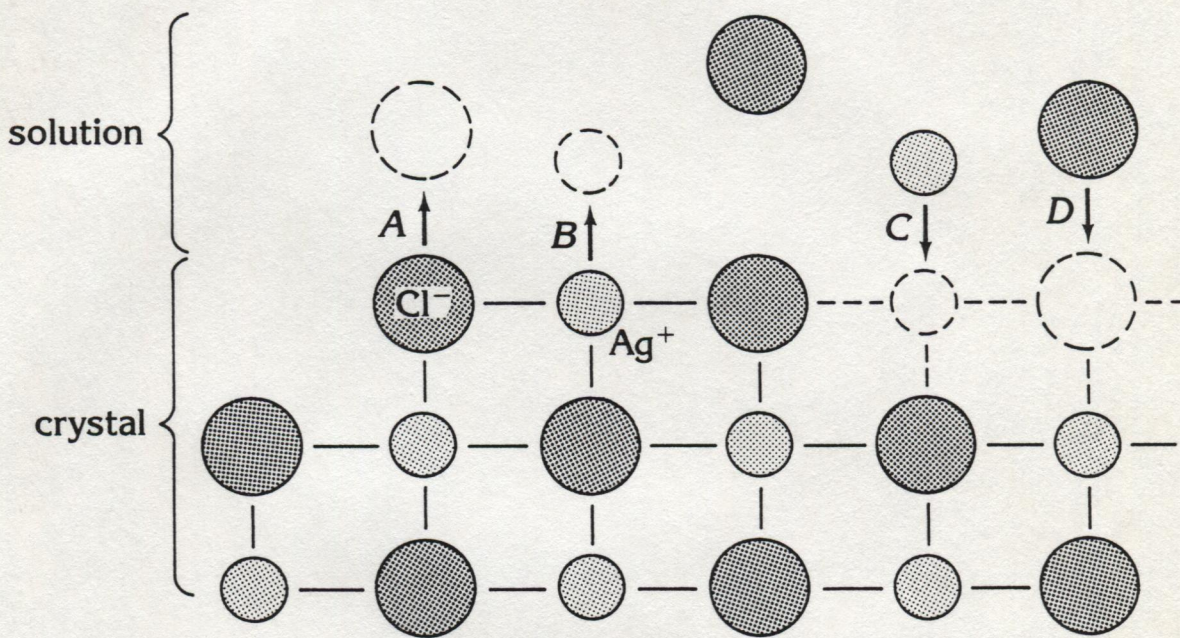


The Surface of a Crystal of AgCl in Contact with a Solution of Its Ions



The surface of a crystal of AgCl in contact with a solution containing Ag^+ and Cl^- ions. Equilibrium exists between the solid and dissolved phases when one chloride ion and one silver ion dissolve from the crystal, as shown by the arrows at A and B, for every silver and chloride ion that crystallize out, as shown by the arrows at C and D.

Selected Solubility Product Constants, K_{sp} , at Room Temperature

Compound	Formula	K_{sp}
aluminum hydroxide	$\text{Al}(\text{OH})_3$	5×10^{-33}
barium carbonate	BaCO_3	2×10^{-9}
barium chromate	BaCrO_4	8.5×10^{-11}
barium sulfate	BaSO_4	1.5×10^{-9}
cadmium sulfide	CdS	1.0×10^{-28}
calcium carbonate	CaCO_3	4.7×10^{-9}
calcium sulfate	CaSO_4	2.4×10^{-5}
copper (I) iodide	CuI	1.1×10^{-12}
iron (II) sulfide	FeS	4×10^{-19}
lead chloride	PbCl_2	1.6×10^{-5}
lead chromate	PbCrO_4	2×10^{-16}
lead sulfate	PbSO_4	1.3×10^{-8}
lead sulfide	PbS	7×10^{-29}
silver bromide	AgBr	5.0×10^{-13}
silver chloride	AgCl	1.7×10^{-10}
silver iodide	AgI	8.5×10^{-17}

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Chelation Therapy

NOW AVAILABLE: "MIRACLE DRUG" that can (1) improve memory, liver function, and vision; (2) increase blood flow throughout the body; (3) reduce the symptoms of senility, arthritis, multiple sclerosis, and Parkinson's disease; and (4) decrease the need for coronary bypass surgery and the incidence of cancer.

Does this miracle drug sound like the "snake oil" remedies sold by traveling salesmen long ago? How could one drug possibly do all those things? Yet, some doctors, and patients, today are convinced that one substance can provide all these benefits. That substance is ethylenediaminetetraacetate (EDTA), and it is used in a procedure called chelation therapy.

Chelation is the binding together of metal ions and organic molecules. Some typical chelates, or compounds formed by chelation, are chlorophyll (the photosynthetic pigment in plants), which contains magnesium, and hemoglobin (the oxygen-carrying pigment in blood), which contains iron. Many of the enzymes of the body are formed by chelation.

Chelation has been used widely in industry, in the manufacture of paint, dyes, and rubber. Chelates are included in household detergents to reduce "ring around the bathtub" and "ring around the collar." Chelates that bind with magnesium and calcium soften hard water. The way these products work is much like the way in which EDTA is believed to work in the body.

Chelation therapy is a procedure that is said to improve circulatory and metabolic function by removing metals from the body. The metals can be toxic ones, such as cadmium and lead, or they can be excess quantities of those needed for nutrition, such as iron and copper. EDTA has a powerful attraction for loosely bound metals in the body. It binds tightly to such metals, preventing them from disturbing normal metabolism or entering into harmful chemical reactions. The procedure is generally performed by administering EDTA intravenously in a number of treatments.

EDTA has been accepted since the 1950s for the treatment of lead poisoning in children and adults. However, what is controversial is the use of this compound for the diseases mentioned in the "ad" at the top of this page.

Advocates of EDTA chelation therapy believe that most degenerative diseases, such as arteriosclerosis, arthritis, and senility, are caused by the production of excess free radicals in the body. This is known as the free-radical concept of aging. A free-radical molecule has an unpaired electron in its outer orbital shell. Such molecules are very unstable and react easily with other molecules—these reactions may interfere with normal reactions that are necessary to health or may form harmful products. Free radicals are produced normally, but in a controlled fashion, in a healthy body. Unbound metallic ions are thought to catalyze the production of free radicals at an elevated rate. At these abnormal rates, the free radicals are thought to cause great cellular damage.

EDTA is believed to inhibit the production of free radicals by a millionfold, simply by removing from the body the metallic ions that may catalyze free-radical reactions. Chelation therapy advocates believe that EDTA not only inhibits free-radical production, but also stops the progression of diseases caused by the excess of free radicals and permits the body to heal itself. They claim that along with an improved diet, giving up smoking and alcohol, and getting more exercise, chelation therapy is successful in the treatment of various degenerative diseases.

The disease with which chelation therapy is most often associated is heart disease. Some practitioners use EDTA to reduce the clogging of the blood vessels of the heart caused by fatty deposits. In this way they seek to avoid coronary bypass surgery, in which a clogged heart artery is replaced by a graft of a vein from the patient's leg.

Chelation therapy is not accepted by all doctors. In fact, its proponents are in a distinct minority. The January 1983 issue of *The Harvard Medical School Health Letter* cautioned readers that chelation therapy with EDTA for diseases other than lead poisoning was potentially dangerous, and that patients who underwent such treatment were being used as "guinea pigs." Recently the Food and Drug Administration (FDA) banned the sale of so-called "chelation pills," sold over the counter, calling them a waste of the purchaser's money. Yet each year more and more people who wish to avoid surgery and to obtain a healthier life seek out doc-

Chelation Therapy (Continued)

ers who will perform chelation therapy. Some practitioners are said to use this procedure as a way to make money from desperately sick people who feel they have nowhere else to turn. The doctors who employ chelation therapy for its more accepted uses insist that these practitioners give the procedure a bad reputation.

One reason why many doctors object to chelation therapy is that they feel it has not been tested sufficiently in well-controlled scientific experiments. They also claim that EDTA's effects and mechanisms of action are not understood well enough to substantiate its advertised benefits. More controlled experiments and research will help to determine whether chelation therapy with EDTA is an acceptable way to better health or a useless gimmick.

QUESTIONS

1. a) What is meant by *chelation*?
b) What is meant by *chelation therapy*?
2. a) For what conditions is chelation therapy with EDTA known to be helpful?
b) If chelation therapy is successful in treating some conditions, what is the central issue regarding its use for other conditions?
3. Present the arguments both for and against the overall acceptance by the medical authorities of chelation therapy as a valid therapeutic procedure.
4. Some doctors claim to have achieved good results using EDTA and that this is enough to prove its effectiveness. They say controlled experiments in large laboratories are not necessary. How do you feel about this? Would you want to be treated with medicine that had not been tested many times in controlled experiments? Why or why not?
5. Should the FDA have banned chelation pills, or should people who want to take them be allowed to? Explain your answer.