Comparison of the Effect of Calcium on the Bioavailability of Iron from *Spirulina Platensis* and Ferrous Sulphate *In Vivo*

Maznah I[1], Loh SP[1], Abdul Salam A[1], Hishamuddin O[2] and Rehir D

Faculty of Medicine and Health Sciences
Universiti Putra Malaysia
43400 UPM, Serdang, Selangor
Malaysia

E-mail of Corresponding Author: maznah@medic.upm.edu.my

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Introduction

It has long been known the importance of iron as an essential mineral in human biochemistry and physiology. Many studies in recent years have highlighted that iron deficiency is both the most common cause of anemia and the most frequent human nutritional deficiency in the world. Iron deficiency is caused not only by low iron intake but also more often by poor bioavailability from the diet due to iron interaction with other dietary components (*1*). Relationship between calcium and iron absorption has been postulated for many years. It has been known since the 1940s that calcium could inhibit iron absorption. Knowing all these, alternative ways need to be made to further enhance iron absorption. *Spirulina platensis* is one of the already popular food supplements known to have a high content and bioavailability of iron. *Spirulina platensis* is a blue green algae that has been used by the natives in Africa, Central America and Mexico as a food supplement for centuries (*2*). The purpose of this study was to investigate the bioavailability of iron from *Spirulina platensis* and the effect of added calcium on the bioavailability of iron.

Materials and Methods

64 male albino Sprague-Dawley were first depleted of iron by giving iron deficient diet for 28 days (Hb = 7.87 g/dl) and were later divided into groups of eight. The anemic rats were repleted with iron sources from Spirulina (SP), Spirulina + $CaCO_3$ (SPC), $FeSO_4$ (FE), $FeSO_4$ + $CaCO_3$ (FEC), normal diet (ND) and normal diet + $CaCO_3$ (NDC) for 21 days. The diet was fed every three days is in accordance to study done by Viteri et al, 1995 (*3*) in which true absorption and retention of supplemental iron is more efficient when iron is administered every three days rather than daily. Haematological measurements taken on the last day of pre-experimental period and end of the repletion period were from blood drawn by cardiac puncture while the rats were under light diethyl ether anaesthesia. All the blood were analysed for Hb, Ht and MCV

Results and Discussion

After receiving the iron deficient diet for 28 days, the rats were anemic with a mean blood Hb concentration of 7.87g/L. Other haematological values were also consisted with a microcytic hypochromic anemia. The level of Hb increased after feeding the diet with iron (Spirulina, $FeSO_4$ and normal diet). The diet with added $CaCO_3$ slightly, but significantly, inhibited Hb repletion repletion after 21 days in Spirulina but not in $FeSO_4$ and normal diet. Paired samples T-test showed that Hb, Ht and MCV were increased in all of the groups except for C, CC and SPC. C and CC continued to have a lower value as they were continuing to feed with iron deficient diet. Oneway ANOVA revealed that there were significant differences between all the groups for Hb, Ht and MCV. Duncan Multiple Range tests showed that there were no significant differences between SP, FE and FEC for Hb and PCV. As for MCV, there were no differences in FE and FEC only. It is unusual to find plant-derived iron that is highly available, since nonheme iron from plant sources are not considered to be well absorbed by animals. Human usually absorbs not more than 10% of the nonheme iron from plant sources. These experiments demonstrated a high bioavailablity of iron from spirulina to rats, since the absorption of iron from the algae was equal to that from iron sulfate. In comparison, absorption of iron from other plants such as spinach was not as good (*4*). However, the complexity of the cell makes it difficult to speculate on the chemical form of the iron in spirulina.

Conclusions

Spirulina is a good source of iron, although more expensive than inorganic iron tablet. However, it contains not just iron but also other minerals. So, spirulina might be used a multi-supplement.

Benefits from the study

This study showed that *Spirulina platensis* have the potential to be culture locally and commercialized as the health benefits of it especially in relation to iron availability is good.

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Project Publications In Refereed Journals

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Project Publications in Conference Proceedings

None.

Graduate Research

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