California Avocado Association 1935 Yearbook 20: 53-55

The Dietetic Value of Calavos in the Prevention or Cure of Anemia

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The term "anemia" is applied to any deficiency in the quantity or in the quality of the blood as manifested by the reduction in the number of red corpuscles or in their hemoglobin content.

Hemoglobin is the main constituent of the red corpuscles. It contains the element iron bound up in a complex organic molecule. It is through the hemoglobin of the red corpuscles that oxygen is carried from the lungs to the various parts of the body where it is used to burn the blood sugar to produce energy, or to burn away waste body tissue.

Anemia may be caused in three ways:

1. Loss of blood.

2. Defective formation of blood corpuscles.

3. Destruction of blood corpuscles through disease or infections.

In recent years much work has been done on the determination of the relation of iron in the diet to the prevention of anemia, and in the determination of what foods contain iron and its availability for use in the blood corpuscles.

In experimental work in anemia investigations it is customary to produce anemia in white rats by placing them on a diet free from iron. Foods containing various quantities of iron are then added to the diet and data on their recovery from anemia is noted. The degree of anemia is determined by withdrawing from the end of the tail of the rat a few drops of blood and testing this for hemoglobin by certain color tests. I will report briefly our findings in regard to the calavo as determined in the Chemical Laboratory of the University of Southern California.

The mineral matter of calavos is from two to three times that of other common fruits; averaging 1.3%, based on the edible portion. (1). Of this mineral matter, the element **iron** occupies an unusually high place. The iron content, as tested in our laboratory, is .0015% of the edible portion. This is about three times that of the average of other common fruits.

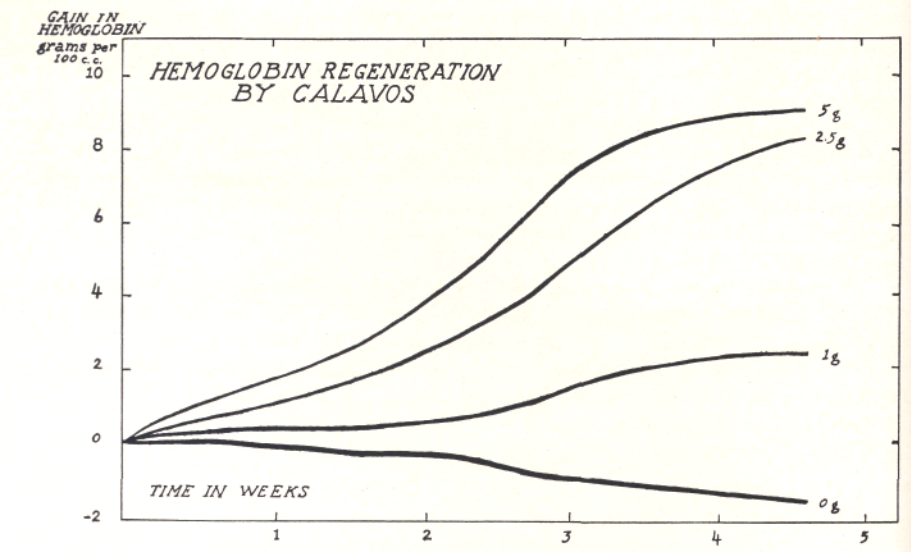
Since this iron content is so high it has seemed logical that the calavo should be most valuable in anemia prevention or cure. Its value in this respect would depend, however, not alone on the quantity of iron present, but also on the availability of this iron in hemoglobin regeneration. The investigation was undertaken, therefore, to determine this by means of the usual method of feeding experiment.

Experiment

Twenty albino rats from standard stock were weaned at the age of three weeks and

were put on an anemic diet of certified raw whole milk. (2). The milk used in this feeding experiment was protected from possible absorption of iron or copper by being milked directly into the glass container in which it was delivered to the laboratory. (This milk was supplied through the courtesy of the Arden Dairy of Los Angeles, from their El Monte Certified Milk Herd.)

As a further precaution, in order to prevent access by the animals to any metal, glass cages with glass grids as bottoms were used. Under these stringent conditions anemia is produced in three weeks.



Weights were taken and hemoglobin tests made semi-weekly. The usual procedure of blood extraction, and hemoglobin determination was followed, using the Newcomer disk as standard. (3).

In slightly under three weeks time the hemoglobin value of the whole group reached an average somewhat under 5 g. per 100 cc. of blood. The animals were then separated into groups; due care being taken to see that the average weight and hemoglobin content was as nearly equal as possible in each of the groups. These groups were then placed on the test diets.**

Groups

I Raw milk alone (negative control).

II Raw milk 1 g. Calavo

III Raw milk 2.5 g. Calavo

IV Raw milk 5 g. Calavo

The accompanying graph shows the regenerating effect of the calavo diets. In the graph there is plotted the gain in hemoglobin in grams per 100 cc. of blood, against time in weeks. The hemoglobin is indicated as 5 g. at the start. The curves are average curves

for each group.

Interpretation of Curves

1. The curve for the negative control group showed a continued loss of hemoglobin. Only two animals of this group survived the 4½ weeks test period.

2. The curve for 1 gram of calavo shows a slightly better than maintenance ration of iron. Most of the animals showed marked improvement in appearance.

3. The curve for 2½ grams of calavo shows good regeneration. The normal hemoglobin level as determined by Williamson and Ets (4) was just reached in the time of the experiment.

4. The curve for 5 grams of calavo shows rapid regeneration and an ultimate hemoglobin content considerably above the normal level. This diet evidently carried a considerable excess of iron. That the normal hemoglobin level is first exceeded is in accordance with customary experience in which there is an excess of iron and rapid recovery. (5).

Recent researches show that copper in addition to iron is required in hemoglobin regeneration. (6). Though no analysis of the calavo for copper was made, the adequacy of the diet proved that if necessary it must be present in adequate amount.

It is the present belief also that iron cannot build hemoglobin without the presence of certain organic radicals not synthesized by animal organisms, as the pyrroll ring, such as is found in chlorophyll. (7). The calavo contains color pigment, and that it contains whatever radicals necessary to supplement the iron is evidenced by its effect in causing rapid hemoglobin recovery.

Summary.

The iron content of calavos, which analysis shows to be exceptionally high, was investigated by feeding experiments to determine its value for hemoglobin regeneration in anemia. The hemoglobin regeneration curves showed a high iron content, thus verifying the analytical findings, and proving that this iron is highly available physiologically. The calavo, therefore, should be a valuable dietary factor in the prevention or in the cure of anemia.

**Calavos for the investigation were furnished through the courtesy of the Calavo Growers of California.

References

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