



# Treatment of acute lymphocytic leukemia using zinc adjuvant with chemotherapy and radiation – a case history and hypothesis<sup>☆</sup>

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**Summary** Low blood levels of zinc are often noted in acute lymphocytic leukemia (ALL), but zinc is not administered as part of any modern chemotherapy program in the treatment of ALL. Upon noting low blood levels of zinc in a 3-year-old 11.3 kg girl, zinc at the rate of 3.18 mg/kg body weight/day was administered from the start of chemotherapy through the full 3 years of maintenance therapy. Dosage was split with 18 mg given at breakfast and 18 mg zinc with supper. The result was a bone marrow remission from 95+% blast cells to an observed zero blast cell count in both hips within the first 14 days of treatment which never relapsed. In addition to the reduction of blast cells to an observed count of zero (not a single leukemic or normal blast), red blood cell production and other hemopoietic functions returned to normal at a clinically remarkable rate. There were no side effects from zinc or chemotherapy at any time, and zinc is hypothesized to have improved the patient's overall ability to withstand toxic effects of chemotherapy. This report identifies zinc treatment as being vital to rapid and permanent recovery from ALL. The extremely broad role of zinc in pre-leukemic adverse health conditions, viral, fungal and tumoral immunity, hemopoietics, cell growth, division and differentiation, genetics and chemotherapy interactions are considered. If a nutrient such as zinc could be shown to strengthen the function of chemotherapy and immune function, then it could be hypothesized that the relapse rate would be lessened since the relapse rate is related to both the rate at which a remission is obtained and the thoroughness of the elimination of leukemic blasts. Identical results also occurred in 13 other children with ALL whose parents chose to treat with zinc adjuvant. Since treatment with zinc and other identified deficient nutrients, particularly magnesium, did not appear injurious in ALL and they appear to be highly beneficial, controlled clinical studies of zinc (3.18 mg/kg body weight/day) with magnesium (8.0 mg/kg body weight/day) as adjuvants to chemotherapy in the treatment of childhood ALL are suggested. Treatment with zinc adjuvant is hypothesized to accelerate recovery from ALL, and in conjunction with chemotherapy, cure ALL.

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## Introduction

Childhood acute lymphocytic leukemia (acute lymphoblastic leukemia or ALL) is a disease in which

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too many underdeveloped lymphocytes (infection-fighting white blood cells) develop in a child's blood and bone marrow, causing death if not controlled. Pre-acute lymphocytic leukemia in the child is often marked by: (a) severe atopic-like allergic reactions, (b) major and/or frequent upper respiratory viral infections and fevers, (c) taste and appetite suppression, (d) growth suppression, (e) lethargy and depression, (f) diarrhea, and (g) offensive body odor (free asparagine). Each of these conditions can be a symptom of zinc deficiency.

The cause of ALL is unknown. ALL is routinely treated with chemotherapy to kill leukemic cells, but little effort is exerted to improve overall health through dietary support, and no modern chemotherapy includes zinc adjuvant even though zinc serum levels are usually low in leukemic children.

Leukemic cells contain much less zinc than normal lymphocytes, suggesting an error in zinc metabolism, which appears correctable with zinc treatment. Zinc is vital for recovery because zinc is required for proper functioning of genetics, immunity, formation of red blood cells, organ, muscle and bone function, cell membrane stability, cell growth, division, differentiation and genetics. Zinc has beneficial interactions with several chemotherapy drugs. Zinc metabolism deviations have been recognized in leukemia since 1949 but remain poorly understood, although zinc was used in the early 1950s as a leukemia therapy. These effects, interactions and relationships are reviewed at <http://coldcure.com/html/leukemia.doc>, and this web page and its html counterpart are archived at <http://archive.org>. Most remissions without zinc in other children in 1979 after 30 days of treatment showed 3–5% blasts remaining in bone marrow. Treatment with zinc is hypothesized to accelerate recovery from ALL, and in conjunction with chemotherapy, cure ALL.

## Methods and procedures

In a case of acute T-cell lymphocytic leukemia (ALL) in a 3-year-old white female treated with Children's Cancer Study Group protocol 161, regimen 2 (CCG 161), zinc (3.18 mg/kg body weight/day) as zinc gluconate was given as an adjuvant to chemotherapy upon noting low serum zinc. The daily dosage (36 mg) was split into two 18 mg dosages and was given with morning and evening meals. Predisone, vincristine, L-asparaginase, and intrathecal methotrexate were used for remission

induction followed by 2400 rads cranial radiation. Maintenance therapy was vincristine and predisone on a monthly "pulse" basis, methotrexate weekly and 6-mercaptopurine daily. Treatment occurred 1979 through 1982, at Santa Rosa Hospital in San Antonio, Texas.

The decision to supplement zinc and all nutrients (except folic acid and calcium) using adult RDA doses was made by a parent (this writer), not the oncologist or hospital, but with their knowledge and permission. Nutrient treatment was only to preclude nutrient deficiencies brought on by chemotherapy and poor eating habits. Zinc was continued for the 3 years of chemotherapy at the rate of 3.18 mg/kg body weight/day.

## Results

A bone marrow remission from 95+% blast cells to an observed zero blast cell count in both hips occurred within 14 days of simultaneous initiation of chemotherapy and nutrients. Not a single leukemic cell or immature lymphocyte was observed. In addition to the reduction of blast cells to zero, red blood cell production and other hemopoietic functions returned to normal at a clinically remarkable rate. During the 3 years of maintenance therapy, a continuous remission (0.2–1.5% bone marrow blasts) was maintained. When chemotherapy was temporarily suspended at year 2 in order to administer chicken-pox vaccine, bone marrow blast count only rose to 2%, and then returned to 0.2% after resumption of chemotherapy.

Total white blood cell count averaged 4000/mm<sup>3</sup> and infrequently varied between 2000/mm<sup>3</sup> and 7000/mm<sup>3</sup>. Absolute lymphocyte count remained 1000/mm<sup>3</sup> or less. Moon-face appearance and obesity normally found with use of predisone were absent. Immunity to disease was normal, and she was not immunosuppressed. Incidence of infection was much lower after initiation of chemotherapy with zinc than during an equivalent period prior to diagnosis. Activated lymphocytes were noted in 12% of the bi-weekly blood tests. A "catch-up" growth occurred from pre-leukemia height and weight of 28% and 5%, respectively, to 50% and 50%, respectively, after 1 year of treatment. Growth remained at the 50% level for both height and weight during the 3-year chemotherapy treatment. In general, the child enjoyed excellent health.

Oral zinc treatment (3.18 mg/kg body weight/day) was continued throughout the 3-year chemotherapy program. Zinc serum level remained in

the 130–140 mcg/dl range (high end of normal). All vitamins except folic acid, all minerals (except calcium) and all known trace minerals were given daily in adult dosages. All serum nutrient levels remained in the normal range.

After 2 years of treatment, she beneficially developed a titer of 1024 to chicken pox virus and demonstrated strong CMI response to chicken pox in vitro after inoculation with the Japanese vaccine to chicken pox.

No adverse effects from chemotherapy or nutrient treatment were observed at any time. Her blood count returned to normal within 3 months of cessation of chemotherapy. She never relapsed and is currently a neuropsychology graduate student.

## Discussion

Zinc and other nutrient administration was not harmful in any way. Since bone marrow improvements normally obtained using chemotherapy contain 3–5% blasts after 30 days of chemotherapy, these results (zero blasts) were a significant improvement. Since the rate in which a remission is obtained – as well as the reduction in blast count – is related to the propensity to relapse, these observations are also important and suggest that zinc should be administered to children with ALL as part of formal protocols.

Zinc lozenges that release ionic zinc can shorten common colds by 7 days [1], probably by cell membrane stabilization [2]. These lozenges were effective in greatly shortening her colds during the 3-year maintenance program. On the other hand, zinc dietary supplements and lozenges without ionic zinc (the prevalent OTC form in the US due to flavor issues) do not significantly shorten colds.

Additionally, there is a high prevalence of both zinc and intracellular magnesium (ionic magnesium) deficiency in T-cell lymphoblastic leukemia [3]. Intracellular magnesium deficiency causes the osteoporosis found in ALL [6]. Although serum magnesium is low only in alcoholism, intracellular magnesium deficiency is widespread, affecting over 70% of the public [4,5] due to reliance upon nutri-

ent-depleted refined grain products and sugar for calories. Over 99% of all magnesium is intracellular, and serum tests are totally misleading. That either zinc or intracellular ionic magnesium deficiency can cause genetic and cellular replication perturbations is well known, and that this combination of deficiencies is a necessary precondition for development of ALL is hypothesized.

In clinical practice, there is a well known correlation between return of zinc serum levels to normal and survival in ALL. However, no modern leukemia therapy, with the exception of the Polish trial [7], used zinc treatment. Thirteen other parents supplemented their leukemic child with zinc due to a newspaper account of this 1979 incident, with all having the same beneficial results.

Since treatment with zinc and other nutrients (except folic acid) does not appear injurious in ALL and appears to be highly beneficial, controlled clinical studies of zinc (3.18 mg/kg body weight/day) with magnesium (8.0 mg/kg body weight/day) used as an adjuvant to chemotherapy in the treatment of childhood ALL are needed.

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