine Childhood Lead Poisoning Prevention Program: (207) 287-4311
Maine Medical Center Inpatient Pharmacy: (207) 662-2151
Maine Medical Center Lab: (207) 662-2711

New Hampshire Healthy Homes and Lead Poisoning Prevention Program:
(603) 271-4507 and (800) 897-5323