

Diet and Disease Symptoms in Rheumatic Diseases - Results of a Questionnaire Based Survey

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Summary Experiences with food intake, diet manipulations and fast were registered in rheumatic patients. The study was a questionnaire-based survey in which 742 patients participated. It comprised 290 patients with rheumatoid arthritis, 51 patients with juvenile rheumatoid arthritis, 87 patients with ankylosing spondylitis, 51 patients with psoriatic arthropathy, 65 patients with primary fibromyalgia and 34 patients with osteoarthritis. One third of the patients with rheumatoid arthritis, ankylosing spondylitis and psoriatic arthropathy reported aggravation of disease symptoms after intake of certain foods while 43% of the patients with juvenile rheumatoid arthritis and 42% of the patients with primary fibromyalgia stated the same. Twenty-six percent of the patients with juvenile rheumatoid arthritis and 23% of the patients with rheumatoid arthritis, ankylosing spondylitis and primary fibromyalgia had previously tried certain diets in the attempt to alleviate disease symptoms, whereas 13% of the patients with psoriatic arthropathy and 10% with osteoarthritis had tried diet therapy. Less pain and stiffness were reported by 46% of the patients and 36% reported reduced joint swelling. Similar beneficial effects of diet were also reported in other rheumatic disease groups. Fifteen percent of the patients with rheumatoid arthritis and ankylosing spondylitis had been through a fasting period. Less pain and stiffness were reported by 2/3 of the patients in both groups and half of the patients in both groups reported a reduced number of swollen joints.

Key words: Diet, Diet Therapy, Fast, Rheumatoid Arthritis, Inflammatory Rheumatic Diseases, Noninflammatory Rheumatic Diseases.

INTRODUCTION

The possible influence of diet on chronic arthritis is a difficult and controversial issue. Clinical trials (1-4) undertaken so far have reached divergent conclusions. Case reports (5,6) have suggested allergic responses to certain foods in patients with rheumatoid arthritis. Panush showed that 3 patients out of 15 who claimed they suffered from food allergy / intolerance, responded with aggravation of disease symptoms in a double-blind food challenge study (7). From this result the author es-

timated that 5% of patients with rheumatoid arthritis have immunologic reactions to food. Furthermore, patients with rheumatoid arthritis not previously aware of having food intolerance, benefited from elimination diets in two recent studies (4,8).

Many rheumatic patients believe diet has an influence on disease symptoms. Nevertheless, we do not know the number of patients who have experienced aggravation of symptoms after food intake, which foods are most commonly involved and what kind of symptoms they cause. Neither do we know the number of patients who have undertaken a fast or tried certain diets in attempt to alleviate disease symptoms, and to what extent the patients benefited from previous dietary manipulation. The aim of this study was to shed light on these questions.

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MATERIALS AND METHODS

Study design

This study was a questionnaire based survey, in which all patients admitted to the rheumatological department at two different hospitals in Norway, during a certain period, were asked to participate. This implies that many types of rheumatic diseases were represented. The number of participants in some rheumatic disease groups, however, became too small and for practical and statistical reasons we will only discuss the largest groups in this report.

The questionnaire

The questionnaire consisted of 10 major closed questions with a variety of subquestions, both closed and open. The patients were first asked to indicate on a visual analogue scale from 0 to 10 cm, how great an influence in general they believed diet had on disease symptoms. The patients were then asked if they had experienced aggravation of disease symptoms after food intake. If the answer was yes, they were requested to name the food item and further characterize the aggravation. In the third question the patients were asked to name the drugs they had used or were using at the time of the survey. Twenty-one different antirheumatic drugs were listed in order to stimulate the patients' memory. The fourth question dealt with fast. If the patients had fasted, the duration in days and possible influence on disease symptoms was to be noted. We also asked if there were changes in medication before, during and af-

ter the fast. The fifth question dealt with the patients' experiences with diet therapy. Three different diets were listed, an ovo-lactovegetarian diet (a diet without meat and fish, but with milk, dairy products and eggs, a vegan diet (a diet without meat, fish, eggs, milk and dairy products) and a diet consisting mostly of raw vegetables, commonly recommended to rheumatic patients on health farms. We asked for the length of time the patients had tried the diet and whether and how the diet influenced the disease symptoms. Patients no longer on diet were asked for reasons why they stopped.

The five remaining questions were personal data: name, age, sex, diagnosis and length of disease duration, known allergies and surgical treatment. It would take the participants from 10 to 20 minutes to answer the questionnaire. Copies of the questionnaire are available on request.

Reproducibility

To evaluate the reproducibility of the questionnaire, 47 randomly-selected patients were sent a new copy of the same questionnaire. The time interval between the two questionnaires was 9 months \pm 3 months. For every discrepancy between the two sets of answers the patients were contacted by telephone and questioned in greater detail. Forty-one questionnaires were received in return (87.2%). Information about medication, diagnosis, disease duration and surgical treatment was identical in the two sets. Concerning the information about the patients' diet no major discrepancies were found apart from two patients who had undertaken dietary manipulations and

Table 1: Characteristics of 742 patients participating in the questionnaire-based survey

| Diagnoses | Number of questionnaires | Sex | | Age | | Disease duration | |
|--|--------------------------|------|--------|--------|---------|------------------|---------|
| | | Male | Female | median | (range) | median | (range) |
| Rheumatoid arthritis (9) | 290 | 80 | 210 | 58 | (25-81) | 11.0 | (0-55) |
| Juvenile rheumatoid arthritis (10) | 51 | 8 | 43 | 23 | (17-60) | 16.0 | (1-48) |
| Ankylosing spondylitis (11) | 87 | 57 | 30 | 36 | (18-62) | 9.0 | (0-35) |
| Psoriatic arthropathy (12) | 51 | 29 | 22 | 43 | (18-81) | 9.3 | (1-31) |
| Connective tissue diseases* | 25 | 4 | 21 | 45 | (20-71) | 9.4 | (0-23) |
| Reactive arthritis | 18 | 15 | 3 | 35 | (17-74) | 2.4 | (0-9) |
| Polymyalgia rheumatica (13) | 21 | 3 | 18 | 67 | (56-83) | 5.3 | (1-49) |
| Primary fibromyalgia (14) | 65 | 10 | 55 | 39 | (16-74) | 3.7 | (0-22) |
| Osteoarthritis | 34 | 6 | 28 | 53 | (28-73) | 9.0 | (0-30) |
| Soft tissue rheumatism and patients with unclassified rheumatic complaints | 99 | 28 | 71 | 41 | (18-70) | 2.0 | (0-15) |
| Total | 742 | 241 | 501 | | | | |

*Mixed connective tissue disease, systemic lupus erythematosus, Sjögrens disease and primary systemic sclerosis
(): reference to the diagnostic criteria.

Table II: Believers in diet influence on disease symptoms in rheumatic diseases

| | Small influence (0-5 cm) | Great influence (5-10 cm) |
|--|-----------------------------|------------------------------|
| Rheumatoid arthritis | 116 (63%) | 69 (37%) |
| Juvenile rheumatoid arthritis | 28 (62%) | 17 (38%) |
| Ankylosing spondylitis | 39 (57%) | 29 (43%) |
| Psoriatic arthropathy | 23 (64%) | 13 (36%) |
| Primary fibromyalgia | 21 (60%) | 14 (40%) |
| Osteoarthritis | 11 (50%) | 11 (50%) |
| Soft tissue rheumatism and patients with unclassified rheumatic complaints | 37 (56%) | 29 (44%) |

Table III: Foods most frequently reported to cause aggravation of rheumatic symptoms in patients with rheumatoid arthritis

| Type of food | number of patients | % of total reactions |
|--------------------------|--------------------|----------------------|
| Meat* | 41 | 48% |
| Wine | 22 | 26% |
| Alcohol # | 13 | 15% |
| Coffee | 23 | 27% |
| Sweets, sugar, chocolate | 16 | 19% |
| Citrus fruits and apples | 10 | 12% |

* Includes pork, beef and lamb. # Except wine.

four patients who had tried a fasting period between the two sets of answers.

Validity

For all patients, the diagnoses were checked with the medical records. Furthermore, for 32 randomly-selected patients, answers concerning medication, disease duration, allergies and surgical treatment were compared with information in the medical records. Information of fast, diet and diet therapy was seldom found in the medical records and therefore this information was obtained through personal interviews. In general, there was a good agreement between the information in the questionnaire and the information from the medical record and personal interview. Discrepancies were found with respect to medication, but these did not involve major antirheumatic drugs.

Patients

In this survey 290 patients with rheumatoid arthritis, 51 patients with juvenile rheumatoid arthritis, 87 patients with ankylosing spondylitis, 51 patients with psoriatic arthropathy, 65 patients with primary fibromyalgia and 34 patients with osteoarthritis participated. The characteristics of all participants are shown in Table I.

The patients were under medical treatment, either as hospitalized patients (59%) or as outpatients (41%). Most patients participating in this survey were on medication.

All patients above 18 years of age admitted to Oslo Sanitetsforening Rheumatism Hospital and to the Department of Rheumatology, University Hospital of Tromsø, were handed a questionnaire at admittance. Questionnaires were also sent to the patients in the outpatient clinic in Tromsø together with time for appointment at the clinic. In Oslo the survey was carried out for one year and in Tromsø for five months. The patients in Oslo were asked to fill out and drop the questionnaire in a box placed in the ward. The box was labelled with the cover of the questionnaire and could be readily seen by the patients. There was no routine in assisting the patients with the questionnaire, or in reminding them to drop the questionnaire in the box. At the Department of Rheumatology in Tromsø, the doctor collected the questionnaires and assisted the patients in filling out the forms on request. At the out-patient clinic in Tromsø the patients were asked for the questionnaire by the nurse or the doctor at the time of appointment.

Statistics

Data were calculated with cross tabulation on an IBM personal computer, using NCSS, a software package for statistical calculations. Mean, standard deviation, median and range were calculated for influence of food intake on disease activity, length of diet period, age and disease duration. Unpaired t-tests, Mann-Whitney U-test, Fisher's exact test and chi-square tests were used to compare the different patient groups. A paired t-test was used to test reproducibility.

RESULTS

The questionnaire

Fifty-seven percent of the patients with psoriatic arthropathy and 46% of the patients with rheumatoid arthritis, juvenile rheumatoid arthritis and ankylosing spondylitis answered the questionnaire whereas approximately one-third of the patients with osteoarthritis and primary fibromyalgia filled in the questionnaire. To investigate this seeming lack of interest in diet among rheumatic patients, a second questionnaire was sent to 89 nonparticipating patients, and 74% replied. Stated reasons for not participating in the survey were as follows: twenty patients (30%) had filled in the questionnaire but had forgotten to deliver it to the staff; eighteen

Table IV: Number of rheumatic patients reporting on fast and diet therapy. In parenthesis the percentage of patients answering the question in each group

| | Fast | | Diet therapy | | Using diet today | Lactovegetarian diet | Vegan diet | Other diets |
|--|------|-------|--------------|-------|------------------|----------------------|------------|-------------|
| Rheumatoid arthritis | 41 | (15%) | 63 | (23%) | 22 | 29 | 15 | 38 |
| Juvenile rheumatoid arthritis | 10 | (20%) | 13 | (26%) | 4 | 7 | 3 | 5 |
| Ankylosing spondylitis | 14 | (16%) | 19 | (22%) | 4 | 10 | 2 | 7 |
| Psoriatic arthropathy | 6 | (12%) | 6 | (12%) | 4 | 3 | 1 | 2 |
| Primary fibromyalgia | 5 | (9%) | 13 | (23%) | 2 | 4 | 0 | 10 |
| Osteoarthritis | 3 | (13%) | 3 | (13%) | 1 | 0 | 1 | 2 |
| Soft tissue rheumatism and patients with unclassified rheumatic complaints | 8 | (8%) | 10 | (11%) | 4 | 6 | 0 | 4 |
| Total | 97 | (14%) | 143 | (21%) | 47 | 72 | 28 | 49 |

patients (26%) had no verified rheumatic disease at the time of the survey; seventeen patients (25%) had not received the questionnaire from the staff; thirteen patients (20%) found the questionnaire difficult to fill in and six patients (9%) gave lack of interest in the subject as reason.

Influence of food intake on disease symptoms

The patients were arbitrarily defined as a "poor believer" if they put a mark on the visual analogue scale between 0 cm and 5 cm, while a patient marking the scale from 5 cm to 10 cm was characterised as a "good believer" of diet influence on disease symptoms (Table II). No significant differences in the proportion of poor or good believers were found in the different diagnostic groups. In our material about 40% of the patients believed diet would have a major impact on disease symptoms.

Forty-three percent of the patients with juvenile rheumatoid arthritis and 42% of the patients with primary fibromyalgia had experienced aggravation of disease symptoms after intake of a special types of food. Thirty-three percent of the patients with rheumatoid arthritis, ankylosing spondylitis and psoriatic arthropathy reported the same experience. Twenty-six percent of the patients with osteoarthritis stated reactions to certain foods. In juvenile rheumatoid arthritis, rheumatoid arthritis and ankylosing spondylitis the stated impacts were: increase of pain in 72% of the patients and increased stiffness in 71%. Forty-six of the patients with rheumatoid arthritis and 36% of the patients with ankylosing spondylitis mentioned increased swelling of the joints. Eleven percent of these patients reported additional symptoms such as stomachache, headache and skin rash. Among the patients with primary fibromyalgia

80% reported pain and stiffness after intake of certain foods, whereas 29% reported swelling of the joints. There was a significantly higher incidence of reported reactions to food in patients who claimed to have some kind of allergic disease, compared with patients who did not report allergy ($p < 0.001$ chi-square test). There was also a significantly higher number of patients who reported aggravation of disease symptoms after intake of certain foods in the group of "good believers", compared with the number of patients reporting aggravation of the symptoms in the group of "poor believers" ($p < 0.001$ chi-square test).

For patients with rheumatoid arthritis, types of food most frequently associated with disease aggravation are listed in Table III. Meat was reported to have caused aggravation of disease symptoms in almost 50% of these patients. Patients with other rheumatic diseases stated reactions to the same food items and in almost identical percentage as the patients with rheumatoid arthritis. It appears, however, from the present survey that almost any food item could cause aggravation of disease symptoms.

Influence of fast on disease symptoms

Ten patients (20%) in the juvenile rheumatoid arthritis group, 41 patients (15%) with rheumatoid arthritis, 14 patients (16%) with ankylosing spondylitis and 5 patients (9%) with primary fibromyalgia had previously fasted on their own initiative in an attempt to ameliorate disease symptoms (Table IV). The fast was carried on for a median length of 7-10 days. Of 41 patients with rheumatoid arthritis 71% reported less pain, 60% reported less stiffness and 52% reported less joint-swelling. Almost the same experiences were reported by the patients with juvenile rheumatoid arthritis and ankylos-

ing spondylitis. Of the patients with primary fibromyalgia, only one patient reported less pain and stiffness as a result of fast.

Influence of diet therapy on disease symptoms

Of the patients in this survey 143 had tried diet therapy in an attempt to alleviate rheumatic symptoms (Table IV). Sixty-four percent of the patients who experienced disease aggravation after food intake had tried diet therapy, compared with 25% of the patients who did not have this experience ($p < 0.001$ chi-square test). Of the women, 25% had tried diet therapy compared with 13% of the men ($p < 0.001$ chi-square test). Disease duration was not found to be longer in the patients who had tried diet therapy, compared with those who had not tried diet therapy.

Seventy-two patients had used a lactovegetarian diet, 28 patients a vegan diet and 49 patients had used other diets, mostly excluding food items causing aggravation of disease symptoms (Table IV). Of 119 patients describing the effect of dietary manipulations 47% reported less pain, 46% reported less stiffness and 36% reported reduced joint swelling. No differences were found between the different rheumatic disease groups with regard to effect of dietary manipulations. Vegan diet, however, was reported to reduce disease symptoms more effectively than the lactovegetarian diet by patients with rheumatoid arthritis ($p < 0.02$, Mann-Whitney U-test). At the time of the survey 47 patients (36%) were on diet or used diet now and then. Patients, who had abandoned the diet, did so mostly because it did not reduce disease symptoms, but also because diet manipulations were time consuming, expensive and put a strain on social life.

Altogether, 21 patients stated that they had changed their medication during the diet period. Most of the 10 patients who specified the changes had reduced the dose of NSAID's and/or corticosteroids.

Patients with rheumatoid arthritis who had tried diet therapy, had a significantly higher incidence of synovectomies ($p < 0.001$, chi-square test) and total joint replacements ($p < 0.01$, chi square test), compared with patients who did not try dietary manipulations. They also had a higher consumption of drugs, although this difference was not significant.

DISCUSSION

The aim of the present survey was: 1) to register the number of rheumatic patients who experience aggravations of disease symptoms after food intake, 2) to register how common diet manipulations are among rheu-

matic patients and 3) to register possible influence on disease symptoms. In order to achieve this, a questionnaire was handed to adult hospitalized patients and to outpatients.

The low participation in this survey was investigated to find possible selection of the rheumatic patients. The main reason for not participating was forgetfulness but also uncertainty about the diagnoses. This could especially explain the low participation among patients with noninflammatory rheumatic diseases. Very few patients, however, stated lack of interest in the subject as reason for not participating in the survey.

Thirty-three percent of the patients with rheumatoid arthritis reported disease aggravation after intake of certain foods like meat, alcohol, coffee, sugar and sweets. Increase in pain and stiffness as well as increase in joint-swelling was reported. These findings are in accordance with the results of a questionnaire based survey by Felder et al. (15). In this survey 33% of the patients with rheumatoid arthritis experienced aggravation of disease symptoms after food intake; however, no signs of allergic reaction were demonstrated by food challenge experiments. The conclusion that food allergy is not involved in the pathogenesis of rheumatoid arthritis was also drawn from an earlier study by Denman et al. (2). In our study patients who had allergies reported more often aggravation of disease symptoms after food intake, than patients who had no allergies. This might support the theory of an allergic response to food in inflammatory rheumatic diseases. Case reports (5,6,20), and a study by Panush et al. (7) have also provided evidence for existence of food allergy in some patients with rheumatoid arthritis. Panush has estimated immunological sensitivity to food to account for severe disease deterioration in 5% of the patients with rheumatoid arthritis (7). The foods most frequently reported to cause aggravation of symptoms in patients with rheumatoid arthritis are gluten and dairy products (5,6,20). In our survey, only 8 patients with rheumatoid arthritis reported aggravation of disease symptoms after intake of gluten and/or dairy products. Food allergy / intolerance to these products is hard to detect since they are eaten daily by almost all individuals in the Western society.

The reported improvements of disease symptoms after a fast in our survey agree with results of previous studies in rheumatoid arthritis (16-19). This survey revealed that patients with other rheumatic diseases, also experience alleviation of pain and stiffness and reduction of joint swelling after fast. It is not yet understood why fast can ameliorate the symptoms of rheumatoid arthritis. Fast may have an effect on the immune system. Normalization of suppressor cell activity has been shown in patients with rheumatoid arthritis (18). Hafström et al.

(17) have reported reduced release of proteolytic enzymes and leukotrienes from neutrophils, which might cause reduced inflammation and tissue destruction. Clinical improvement may also result from reduced antigenic challenge due to decreased food intake and a change in intestinal permeability (19).

Half of the patients with rheumatoid arthritis reported no change of disease symptoms while on a lactovegetarian diet, and did not continue this diet for more than an average of two months. This observation agrees with results from an earlier study with lactovegetarian diet (16). Half of the patients on lactovegetarian diet reported improvement of pain and stiffness and stayed on the diet for a longer period (i.e. a median of 7 months) and 24% of the patients were still on the diet at the time of the survey. The reason why so few patients continued the lactovegetarian diet, might be that they did not improve enough to compensate for the inconvenience. Stated reasons for discontinuing the diet were that the lactovegetarian diet was time consuming and that it put a strain on social life. The patients with rheumatoid arthritis who used a vegan diet reported greater improvements than the patients trying a lactovegetarian diet. The improvement stated after the vegan diet agrees with the result from an open study on fast and vegan diet by Skjöldstam

(21), who found subjective improvement of symptoms in patients with rheumatoid arthritis.

Doubts about the patients own ability to assess their disease have been put forward. The validity and reproducibility of self-reporting questionnaires, however, can be documented, and in a recent study of Pincus et al. (22) patients with rheumatoid arthritis showed that there was a strong correlation between patients own assessment of their disease, and clinical and laboratory findings.

In conclusion, one third of the patients with rheumatoid arthritis, juvenile rheumatoid arthritis, ankylosing spondylitis, psoriatic arthropathy and primary fibromyalgia in our study reported disease aggravation after intake of a certain foods. The previously well-documented positive effect of fast in rheumatoid arthritis was confirmed and extended to patients with other inflammatory rheumatic diseases. More than 50% of the patients with rheumatoid arthritis who had changed their diets, reported reduction in pain, stiffness and joint swelling.

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REFERENCES

- Panush, R.S., Carter, R.L., Katz, P., Kowsari, B., Longley, S., Finnie, S. Diet therapy for rheumatoid arthritis. *Arthritis Rheum* 1983, 26, 462-471.
- Denman, A.M., Mitchell, B., Ansell, B.M. Joint complaints and food allergic disorders. *Ann Allergy* 1983, 51, 260-263.
- Marshall, R., Stroud, R.M., Kroker, G.F., Bullock, T., Carroll, F.M., Greenberg, M., Randolph, T.G., Rea, W.J., Smiley, R. Food challenge effects on fasted rheumatoid arthritis patients: a multicenter study. *Cl Ecol* 1984, 2, 181-190.
- Darlington, L.G., Ramsey, N.W., Mansfield, J.R. Placebo-controlled, blind study of dietary manipulation therapy in rheumatoid arthritis. *Lancet* 1986, i, 236-238.
- Parke, A.L., Hughes, G.R.V. Rheumatoid arthritis and food: a case study. *Br Med J* 1981, 282, 2027-2029.
- Panush, R.S., Stroud, R.M., Webster, E. Food-induced allergic arthritis. *Arthritis Rheum* 1986, 29, 220-226.
- Panush, R.S. Food induced ("Allergic") Arthritis: Clinical and Serologic Studies. *J Rheumatol* 1990, 17, 285-290.
- Beri, D., Malaviya, A.N., Shandilya, R., Singh, R.R. Effect of dietary restrictions on disease activity in rheumatoid arthritis. *An Rheum Dis* 1988, 47, 69-72.
- Arnett, F.A., Edworthy, S.M., Bloch, D.A., Mcshane D.J. et al. The American Rheumatism Association 1987 revised criteria for the classification of rheumatoid arthritis. *Arthritis Rheum* 1988, 31, 315-324.
- Brewer, E.J., Bass, J., Baum, J., Cassidy, J.T., Fink, C., Jacobs, J., Hanson, V., Lecinson, J.E., Schaller, J., Stillman, J.S. Current proposed revision of JRA criteria. *Arthritis Rheum* 1977, 20, 195-199.
- Bennett, P.H., Wood, P.H.N. Population studies of the rheumatic diseases. Amsterdam: Expert Medica 1968, 456.
- Bennet, R.M. Psoriatic arthritis. In: *Arthritis and Allied Conditions*. 9th ed. Ed: McCarthy, D.J., Philadelphia: Lea and Febiger 1979, 642-655.
- Ellis, M.E., Ralston, S. The ESR in the management of polymyalgia rheumatica/giant cell arthritis syndrome. *Ann Rheum Dis* 1983, 42, 168-170.
- Wolfe, F., Smuthe, H.A., Yunus, M.B., Bennett, R.M. et al. Criteria for the classification of fibromyalgia. Report of the multicenter criteria committee. *Arthritis Rheum* 1972, 33, 160-172.
- Felder, M., de Blecourt, A.C.E., Wuthrich, B. Food allergy in patients with rheumatoid arthritis. *Clin Rheumatol* 1987, 6, 181-184.
- Skjöldstam, L., Larsson, L., Lindström, F.D. Effects of fasting and lactovegetarian diet on rheumatoid arthritis. *Scand J Rheumatol* 1979, 8, 249-255.
- Hafström, I., Ringertz, B., Gyllenhammar, H., Palmblad, J., Harms-Ringdahl, M. Effects of fasting in disease activity, neutrophil function, fatty acid composition, and leukotriene biosynthesis in patients with rheumatoid arthritis. *Arthritis Rheum* 1988, 31, 585-592.
- Uden, A-M., Trang, L., Venizelos, N., Palmblad, J. Neutrophil functions and clinical performance after total fasting in patients with rheumatoid arthritis. *Ann Rheum Dis* 1983, 42, 45-51.

19. Sundquist, T., Lindström, F., Magnusson, K-E., Sköldstam, L., Stjernström, I., Tagesson, C. Influence of fasting on intestinal permeability and disease activity in patients with rheumatoid arthritis. *Scand J Rheumatol* 1982, 11, 33-38.
20. Lunardi, C., Bambara, L.M., Biasi, D., Venturini, G., Nicolis, F., Pachor, M.L., De Sandre, G. Food allergy and rheumatoid arthritis. *Clin Exp Rheum* 1988, 6, 423-424.
21. Sköldstam, L. Fasting and vegan diet in rheumatoid arthritis. *Scand J Rheumatol* 1986, 15, 219-221.
22. Pincus, T., Callahan, L.F., Brooks, R.H., Fuchs, H.A., Olsen, N.J., Kaye, J.J. Self-reporting questionnaire scores in rheumatoid ar-

thritis compared with traditional physical, radiographic and laboratory measures. *Ann Intern Med* 1989, 110, 259-266.

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