It is also conspicuous that, among the nine amine hydrates which we have so far examined, not one has been discovered with the 17-Å cubic structure, which is invariably found with hydrophobic guest molecules containing three to five carbon or halogen atoms.

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Zinc Retention in Rabbits: Effect of Previous Diet

Abstract. *The retention of orally administered zinc-65 was influenced by the previous diet. Zinc-deficient rabbits fed a diet containing 25 parts of zinc per million incorporated naturally in soybean protein still retained 58 percent of an oral dose of zinc-65 16 days after the dose was given, while rabbits fed the same diet supplemented with zinc (54 parts per million) as zinc oxide retained only 14 percent. The weight gain and the appearance of the animals fed these two diets were different.*

The determination of gamma radiations emitted from the whole animal permits study of the absorption and retention of some major elements. The uptake and retention of orally administered Zn^{65} by four mammalian species was studied by Richmond *et al.* (*1*). The slopes of curves prepared by Furchner and Richmond (*2*) in their studies of the effects of excess dietary zinc were different. These variations were explained as being caused by differences in the species of the animals under study or by excess zinc in their diets. We studied the retention of Zn as it relates to nutritional, dietary zinc deficiency of rabbits during a period before administration of an oral dose of Zn^{65}.

The availability of dietary zinc to animals is in part dependent on the availabilities, for absorption, of zinc from various proteins. Proteins from soybeans, sesame seeds, and cotton seeds contain zinc in a form that apparently cannot be used by animals. Soybean protein has been studied most extensively in this respect (*3*). The evidence indicates that phytic acid present renders the zinc unavailable for absorption. Thus total analysis of the amount of zinc present in food is not a clear index of the amount of zinc absorbed by the body.

Ten weanling, New Zealand white rabbits (average weight, 795 grams) were randomly separated into two groups. One group was fed a low-zinc diet; the other was fed a high-zinc diet. We prepared the low-zinc diet by mixing dried beet pulp, 75 percent; soybean oil meal, 16 percent; cerelose, 2 percent; corn oil, 1 percent; and minerals other than zinc. The concentration of Zn determined by spectrographic analysis was 25 parts per million. In the preparation of the high-zinc diet (54 parts of zinc per million), ZnO was added to the above mixture. The calcium concentration of both diets was made extremely high so that the zinc deficiency would be more easily produced (*4*).

The criteria for judging zinc deficiency were arbitrary since the National Research Council has not determined the amount of zinc required by rabbits; therefore only reduced weight gain and general appearance could be used as signs of deficiency. The two groups of rabbits were fed their respective rations until their weights were definitely different. At this time each rabbit was given an oral dose of Zn^{65}. The dose was administered in a pellet to which radioactive zinc chloride had been added. The specific activity of the dried pellets (25,000 to 50,000 count/min) was determined with a sodium iodide crystal at a distance approximating that to the stomach of a rabbit arranged as it would have been at the outset of the experiment. For counting, an RIDL multichannel analyzer, model 3412, was used. The best geometry was obtained when the rabbit was secured with tape to a wooden frame that had a hole into which the animal's head could be placed. The specific activity of the animals was counted approximately 15 minutes after the dose was administered, this time being designated 0 hours. The specific activity was then counted at 6, 12, 24, and 48 hours, and then after each consecutive 48-hour period until 384 hours had passed. The percentage of Zn^{65} retained was determined and calculated at uniform geometry for all rabbits for each of the counting periods.

Gains in body weight for the two groups were noticeable at 2 days, the difference being greatest at 34 days. For the 34-day period, the rabbits fed the low-zinc ration gained 40 percent less weight than the other group. After the 5th day, the hair of the group fed the low-zinc diet was short and rough, being different from

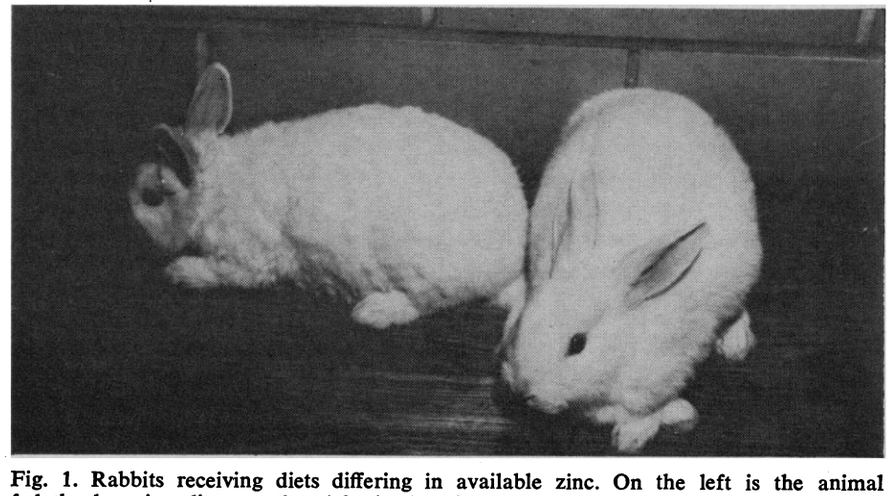

Fig. 1. Rabbits receiving diets differing in available zinc. On the left is the animal fed the low-zinc diet; on the right is that fed the high-zinc diet.

that of the other group, which was long and smooth. It remained so until the animals approached adulthood; then both groups had smooth hair.

A large percentage of the oral dose was absorbed by the rabbits. The individual retention of Zn^{65} is shown in Fig. 2. The activity at 24 hours was considered 100 percent. The percentage of Zn^{65} retained by rabbits fed the low-zinc ration was 58 after 16 days. The rabbits fed the diet containing ZnO retained only 14 percent of the orally administered zinc after 16 days. This difference in retention indicates that the zinc in the low-zinc ration was not absorbed but that in the ZnO was available to the animal.

Our finding is in agreement with the observations that zinc-deficient animals retain a high percentage of administered Zn^{65} (*5*). The greater turnover of the Zn^{65} by the rabbits fed the ration supplemented with ZnO indicates that the animals fed the diet adequate in zinc absorb less Zn^{65} than do those fed the inadequate diet. Curves describing the retention of radioactive zinc have been established. Those describing animals fed small amounts of zinc, or zinc that is not available to the animal, have a flat slope, those describing animals fed medium rations have a medium slope, and those describing animals fed an excess of zinc have a very steep slope.

If the whole-body counting is to be used in obtaining an index of the deficiency in an element, the absorption of the element should be investigated. If the absorption is nearly normal, the shape of the retention curve will reflect, with marked accuracy, the amount of the element previously available in the diet.

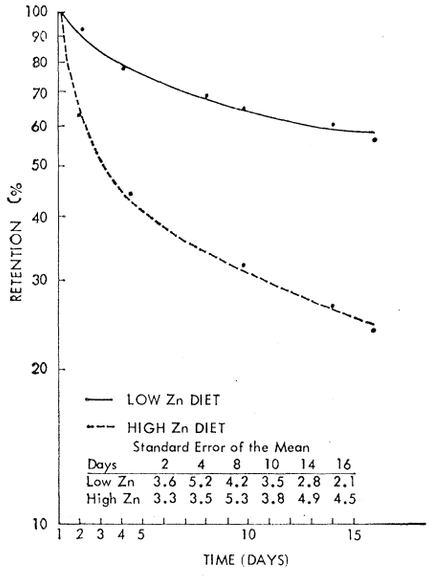

Fig. 2. Percentage of Zn^{65} retained, as a function of time.

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Autosomal Deletion Mapping in Man

Abstract. *Two families were observed in which morphologically similar deletions involving a G-group chromosome were associated in the propositi with conspicuous abnormalities in ossification of the skull. The findings suggest that specific genetic information relating to morphogenesis of the skull may be located on a G-group chromosome.*

Deletion mapping has been successfully exploited for the definition and localization of genetic elements in viruses (*1*), bacteria (*2*), and higher organisms (*3*). Study of the families reported below suggests that deletion mapping may also be useful for the chromosomal localization of autosomal genes in man (*4–6*).

The proband in the first family was a 16-year-old girl with pycnodysostosis. This condition is a rare, generalized bone disease which is usually inherited as a Mendelian recessive trait (*7*). The proband showed all of the phenotypic characteristics typical of this disorder, including short stature (138 cm), sclerotic bones with predisposition to fracture in the lower extremities (a history of 36 fractures was elicited in the present case), a double row of front teeth, hypoplasia of the ungual tufts, and hypoplasia of the mandible with flattening of the angle of the jaw. The clinical and biochemical findings have been described (*8*). A particularly striking feature of this and reported cases of pycnodysostosis is a dysplasia of the skull in which the cranial sutures did not close normally. This condition results in a large head, and not infrequently it has led to the erroneous diagnosis of hydrocephalus. In the present case, the anterior fontanel was still widely patent at the age of 16 years (Fig. 1A). The parents and three siblings were clinically normal, and no evidence of a similar bone disease has been found in any other relative. The parents were not consanguineous, their families having originated in different parts of the country. Karyotype studies of the proband revealed deletion of the short arm and satellite region of a G-group chromosome (Fig. 2A). An identical chromosome anomaly was found in the father, two siblings (Fig. 3A), the paternal grandfather, and a paternal uncle, all of whom were clinically normal. Genetic studies of this family permitted exclusion of the ABO, MNS, Rh, Kidd, Lutheran, and haptoglobin loci from the region involved in the deletion.

The probands in the second family were brothers (aged 5 and 3 years), who were referred for study because of the occurrence in both of craniostenosis. There was a history of absence of the "soft spot" in both children at birth. We confirmed by radiography the existence of premature closure of the sagittal suture, and the films also revealed the "beaten metal" appearance characteristically found in this condition (Fig. 1B). Except for moderate asymmetry of the skull, the children appeared to be physically and mentally normal. Chemical analysis of their blood, including calcium, phosphorus, alkaline phosphatase, acid phosphatase, total protein, and plasma amino acid determinations, gave no evidence of a generalized metabolic disorder. The mother had marked dolichocephaly, confirmed radiographically, which may well have resulted from early closure of the cranial sutures. There was no history of an abnormally shaped skull in her seven siblings, her parents, or any other family member. The father was clinically normal, and there was no history of bone disease or skull deformity in his family. There was no evidence of consanguinity.