

Dietary hempseed reduces platelet aggregation¹

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Dietary interventions can exert potent antiaggregatory effects that may be better accepted by the general clinical population than drug therapy [1]. Fish oils, for example, can augment bleeding times through their elevated omega-3 polyunsaturated fatty acid (PUFA) content [2]. Hempseed is another dietary component that also may have antiaggregatory effects because it is enriched in PUFA. However, despite the enrichment in PUFAs, it is difficult to predict what effects a hempseed-supplemented diet would have on platelet aggregation. Hempseed is enriched in both omega-6 PUFAs, such as linoleic acid (LA), and omega-3 PUFAs, such as alpha-linolenic acid (ALA), in a 3:1 $n-6/n-3$ ratio that is recommended for optimal health [3]. However, omega-6 PUFAs are suggested to be prothrombotic through the stimulation of thromboxane A₂, an eicosanoid derived from the omega-6 fatty acid, arachidonic acid [4], whereas omega-3 PUFAs are antithrombotic as they produce the antiaggregatory eicosanoids eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) [3]. The purpose of this study, therefore, was to determine the effects of a hempseed-supplemented diet on platelet aggregation.

Male Sprague–Dawley rats (252 ± 12 g) were randomly assigned ($n = 8$ in each group) to receive: regular rat chow (RG) or regular rat chow containing 5% ground hempseed (wt/wt; 5H) or 10% ground hempseed (wt/wt; 10H) or saturated fat in the form of 1% palm oil (S). The 10% hempseed dosage is similar to that used in other animal studies of dietary flaxseed [5], which was also similar to that employed in human trials [6]. Thus, it can be argued that this dosage of hempseed is feasible in human trials. Each rat consumed 4 g d⁻¹ of diet for 12 weeks.

The nutritional composition of the diets differed only in the total fat content resulting from the inclusion of hempseed. The hempseed-supplemented diets had significantly elevated levels of LA and ALA in comparison to the control. These

differences in the fatty acid composition of the diet induced changes in the plasma fatty acid profiles. Total plasma PUFAs from rats fed with the hempseed were significantly increased in comparison to the control but supplementation of the diet with palm oil significantly reduced this ($P < 0.05$). ALA and LA levels increased significantly in a concentration-dependent manner in the rats fed with the hempseed. Palm oil supplementation of the diet significantly decreased LA levels but had no effect on ALA. Platelet-rich plasma was collected from blood samples, adenosine diphosphate (ADP) was added (7.5 μM) and aggregation was measured with a Chrono-log aggregometer with the platelet-poor plasma fraction behaving as the blank. Platelet aggregation and the rate of aggregation were significantly inhibited by both 5% and 10% hempseed supplementation (Fig. 1). This was not achieved by including palm oil in the diet.

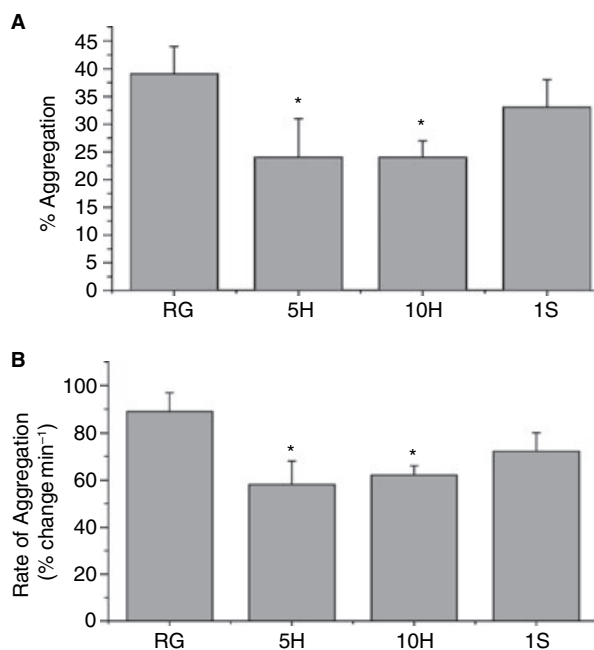


Fig. 1. Effect of 12 weeks of dietary intervention in rats on adenosine diphosphate (ADP)-induced platelet aggregation. ADP-induced platelet aggregation expressed as (A) maximal aggregation and (B) rate of aggregation over 1 min. Both 5% and 10% hempseed supplementation significantly inhibited platelet aggregation. Results are expressed as the mean ± SEM for six to seven separate samples. * $P < 0.05$ vs. control value. RG: regular diet; 5H: 5% hempseed supplemented diet; 10H: 10% hempseed supplemented diet; 1S: 1% palm oil supplemented diet.

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Despite an ancient history of use, no scientific studies exist examining the benefits of hempseed in the prevention or treatment of cardiovascular disease. Even the anecdotal evidence that does exist must be viewed with some caution because the hempseed used at that time contained higher levels of tetrahydrocannabinol (THC) that may have only conferred the appearance of relief from illness. Hemp has been selectively bred over recent years to remove the THC from the plant seed [7]. The present study is important in view of this relative lack of information. Our results demonstrate that a significant inhibition of platelet aggregation was induced by dietary supplementation with hempseed. This was not achieved as a result of the elevated total fat content of the hempseed diet because, despite its similar total fat content, palm oil did not achieve the same effects as hempseed. Instead, the specific fatty acid composition of the hempseed was responsible for its beneficial effects on platelet aggregation. The high plasma ALA levels represent the most logical factor responsible for the inhibitory effects on platelet aggregation in the present study. ALA may directly alter platelet function or induce other metabolic pathways in the body to have an effect on platelet aggregation. ALA can be metabolized into the antiaggregatory eicosanoids DHA and/or EPA in some species [3]. However, in our present study, EPA and DHA levels were unaltered after the dietary hempseed. It is most likely, therefore, that ALA itself altered the aggregation of the platelets directly. It is difficult to argue that the elevation in LA contributed to the antiaggregatory effects of hempseed when others have shown that LA is a prothrombotic agent [4]. We can certainly conclude that LA does not have a detrimental effect upon platelet aggregation when delivered with ALA in the form of hempseed. LA has been associated with a reduction in cardiovascular disease in epidemiological studies [8], which is difficult to reconcile with a prothrombotic action. Our data would suggest that the delivery of both omega-6 and omega-3 PUFAs together in the diet in foods induces different effects than when studied in isolation.

Recent articles [1,9] have warned clinicians to be aware of foods that alter bleeding times of patients. Hempseed may now be included in this list. However, this action may be of benefit in the protection against clot-induced strokes and myocardial infarctions. Although this protection may be similar to that

demonstrated for other foods that contain PUFAs [6], its unique composition of both omega-3 and omega-6 fatty acids may provide beneficial effects against a greater variety of cardiovascular diseases.

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Disclosure of Conflict of Interests

The authors state that they have no conflict of interest.

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