



### A review on known and unknown facts of EDTA

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#### ABSTRACT:

Edetate disodium (EDTA) is a chelating (KEE-late-ing) agent. A chelating agent is capable of removing a heavy metal, such as lead or mercury, from the blood. Ethylenediaminetetraacetic acid (EDTA) is a chelating agent can bind to metals via four carboxylate and two amine groups. It is a polyamino carboxylic acid and a *colorless*, water-soluble solid, which is widely used to dissolve lime scale. It is produced as several salts, notably disodium EDTA and calcium disodium EDTA. EDTA reacts with the calcium ions in dentine and forms soluble calcium chelates. A review on EDTA's known and unknown facts are presented in this article.

**Keywords:** Edetate disodium (EDTA), chelating agent, known facts, unknown facts

#### INTRODUCTION

**Ethylene diamine tetra acetic acid (EDTA)**, also known by several other names, is a chemical used for both industrial and medical purposes. It was synthesized for the first time in 1935 by Ferdinand Münz.

- It is an aminopolycarboxylic acid and a colourless, water-soluble solid. Its conjugate base is **ethylenediaminetetraacetate**. It is widely used to dissolve limescale.
- Its usefulness arises because of its role as a hexadentate ("six-toothed") ligand and chelating agent, *i.e.*, its ability to sequester metal ions such as  $\text{Ca}^{2+}$  and  $\text{Fe}^{3+}$ . After being bound by EDTA into a metal complex, metal ions remain in

solution but exhibit diminished reactivity.

- EDTA is produced as several salts, notably **disodium EDTA**, **calcium disodium EDTA**, and **tetrasodium EDTA** (typically as the hydrate).
- **Other Names :** Acide Éthylènediaminetétracétique, Calcium Disodium Edathamil, Calcium Disodium EDTA, Calcium Disodium Edetate, Calcium Disodium Versenate, Calcium Edetate, Calcium EDTA, Chelation Therapy, Disodium Edathamil, Disodium Edetate, Disodium EDTA, Disodium Ethylenediamine Tetraacetic Acid, Disodium Tetraacetate, Edetate, Edetate Calcium Disodium, Edetate Disodium, Edetic Acid, EDTA de Calcium Disodique, EDTA de Fer, Ethane-1,2-diyl dinitrilo Tetraacetic Acid, Ethylene Diamene Tetraacetic Acid, Ethylenediamine tetraacetic acid, Éthylènediaminetétraacétate de Calcium et de Disodium, Éthylène-Diamine-Tétracétate Disodique, Iron EDTA, Sodium Calcium Edetate, Sodium Edetate, Traitement Chélateur, Trisodium ethylenediamine tetraacetic acid

## MODE OF ACTION

- EDTA is a chemical that binds and holds on to (chelates) minerals and metals such as chromium, iron, lead, mercury, copper, aluminum, nickel, zinc, calcium, cobalt, manganese, and magnesium. When they are bound, they can't have any effects on the body and they are removed from the body.

## USES:

- A specific salt of EDTA, known as sodium calcium edetate, is used to bind metal ions in the practice of chelation therapy, such as for treating mercury and poisoning. It is used in a similar manner to remove excess iron from the body. This therapy is used to treat the complication of repeated blood transfusions, as would be applied to treat thalassaemia.
- Dentists and endodontists use EDTA solutions to remove inorganic debris (smear layer) and lubricate the root canals in endodontics. This procedure helps prepare root canals for obturation.
- Furthermore, EDTA solutions with the addition of a surfactant loosen up calcifications inside a root canal and allow instrumentation (canal

shaping) and facilitate apical advancement of a file in a tight or calcified root canal towards the apex.

- It serves as a preservative (usually to enhance the action of another preservative such as benzalkonium chloride or thiomersal) in ocular preparations and eyedrops.
- In evaluating kidney function, the chromium(III) complex [Cr(edta)]<sup>-</sup> (as radioactive chromium-51 (51Cr)) is administered intravenously and its filtration into the urine is monitored. This method is useful for evaluating glomerular filtration rate (GFR) in nuclear medicine.
- EDTA is used extensively in the analysis of blood. It is an anticoagulant for blood samples for CBC/FBEs, where the EDTA chelates the calcium present in the blood specimen, arresting the coagulation process and preserving blood cell morphology.
- EDTA is a slime dispersant, and has been found to be highly effective in reducing bacterial growth during implantation of intraocular lenses (IOLs).

## UNKNOWN USES

- **Treating lead poisoning.** Giving EDTA in the vein or muscle is effective for treating lead poisoning and brain damage caused by lead exposure. One specific kind of EDTA, the calcium disodium form, is approved by the U.S. Food and Drug Administration (FDA) for these uses. Treatment with calcium disodium EDTA improves symptoms such as abdominal pain, fatigue, constipation, and loss of appetite. It also seems to help slow down kidney problems in people who have had long-term lead poisoning. However, EDTA does not seem to be effective for diagnosing lead poisoning.
- **Treating calcium deposits in the eye.** After appropriate preparation of the eye, a single application of the disodium form of EDTA can clear calcium deposits in the eye and improve eyesight.
- **Alternative medicine**  
Some alternative practitioners believe EDTA acts as an antioxidant, preventing free radicals from injuring blood vessel walls, therefore reducing atherosclerosis.<sup>[citation needed]</sup> These ideas are unsupported by scientific studies, and seem to contradict some currently accepted

principles. The U.S. FDA has not approved it for the treatment of atherosclerosis

### **EDTA AS CHELATING AGENT**

A chelator is an organic chemical. Its molecules have the ability to attract and bind with bivalent or trivalent metallic cations. In EDTA chelation therapy a chelator named Ethylene Diamine Tetraacetic Acid is intravenously infused in a patient's body through a carrier solution along with many other vitamins and minerals. Depending upon the disease and its severity 30 or even more infusions may have to be administered to a patient

The treatment is given in the doctor's office or side room. Patients sit on reclining chairs as shown in the photo in previous slide. The trauma caused is easily bearable. Patients can read, talk, watch TV or even eat while the treatment is being given. The infusion usually lasts about 3 hrs. But in case of some old patients or patients with kidney disease, it can take longer. Therefore, barring very few instances, there is no need to get admitted into a hospital or nursing home. After the infusion, a patient can even travel back to his house on a motorcycle.

The weight of the chelator to be infused is calculated on the basis of patient's sex, weight, height, and age and

creatinine clearance. A bottle of 500 ml carrier solution is used unless the patient cannot tolerate this volume. In such case 250 ml bottle is used. To facilitate infusion of the mixture from the bottle into the patient's vein, a needle of a scalp vein is pricked into patients' vein, as shown in figure on the top right. An infusion is also called a drip. The tube that carries the mixture from the bottle to the scalp vein is called infusion line. The regulator wheel of the infusion line enables controlling the fluid infusion rate as needed. If a patient has to go to wash room during the infusion, the scalp vein can be detached from the infusion line and closed so the patient can go to washroom.

EDTA chelation therapy can be given to a patient of age 15 to even 95. In younger persons it is avoided because their body building processes are different than adults. In older patients it is avoided because their body is very severely degenerated and EDTA chelation therapy may prove more traumatic than beneficial. For many patients EDTA chelation infusions can be given twice a week. For old or weak patients this frequency is reduced once a week. For patients with kidney disease it can even be once in a fortnight. EDTA chelation therapy acts by detoxification. Once the curative process is over through taking 30 or so infusions, it is advisable to take an infusion once in two to

four months so the body detoxification status is maintained. There is no specific limit on the number of infusions that can be taken by an individual.

#### CONTRA-INDICATIONS:

- heart disease, congestive heart failure;
- a heart rhythm disorder;
- a history of seizures, brain tumor, or head injury;
- diabetes;
- low potassium levels (hypokalemia); or
- if patient takes digitalis (digoxin, Lanoxin, Lanoxicaps).
- During pregnancy

#### CONCLUSION:

- EDTA is used to lower blood levels of calcium when they have become dangerously high. EDTA is also used to control heart rhythm disturbances caused by a heart medication called digitalis (digoxin, Lanoxin).
- EDTA may also be used for purposes other than those listed in medication guide.

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