Table I. *Monoamine and diamine oxidase activities in platelet-rich plasma of psoriasis patients and healthy controls*

	Type B monoamine oxidase (mmol min $^{-1}$l^{-1})	Diamine oxidase (mmol min $^{-1}$l^{-1})	Histamine (μg l^{-1})
Psoriasis vulgaris	0.242±0.095 (n=25)	0.231±0.101 (n=24)	5.41±2.05 (n=25)
Controls	0.394±0.091 (n=14)	0.535±0.133 (n=13)	2.25±1.00 (n=13)
Significance Student t-test	$p<0.05$	$p<0.001$	$p<0.001$

RESULTS AND DISCUSSION

The investigations show reduced MAO-B and DAO activities in platelet-rich plasma of psoriasis patients, when compared with control subjects (Table I). The difference was highly significant for the first step histamine catabolizing enzyme, DAO ($p<0.001$) and significant for the methylhistamine catabolizing enzyme MAO-B ($p<0.05$). Concomitantly with reduction of MAO-B and DAO activities, plasma histamine levels increased (Table I). Our results suggest that low MAO-B and DAO activities may account for increased histamine levels of endogeneous or exogeneous (5) origin in psoriatic patients.

The cofactor concentrations of MAO-B (6) were reduced but for DAO (7) were almost normal (manuscript in preparation). We therefore conclude that, contrary to MAO-B activity, some other reason such as the cofactor level must be responsible for the lowered activity of DAO. Biogenic amines, food additives, or drugs (5, 8) are the most probable candidates for inhibition of the enzyme. Investigations concerning DAO inhibitors in psoriasis are in progress in our laboratory.

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Dietary Supplementation with a Combination of n-3 and n-6 Fatty Acids (Super Gamma-Oil Marine) Improves Psoriasis

KNUD KRAGBALLE

Department of Dermatology, Marselisborg Hospital, University of Aarhus, Aarhus, Denmark

Psoriasis may improve during dietary supplementation with fish oil containing n-3 fatty acids including eicosapentaenoic acid. In the present study 17 psoriatic patients were treated with Super Gamma-Oil Marine containing a combination of n-3 and n-6 fatty acids (linoleic acid and gammalinolenic acid). After 4 months, excellent improvement was observed in 2 patients, moderate improvement in 8, mild improvement in 4, and no improvement in 3 patients. These results may indicate that a combination of n-3 and n-6 fatty acids is useful for the treatment of psoriasis. However, controlled studies including more patients are warranted.

(Accepted December 5, 1988.)

Acta Derm Venereol (Stockh) 1989; 69: 265–268.

K. Kragballe, Department of Dermatology, Marselisborg Hospital, University of Aarhus, DK-8000 Aarhus C, Denmark.

The contents of free arachidonic acid (AA) (20:4, n-6) and certain of its lipoxygenase products are increased in psoriatic lesional tissue (1, 2). Particular interest has been taken in the presence of leukotriene B_4 (LTB_4) (2, 3), because this 5-lipoxygenase product of AA is a potent mediator of skin inflammation (4) and a stimulator of epidermal proliferation (5, 6). However, confirmation or denial of the importance of LTB_4 in psoriatic pathophysiology still awaits the availability of specific and selective 5-lipoxygenase inhibitors. Another way of inhibiting the formation of LTB_4, and possibly the effect of LTB_4, is to replace AA in phospholipids with other polyunsaturated fatty acids.

There are two families of polyunsaturated fatty acids, the n-3 family and the n-6 family. Eicosapentaenoic acid (EPA) belongs to the n-3 family and is transformed by the same enzymes as AA. Thus, 5-lipoxygenase activity results in the formation of LTB_5 which expresses only 3–10% of the neutrophil chemotactic activity of LTB_4 (7) and furthermore inhibits LTB_4-induced neutrophil chemotaxis (8). The formation of LTB_5 at the expense of LTB_4 might therefore result in weaker inflammatory responses, because of competitive binding of the less potent LTB_5 to receptors for LTB_4 (7).

Recent uncontrolled (1, 2, 3) and controlled (4) studies have suggested that dietary supplementation with fish oil (MaxEPA) can improve psoriasis. MaxEPA contains 18% EPA which belongs to the n-3 group of polyunsaturated fatty acids. The clinical improvement caused by fish oil may be secondary to replacement of arachidonic with EPA, resulting in the formation of leukotriene B_5 at the expense of leukotriene B_4 (3).

However, long-term ingestion can also lead to EPA displacing the n-6 fatty acids linoleic acid (LA), gamma-linolenic acid (GLA) and dihomo-gamma-linolenic acid (DGLA) in cell membranes (5). This is undesirable, because these n-6 fatty acids are essential for cell structure and function (6). Combination of EPA with oils providing LA and GLA may therefore be preferable to obtain a correct balance between the two families of fatty acids.

The purpose of the present study was to determine the effect of dietary supplementation with Super Gamma-Oil Marine, containing both n-6 fatty acids (LA and GLA) and n-3 fatty acids (EPA and docosahexaenoic acid (DHA)) on psoriasis.

Table I. *Dermographic data of psoriatic patients participating in the study*

Age (years)	38 (21–52)
Sex (F/M)	12/5
Duration of psoriasis (years)	11 (1–22)
Extent of psoriasis (% body surface)	10 (2–43)

Values are means and ranges.

MATERIAL AND METHODS

Patients

Eighteen patients with plaque psoriasis, stable in extent for at least 2 weeks were included in the trial. Patients had not received anti-psoriatic treatment topically for 2 weeks and systemically for 2 months. All patients were asked to apply an emollient once daily to the psoriatic lesions.

Clinical evaluations of the severity and the extent of psoriasis were made prior to the dietary intake and at monthly intervals. At each visit the investigator made an overall assessment of the disease, compared with baseline. The grading of the overall assessment was as follows: worse, no change, mild improvement, moderate improvement, and excellent improvement.

Diet

Each patient was instructed to follow a diet low in fat, particularly low in arachidonic acid and saturated fats for 4–6 months. Food excluded were fats and oils, red meat, whole-milk dairy products, baked foods, egg yolk, sallad dressings and nuts. Constituents of the administered diets were fish, poultry, fruits, vegetables (except avocado), cereals, skim-milk dairy products, carbonated beverages, coffee and tea. Adequate protein and carbohydrate intake was maintained. Total daily caloric intake was calculated for each patient to maintain prestudy body weight.

This diet was supplemented with 12 Super Gamma-Oil Marine capsules daily and 100 μg organic selenium daily. Each capsule (750 mg of blended oils) contained 280 mg LA, 80 mg GLA, 45 mg EPA, 30 mg DHA and 9 mg docosapentaenoic acid. Furthermore, each capsule contained 15 mg α-tocopherol as an anti-oxidant.

RESULTS

Seventeen of the 18 psoriatic patients completed the study (4 months). The demographic data of these 17 patients are shown in Table I. One patient withdrew because of difficulties in complying with the study diet.

Fig. 1 depicts the overall assessment of psoriasis

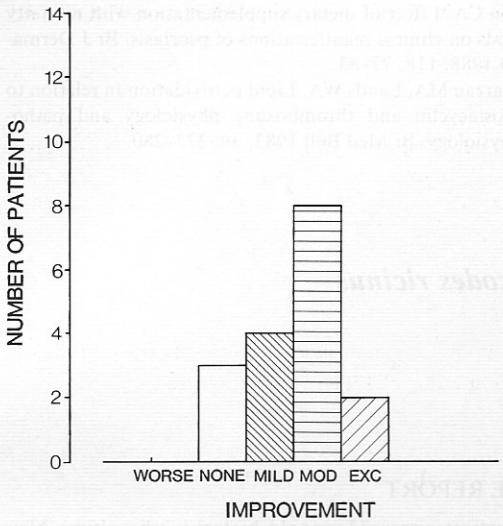

Fig. 1. Overall improvement of psoriasis after treatment for 4 months with dietary Super Gamma-Oil Marine.

after treatment for 4 months, compared with baseline. Moderate or excellent improvement was observed in 10 (59%) of the patients, mild improvement in 4 (23%), and no change in 3 (18%). In most patients experiencing a satisfactory response (moderate or excellent improvement), there was some improvement after only 1 month (data not shown), but maximum improvement was obtained after 4 months.

A comparison between the clinical response and the extent of the disease showed that a greater proportion of patients with less than 10% involvement had a satisfactory clinical response, than patients with more extensive disease (data not shown). However, these differences did not reach statistical significance.

DISCUSSION

The present study shows that long-term treatment of psoriasis vulgaris with a low-fat diet supplemented with dietary Super Gamma-Oil Marine results in a satisfactory improvement in almost 60% of the patients. In our patients it was impossible to predict from the extent of their disease or the severity of their lesions, whether they would respond to dietary treatment or not. Although this was an open, uncontrolled study, it is our impression that the response rate is much higher than with placebo. Also, it appears that the anti-psoriatic effect of dietary Super Gamma-Oil Marine is comparable to that of dietary MaxEPA (5). It appears from our study that it is necessary to eat a low-fat diet supplemented with Super Gamma-Oil Marine for 2 months, before it can be decided whether a given patient will respond clinically or not. This fact may explain why no improvement was observed in an 8-week clinical trial (7). An additional explanation for the lack of effect in the latter study may be that the patients were kept on a regular diet.

Although the present results suggest that dietary supplementation with a combination of n-3 and n-6 polyunsaturated fatty acids may be used as adjunctive therapy in psoriasis, three are still many unsolved questions that need to be answered. First, the optimal ratio between n-3 and n-6 fatty acids is not known. Secondly, a proper dose-determining study needs to be conducted. Thirdly, the commercial oils providing n-3 and n-6 fatty acids need to be standardized. Recently, we have found that oils from different manufacturers are of highly variable quality (unpublished data). Furthermore, different batches from the same manufacturer may have different fatty acid contents. This apparent lack of quality control has several implications. First of all, it becomes impossible to compare results obtained with different fish oil products. Of equal importance is the high content of potentially harmful lipid oxidation products in certain fish oils on the market (unpublished data). The products of lipid oxidation may, at least in animals, act as initiators of promoters or carcinogenesis (8) and should therefore, be kept on the lowest possible level. This is partially accomplished by having α-tocopherol in the oil capsules. However, it can only be assured by taking additional anti-oxidants, such as selenium, orally.

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Multiple Bites from the Larvae of the Tick *Ixodes ricinus*

A Case Report

LARS HALKIER-SØRENSEN and KNUD KRAGBALLE

Department of Dermatology, and Venereology, Marselisborg Hospital, University of Århus, Århus, Denmark

The case is presented of a 32-year-old man with multiple reddish-blue papules on both thighs and sporadic on the lower part of the trunk and lower legs, clinically compatible with multiple 'insect' bites. The lesions were found to be multiple bites from larvae of the tick *Ixodes ricinus*. The larvae are about 1 mm long, live very close to the ground, and mainly parasitize small rodents. They are, therefore, generally not well known. Although seldom encountered, we suggest that bites from the larvae of the tick *Ixodes ricinus* should be kept in mind in patients with multiple 'insect' bites, especially in periods with high tick activity. The differential diagnosis is important because the larvae may cause infection with the spirochete *Borrelia burgdorgferi*.

(Accepted November 15, 1988.)

Acta Derm Venereol (Stockh) 1989; 69: 268–269.

L. Halkier-Sørensen, Department of Dermatology and Venereology, Marselisborg Hospital, DK-8000 Aarhus C, Denmark.

Bites from the adult tick *Ixodes ricinus (I. ricinus)* and their association with Borreliosis are well known (1). In general, only a few ticks are found that feed on the skin in humans but foresters and hunters may be attacked by several ticks. The adult tick measures from 2.5 to 3.5 mm, but can grow to more than 10 mm when feeding on the skin (2). Although the tick bite is painless, bites from adult ticks will, due to their size, probably not pass unnoticed, whereas bites from the smaller nymphs and larvae may very well do so, as the larvae measure only about 1 mm (2, 3). Furthermore the larvae are not generally well known and may not be perceived as a tick when found on the skin. We report a case of a 32-year-old man, who reported to the clinic for venereal diseases because he believed he was infested with the pubic louse, *Phthirus pubis*.

CASE REPORT

The patient was a 32-year-old biologist, who ultimo May 1988 had been on a picnic with some of his colleagues. They had been resting for long time at the edge of a glade. All, except our patient, sat on a rug, while our patient sat directly on the ground, wearing shorts. In the evening, he noticed 10 to 15 small parasites proximally on both thighs. He had no pain or itching. He succeeded in removing most of them by topical application of ethanol. However, a few parasites had to be removed with tweezers and one of these were isolated on an objectglass. He feared that it might be morpiones and the next day he reported to the clinic for venereal diseases.

The clinical examination revealed multiple reddish-blue

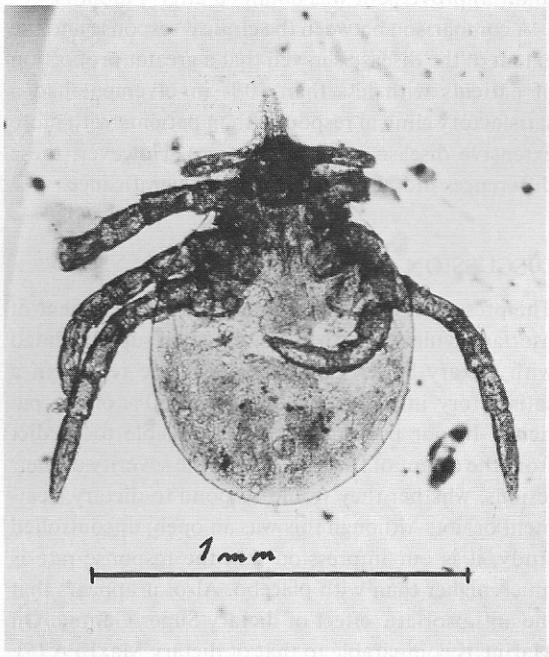

Fig. 1. The small larva of the tick *I. ricinus*.