Inflammopharmacology, Vol. 7, No. pp. 63–68 (1999)

Short communication

The anti-inflammatory properties of rose-hip

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Received 2 December 1998; revised 4 February 1999; accepted 5 February 1999

Abstract—The anti-inflammatory properties of rose-hip are described in this short report. Rose-hip extract reduced chemotaxis of peripheral blood neutrophils and monocytes of healthy subjects *in vitro*. Daily intake of rose-hip powder for four weeks by healthy volunteers and patients suffering from osteoarthritis, resulted in reduced serum C-reactive protein (CRP) levels and reduced chemotaxis of peripheral blood neutrophils. The results indicate that rose-hip possesses anti-inflammatory properties and might be used as a replacement or supplement for conventional drug therapies in patients with osteoarthritis.

Key words: rose-hip; osteoarthritis; anti-inflammatory; chemotaxis; CRP.

1. INTRODUCTION

There have been undocumented lay claims that rose-hip, normally known for its high vitamin C content, may reduce the pain in patients suffering from osteoarthritis. We have recently shown that rose-hip extract reduced the chemotaxis of peripheral blood polymorphonuclear leukocytes (PMNs) and monocytes *in vitro* [1]. This activity was independent of the vitamin C content of rose-hip. Furthermore, the level of CRP and the chemotaxis of neutrophils were reduced in healthy subjects under rose-hip treatment. The purpose of this study was to investigate whether the natural product rose-hip, administered as dry powder to volunteers of which four were suffering from clinical osteoarthritis, had any effect on the clinical signs and symptoms and certain inflammatory parameters.

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2. SUBJECTS AND METHODS

2.1. Subjects

Eight male volunteers, free from any known allergic, hepatic, cardiovascular or infectious diseases, mean age 52 years (range 47–62), were entered into the study. Four of them had never experienced any pain of muscular or joint origin. The other four had all been engaged in hard physical work in different areas of construction for most of their adult life. One had suffered from clinical osteoarthritis for more than 20 years, with pain especially in the knee and elbow. The pain had been alleviated by injections of steroid directly into the joints and by acetylsalicylic acid and non-steroid anti-inflammatory drugs (NSAIDs). The second patient had osteoarthritis and moderate pain in the knee and the ankle, periodically relieved by acetylsalicylic acid. The third patient had pain from osteoarthritis of the ankle and had been periodically treated with NSAIDs and acetylsalicylic acid. The fourth patient had osteoarthritis of the elbow and shoulder of 10 years duration, normally treated with aspirin or paracetamol. The volunteers were treated with 45 grams (high dose) of Hyben Vital rose-hip daily for four weeks. The treatment was withdrawn for at least one month, then followed by another treatment for four weeks at a daily dose of 10 grams (low dose). Rose-hip was taken together with a main meal. After four weeks of the high dose rose-hip intake, at the end of treatment-free intervals and at the end of the low dose intake, the volunteers were asked about the possible side-effects, and blood samples were collected for clinical chemistry and PMN chemotaxis studies. All blood samples were taken between 8 : 30 and 9 : 00 am by the same laboratory technician after 30 minutes of rest, and analyzed immediately. For chemotaxis, heparinized blood was taken using vacuotainers. The time-lapse between blood sampling and chemotaxis was the same for the patients and control subjects.

2.2. Rose-hip

Rose-hip powder of *Rosa canina* was kindly provided by Hyben Vital, Langeland, Denmark. The rose-hip powder used in these studies was a well characterized and standardized batch containing both seeds and shell. During the drying procedure of the rose-hip powder, the temperature never exceeded 40°C. For the *in vitro* studies, a water extract of rose-hip was prepared. The extraction took place at 4°C.

2.3. CRP determination

Serum CRP was estimated by a turbidometric method using a Hitachi 717 turbidometer. CRP antiserum was from Orion Diagnostica, Helsinki, Finland. CRP dilution buffer and human CRP calibrator was purchased from DACO A/S, Glostrup, Denmark. The normal range in our laboratory is $\geqslant$ 10 mg/l.

2.4. Chemotaxis

Chemotaxis was carried out using a modified Boyden chamber assay [2]. For the *in vitro* studies, PMNs isolated from peripheral blood of the subjects were preincubated with various dilutions of rose-hip extract for 30 min at 37°C. Following preincubation, chemotaxis of the cells towards the chemotactic peptide f-Met-Leu-Phe (fMLP) at a concentration of 10^{-5} M or zymosan activated serum (ZAS) at a dilution of 1 : 200 was tested. For the *in vivo* studies, the chemotaxis of peripheral blood neutrophils from healthy control subjects and patients towards fMLP and ZAS was determined. The migrated cells were counted by a computer-assisted image analysis system.

2.5. Statistical analysis

Statistical analysis of the data was performed by using the Wilcoxon test for matched pairs. All data are given as mean ± SEM. p values of $\leqslant 0.05$ were considered significant.

3. RESULTS AND DISCUSSION

Rose-hip extract at concentrations as low as 100 μg/ml inhibited the chemotaxis of PMNs *in vitro* (data not shown). Cell viability after incubation with rose-hip extract was greater than 98%. As shown in Fig. 1, serum CRP levels, although within normal range, declined significantly both in the high-dose ($p \leqslant 0.02$) and in the low-dose groups ($p \leqslant 0.05$) as compared to the no-therapy group. The CRP levels (mean ± SEM) in the patient group were 5.75 ± 2.95, 6.67 ± 2.67 and 8.25 ± 4.98

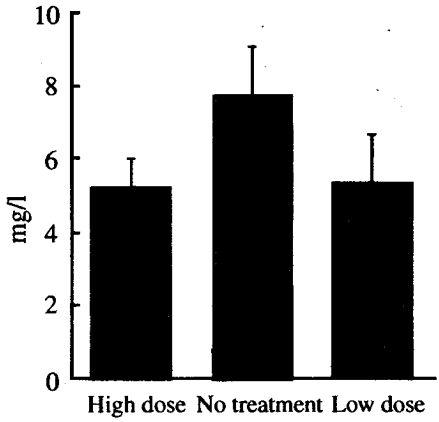

Figure 1. C-reactive protein levels in the serum of eight volunteers given high dose, low dose or no treatment. The values are given as mean ± SEM in mg/l. There were statistically significant differences between CRP levels from the high dose group and no treatment ($p \leqslant 0.02$) and low dose group and no treatment ($p \leqslant 0.05$).

Table 1.
Chemotaxis of peripheral blood neutrophils from the eight volunteers at the end of high dose intake, 28 days after cessation of intake and at the end of low dose intake of rose-hip powder. The results are given as mean ± SEM

	High dose	No therapy	Low dose
Chemotaxis (fMLP)	144 ± 38.7[a]	339 ± 24.0	172 ± 18.0[b]
Chemotaxis (ZAS)	343 ± 89.7[a]	637 ± 29.3	432 ± 39.9[b]

[a] Comparison of high dose with no therapy $p \leqslant 0.01$.
[b] Comparison of low dose with no therapy $p \leqslant 0.02$.

with high dose, low dose and no therapy, respectively. In the control group the CRP levels were 4.75 ± 0.75, 4.00 ± 0.0 and 7.25 ± 1.03 with high dose, low dose and no therapy, respectively. The neutrophil chemotaxis data are shown in Table 1. Chemotaxis towards fMLP declined by approximately 60% and 50%, in the high dose and low dose group, respectively, with p values of 0.01 and 0.02. Chemotaxis towards ZAS also declined in both the high dose ($p \leqslant 0.01$) and in the low dose groups ($p \leqslant 0.02$). The decline in chemotaxis of cells from the patients and the controls under treatment with rose-hip was similar. The decline in chemotaxis was observed in all the 8 subjects. The mean ± SEM values for fMLP were 187 ± 60 compared to 370 ± 39 and for ZAS 414 ± 136 compared to 673 ± 27 in the high dose patient group compared with no therapy. In the high dose control group the mean ± SEM response to fMLP was 101 ± 45 as compared to 308 ± 22 and to ZAS 272 ± 125 as compared to 600 ± 49 as compared to no therapy.

The salient finding of the present study is that rose-hip, given as dry powder, lowered CRP levels significantly and inhibited chemotaxis of peripheral blood neutrophils in human male volunteers. To our knowledge, this finding has not been reported before. There are very few reports in the literature on other properties of rose-hip. Rose-hip has been used as source of vitamin C in tea and other products [3]. Cells such as polymorphonuclear leukocytes (PMNs) and monocytes are involved in the inflammatory process and tissue damage in inflammatory diseases such as arthritis and atherosclerosis [4]. The damage is caused by the release of proteolytic and hydrolytic enzymes as well as toxic oxygen radicals [5]. Acetylsalicylic acid, non-steroid anti-inflammatory drugs and glucocorticoids have been used for the treatment of these diseases [6, 7]. These drugs have a variety of side effects such as gastric erosion and kidney disturbances. The present study demonstrates that administration of rose-hip to patients with osteoarthritis, diagnosed on a clinical basis, reduced the levels of the acute phase protein CRP and peripheral blood neutrophil chemotaxis. Similar results were found in the four healthy subjects who had never experienced pain of osteoarthritis origin. Symptoms were assessed as pain severity on a scale of 1–10 and change in limitation of joint movement. Alleviation of physical symptoms by rose-hip in the patients correlated very well with the reduced chemotaxis of peripheral blood neutrophils and reduced level of CRP. After the volunteers stopped taking rose-hip, the chemotaxis of

neutrophils and the levels of CRP rose to the untreated values. It is interesting to note that the initial CRP values were higher in the patient than the control group. The inhibition of chemotaxis observed in our study was comparable to that observed with acetylsalicylic acid as reported by Matzner *et al.* [8]. On the other hand Kemp and Smith [9] showed that incubation of neutrophils *in vitro* with sodium salicylate increased the chemotaxis of these cells. A similar increased response was observed in normal individuals after ingestion of sodium salicylate [9]. Some non-steroid anti-inflammatory drugs such as ibuprofen at *in vivo* obtainable concentrations inhibited neutrophil locomotion by 50%, similar to our findings with rose-hip [10–12]. The patients who complained of mild pain of osteoarthritis origin, reported that their pain declined after 14 days of rose-hip intake. The pain relieving effect of rose-hip in these patients was comparable to that of NSAID and acetylsalicylic acid. In all cases the pain returned 12–14 days after stopping intake. No allergic reactions or gastrointestinal disturbances were observed during therapy. There was no major difference between the pain alleviating effect of rose-hip given at the two different doses. Three patients had total pain relief from rose-hip and were unable to distinguish the difference between the high dose and the low dose. However, one patient felt that high dose gave him total relief whereas low dose decreased the pain dramatically but not completely. In conclusion, the anti-inflammatory and pain-relieving properties of the natural product rose-hip, combined with its safety, low price and ease of administration, provide an attractive strategy to use rose-hip as part of a supplement to a therapeutic regimen for osteoarthritis. A large scale placebo-controlled clinical study will be required to extend confirmation of the anti-inflammatory effect of rose-hip.

Acknowledgements

Technical assistance of Kirsten Mossin, Hanne Tamstorf and Anne Asanovski and and support of the Danish Rheumatism Association is acknowledged.

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