Chelation is the term used for removing lead from circulating blood and, theoretically, some lead from organs and tissues. It is unclear whether chelation affects lead stores in bones. Although not an antidote in the truest sense, it does serve a similar purpose in that the toxic substance or poison is removed from the body. However, chelation does not counteract any effects of the lead.

Historically, three chelating agents have been used consistently: calcium disodium edetate ($CaNa_2EDTA$, or calcium EDTA), British antilewisite (BAL; dimercaprol, dimercaptopropanol), and Meso-2,3-dimercaptosuccinic acid (DMSA, Chemet, Succimer). BAL (dimercaprol, dimercaptopropanol) is used in conjunction with EDTA with high lead levels or the presence of lead encephalopathy. All of the agents have potential toxic side effects and contraindications. Renal, hepatic, and hematologic parameters should be monitored.

Because of the equilibration process between blood, soft tissues, and other sites in the body, there is often a rebound of the BLL after chelation. After the body burden of lead is reduced enough to stabilize the BLL, rebound will cease. Multiple chelation treatments may be necessary. Adequate hydration is essential during therapy because the chelates are excreted via the kidneys.

Severe lead toxicity (lead level ≥70 mcg/dl) requires immediate inpatient treatment, whether symptoms are present or not. BAL is contraindicated in children with peanut allergies or hepatic insufficiency, nor should it be given in conjunction with iron. Also, use with caution in children with renal impairment or hypertension; monitor for hemolysis with presence of glucose 6-phosphate dehydrogenase deficiency. It must be given only at a deep intramuscular site, in repeated doses over several days. Calcium EDTA should be given intravenously or intramuscularly (in a different site from BAL). The IV route should not be used in children with cerebral edema.

For lead levels of 45 to 69 mcg/dl and an absence of symptoms, DMSA can be used. The capsule is opened and sprinkled on a small amount of food or may be swallowed whole. DMSA can be used in conjunction with iron. Adverse effects include nausea, vomiting, diarrhea, loss of appetite, rash, elevated liver function tests, and neutropenia. Because the chelates are excreted via the kidneys, adequate hydration is essential.