

Effects of a Very Low-Fat, Vegan Diet in Subjects with Rheumatoid Arthritis

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ABSTRACT

Objective: To demonstrate the effects of a very low-fat, vegan diet on patients with rheumatoid arthritis (RA).

Design: Single-blind dietary intervention study.

Subjects and study interventions: This study evaluated the influence of a 4-week, very low-fat (~10%), vegan diet on 24 free-living subjects with RA, average age, 56 ± 11 years old.

Outcome measurements: Prestudy and poststudy assessment of RA symptomatology was performed by a rheumatologist blind to the study design. Biochemical measures and 4-day diet data were also collected. Subjects met weekly for diet instruction, compliance monitoring, and progress assessments.

Results: There were significant ($p < 0.001$) decreases in fat (69%), protein (24%), and energy (22%), and a significant increase in carbohydrate (55%) intake. All measures of RA symptomatology decreased significantly ($p < 0.05$), except for duration of morning stiffness ($p > 0.05$). Weight also decreased significantly ($p < 0.001$). At 4 weeks, C-reactive protein decreased 16% (ns, $p > 0.05$), RA factor decreased 10% (ns, $p > 0.05$), while erythrocyte sedimentation rate was unchanged ($p > 0.05$).

Conclusion: This study showed that patients with moderate-to-severe RA, who switch to a very low-fat, vegan diet can experience significant reductions in RA symptoms.

INTRODUCTION

TREATMENT OF RHEUMATOID ARTHRITIS (RA) with diet was fashionable in the 1920s and over the past 20 years many reports and studies have shown benefit for patients who change their diet. Benefits from dietary manipulation have been observed with water-only fasts (Hafstrom et al., 1988; Kroker et al., 1984; Panush et al., 1986), vegetable and fruit juice fasts (Lithell et al., 1983; Skoldstam et al., 1979, 1991;

Sundqvist et al., 1982), lactovegetarian diets (Kjeldsen-Kragh et al., 1991; Skoldstam et al., 1979; Sundqvist et al., 1982), pure vegetarian (vegan) diets (Beri et al., 1988; Darlington et al., 1991; Kjeldsen-Kragh et al., 1991; Nenonen et al., 1998; Parke et al., 1981; Ratner et al., 1985; Seignalet, 1992), and elimination diets (Darlington et al., 1986; Hicklin et al., 1980; Kavanagh et al., 1995; van de Laar et al., 1992). By their very nature of limited calorie intake, fasts can only be sustained for short periods of time

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and with return to usual eating, the arthritis symptoms have been shown to return in almost every case. Finding an offending food through an elimination program can be effective, but this can be a time consuming and expensive approach. Therefore, an effective, inexpensive, practical dietary approach is needed.

A thorough review of the previous scientific research and the experience of the authors led us to hypothesize that the diet most likely to help the greatest number of patients with RA would be devoid of all animal products (a vegan diet) and also low in all kinds of fats (Beri et al., 1988; Darlington et al., 1986, 1991; Hafstrom et al., 1988; Hicklin et al., 1980; Kavanagh et al., 1995; Kjeldsen-Kragh et al., 1991; Kroker et al., 1984; Lithell et al., 1983; Nenonen et al., 1998; Panush et al., 1986; Parke et al., 1981; Ratner et al., 1985; Skoldstam et al., 1979, 1991; Sundqvist et al., 1982; Seignalet, 1992; van de Laar et al., 1992). This kind of dietary change is inexpensive, practical, and sustainable, and if found to improve the symptoms of RA could potentially be of help to many people suffering with this disease. Therefore, we set out to determine the effects of a very low-fat vegan diet on patients with RA in a free-living environment.

MATERIALS AND METHODS

Participants

The SPHERA Foundation, Los Altos, CA, independent review board (IRB) approved the study.

Newspaper advertisements and letters to local rheumatologists were used to obtain volunteers to participate in a single-blind study of the effects of diet on RA. All subjects signed IRB-approved informed-consent forms as well as the California Subject Bill of Rights. Twenty-four people were identified with moderate (41%) to severe (58%) disease. They were all on a stable dose of medications for 4 weeks prior to the study. None of them could be following a vegan or dairy-free diet prior to the study. Patients with other significant diseases that might be affected by the change in diet were excluded. These included people with diabetes,

heart disease, high blood pressure, cancer, as well as other serious chronic diseases. Women made up 92% of the group with an average age of 56 ± 11 years (27–80). Procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional or regional) and with the Helsinki Declaration of 1975, as revised in 1983.

Design

Baseline measurements were obtained on all participants. They were initially evaluated by an independent rheumatologist who had no information concerning the kind of treatment that was being evaluated or who was receiving the treatment. A composite score of evaluation of several joints was used to determine a joint swelling and joint tenderness score. The lower the score the better. A visual analogue scale was used by the participants to determine degree of pain because of RA, limitation in ability of function, severity of morning stiffness, and duration of morning stiffness. Participants' body weight was measured. Laboratory tests included erythrocyte sedimentation rate (ESR), C-reactive protein, and RA factor. After 4 weeks of dietary intervention the same evaluations and tests were repeated.

Dietary intake was assessed by a 4-day foods record and a weekly food monitoring checklist. Registered dietitians helped with these evaluations.

Diet

Four weekly meetings were held to teach a low-fat, vegan diet to the participants. The diet contained no animal products or added fats and oils of any kind. The menus were based around common starches, such as beans, breads, corn, pastas, potatoes, sweet potatoes, and rice. To this centerpiece was added fresh or fresh-frozen fruits and vegetables. Participants were encouraged to eat *ad libitum*. Menus and recipes were provided. Dehydrated cereals, soups, and main entrees supplemented the daily meals. Education on eating out, shopping, and meal planning was given, along with food demonstrations and tastings.

Laboratory methods

C-reactive protein was analyzed using fixed rate nephelometry; rheumatoid factor using latex, fixed rate time nephelometry; and ESR using the Westergren method.

Statistical methods

The Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL) was used for statistical analysis. All results are expressed as mean \pm standard deviation (SD). Student's paired *t* test (two-tailed) from baseline to 4 weeks was computed. A *p* value of < 0.05 was taken to be statistically significant. Diet records were computer analyzed by Nutritionist IV program (First Databank, San Bruno, CA) by a registered dietitian.

RESULTS

Energy intake decreased from an average of 6681 (± 1871) kJ to 5233 (± 1327) kJ daily, ($p < 0.001$). Percent of calories from carbohydrate increased from 49 (± 7) to 76 (± 7) ($p < 0.001$); from fat decreased 32 (± 6) to 10 (± 5) ($p < 0.001$), and from protein decreased 17 (± 3) to 13 (± 3) ($p < 0.001$).

Body weight showed a substantial decrease from an average of 68 \pm 19 to 65 \pm 18 kg ($p < 0.001$).

ESR remained unchanged (50 \pm 30 mm/hr to 50 \pm 28 mm/hr) ($p > 0.05$). There was a nonsignificant decrease in C-reactive protein (2.08 \pm 1.8 to 1.74 \pm 1.7 mg/dL) ($p > 0.05$). Rheumatoid factor showed a nonsignificant decrease (371.5 \pm 573 to 333.3 \pm 504 IU/mL) ($p > 0.05$).

There were significant changes in symptomatology. Degree of pain because of RA decreased from 49 \pm 20 to 34 \pm 20 ($p < 0.004$). Limitation in ability to function improved from a score of 47 \pm 25 to 29 \pm 22 ($p < 0.001$). The joint tenderness score decreased from 24 \pm 12 to 17 \pm 16 ($p < 0.01$) and the joint swelling score decreased from 27 \pm 9 to 22 \pm 8 ($p < 0.02$). Severity of morning stiffness also improved, falling from 49 \pm 21 to 36 \pm 27 ($p < .04$). However, there was no significant difference in duration of morning stiffness

with a change from 104 \pm 71 to 99 \pm 116 ($p > 0.05$).

Compliance was assessed as very high with 22 of the 24 participants staying with the program for four weeks with only a few lapses in adherence.

DISCUSSION

Our results from studying 24 patients with RA show significant improvement in their symptomatology by following inexpensive and practical dietary recommendations that can be applied to a free-living population of patients with RA. We also found those participants who improved the most had the most active disease at the beginning of the study. Participants with long-standing disease that had already destroyed most of the joint tissues, for obvious reasons, found very little improvement with this change in their diet.

The development of RA is believed to involve disorders of the intestine and the immune system. Patients with inflammatory arthritis have been shown to have inflammation of the intestinal tract resulting in increased permeability (Mielants et al., 1996). Fasting is known to decrease intestinal permeability and improve the symptoms of patients with RA (Sundqvist et al., 1982). After the fast, when patients return to a diet with dairy products, the gut becomes more permeable and the arthritis returns.

With increased intestinal permeability, foreign proteins from foods and bacteria pass into the bloodstream. Elevated levels of antibodies to gut bacteria and to food have been found in people with various forms of inflammatory arthritis (Tiwana et al., 1997; Perez-Maceda et al., 1991). Large immune complexes can form in the blood and be filtered by the small capillaries supplying the joint capsule, causing an inflammatory reaction in the joint tissues (Danning et al., 1998).

Another possible mechanism, molecular mimicry, has been identified in patients with RA. In this case, antibodies directed to foreign protein antigens find similar antigen sites in the joint tissues, attacking these tissues. The amino

acid residues 141–157 of bovine albumin have been identified as essentially the same as the amino acids found in human collagen in the joints (Perez-Maceda et al., 1991).

Complete avoidance of food by a water-only fast is the most complete method of avoiding exposure to foreign proteins (Hafstrom et al., 1988; Kroker et al., 1984; Panush et al., 1986). Fasting with limited amounts of vegetable and fruit juices has been shown to decrease intestinal permeability and also avoids dairy proteins that are commonly found to worsen symptoms (Lithell et al., 1983; Skoldstam et al., 1979, 1991; Sundqvist et al., 1982). Both of these kinds of fasting are also very low in dietary fats. By their design, fasting, either with water only or with vegetable and fruit juices, can only be sustained for a limited time. However, plant-based diets that eliminate foods most likely to cause immune reactions leading to RA are practical and have been found effective in past research (Beri et al., 1988; Darlington et al., 1991; Kjeldsen-Kragh et al., 1991; Nenonen et al., 1998; Parke et al., 1981; Ratner et al., 1985; Seignalet, 1992). Vegan diets are followed by millions of people worldwide for a lifetime. But not all vegan diets are effective for RA. A vegan diet has found to be ineffective for RA when it is also high in fat (42% fat) (Lithell et al., 1983). This suggests that a beneficial diet must not only be free of animal products, but must be low in fat by avoiding the addition of vegetable oils.

Studies using an elimination protocol to identify specific foods that aggravate symptoms of patients with RA have identified many offending foods, including nuts, beef, cheese, eggs, wheat, and corn (Darlington et al., 1986; Hicklin et al., 1980; Kavanaghi et al., 1995; van de Laar et al., 1992). Even though elimination diet studies and some of the studies using vegan diets have found cereals, such as wheat and corn, can aggravate patients with RA, we elected to include these foods in our design. This is because they are commonly enjoyed foods and the investigators' experiences are that few people benefit from this further restriction. It is possible that our results would have been even better without the cereals.

Almost all of the previously reported dietary interventions for RA were carried out under controlled environments, such as hospital

wards or live-in spas. One of our most important questions was, can an effective dietary intervention be taught and implemented in a free-living situation? We found a high degree of compliance (22 of 24) to the dietary recommendations demonstrating that for at least 4 weeks this approach is practical and effective in a community setting. Observations over many months will have to be made to understand the long-term issues surrounding compliance.

Dietary therapy has many important advantages over drug therapy. It is low-cost, self-administered, and has no adverse side effects. Results of our study as well as those of others have found that many patients experience dramatic improvement in their arthritis symptoms and some have a complete remission with a change in diet. To date, no drug therapy has resulted in remission (Emergy, 1997; Wollheim, 1997). An additional benefit for the patients is that a diet lower in fat and cholesterol has been recommended for the prevention and/or treatment of many other common chronic diseases, including heart disease, diabetes, obesity, and some forms of cancer (Weisberger, 2000).

The use of a vegan diet is a source of concern for many people because of the common misconception that a diet without animal products will lead to malnutrition. Except for a very small risk of B₁₂ deficiency, a vegan diet based on unrefined plant foods supplies adequate amounts of calories, proteins, fats, vitamins and minerals, including calcium, zinc, and iron (Messina et al., 1997). Our dietary recommendations include supplementation with 5 μ g of vitamin B₁₂ daily.

This study lacks a controlled design, which would have increased the value of the results by accounting for placebo effects and cyclic changes in disease activity. Long-term controlled studies are needed to confirm our results further, to determine the characteristics of the disease and patients that predict success or failure, and to evaluate differential effects of specific constituents of the diet. For example, the study has not made clear how much of the benefit was from the reduced calorie intake, the lower fat content, or the lack of animal products (particularly dairy products). For the present time, this study has shown that individuals with moderate to severe RA

who switch to a very low-fat, animal-food-free diet can experience significant reductions in the symptoms of their disease.

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