

## The effect bathing in a thermal lagoon in Iceland has on psoriasis. A preliminary study

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### Abstract

**Objective** To investigate if bathing in a unique thermal lagoon in Iceland has a therapeutic effect on psoriasis.

**Design** An open study where twenty-seven psoriasis patients bathed for three weeks in the lagoon. Psoriasis Area and Severity Index (PASI) was used to evaluate the severity of the disease before during and after bathing.

**Results** The mean PASI score decreased from 16.1 to 8.1 ( $p = 0.01$ ). The PASI score decreased most in the first week. The area of the lesions did not diminish but scaling erythema and infiltration decreased. Only very limited UV-radiation was observed during the bathing period.

**Conclusions** Bathing in the lagoon has a favourable effect on psoriasis although in some cases it may not be sufficient as a single treatment. Further studies over longer period are needed.

**Keywords:** Psoriasis, therapy; Thermal lagoon; Algae; Brine

### 1. Introduction

A geothermal lagoon was formed in the Svartsengi lava fields on the Reykjanes peninsula in Iceland in 1976 (Fig. 1). An employee of the geothermal plant in Svartsengi suffering from psoriasis gradually improved when he rubbed the

white mud onto his psoriasis plaques while bathing in the comfortably warm lagoon. In the following years several people tried to cure their skin diseases by bathing in the lagoon and many of them experienced some beneficial effect from the bathing. Two preliminary studies have been conducted on the effect of the bathing in the lagoon on psoriasis [1,2]. Both studies indicated some beneficial effect on psoriasis and thus it was decided to carry out a more thorough study on the effect bathing in the Blue Lagoon has on psoriasis.

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## 2. Materials and methods

### 2.1. *The Blue Lagoon - geography*

Since 1976 a power plant in Iceland has drawn fluid from wells drilled into a geothermal reservoir. The 240°C fluid is a mixture of 65% seawater and 35% freshwater. The composition of this brine has been altered by chemical reactions with the surrounding rock. Precipitation of magnesium silicates has reduced the magnesium concentration by a factor of a thousand, and dissolution of the rock has raised the concentration of silica roughly one hundredfold, to approximately 430 mg/kg. The fluid is separated into a steam phase and liquid phase at the surface. The spent brine is discharged into the lava field close to the plant at a rate of 900 m<sup>3</sup> / hour and a temperature of 70°C. Most of the fluid seeps down into the ground through fissures in the lava, but some

evaporates, reducing the temperature further. However, enough water remains on the surface to form a pond or lagoon. On cooling, the liquid becomes supersaturated with silica, which then precipitates to form a white mud. This seals the fissures in the lava and has caused the lagoon to spread to the present size of approximately 0.2 km wide and a few km long. The silica concentration in the lagoon water is about 135–140 mg/kg. Some of the silica in the water polymerises and forms colloidal particles. These silica particles scatter light intensely, giving the pond a name: The Blue Lagoon. The chemical composition of the fluid in the lagoon is given in Table 1 [3,4].

### 2.2. *The biology of the Blue Lagoon*

The mean temperature in the lagoon is 37°C, the mean pH is 7.5 and the salt content is 2.5% [5]. The dominating algae in the lagoon is a blue

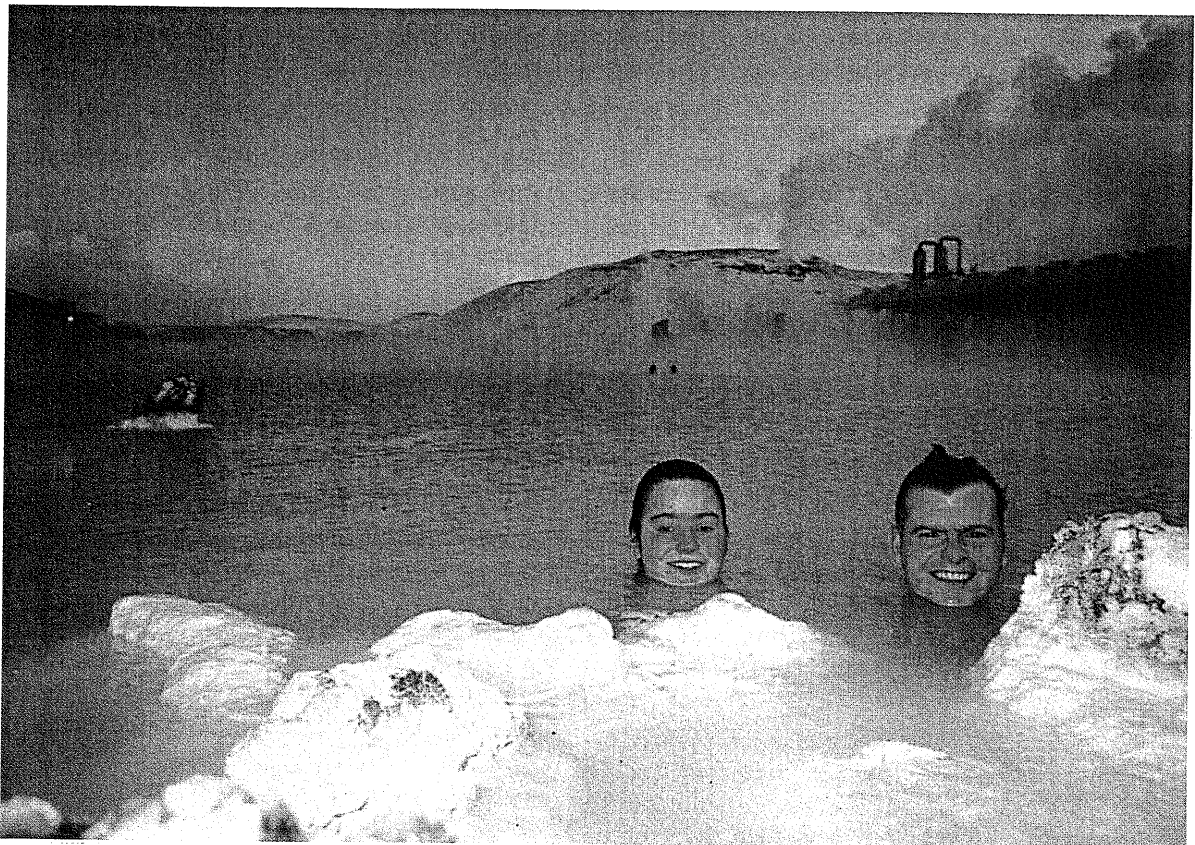


Fig 1. The Blue Lagoon, on the Reykjanes peninsula in Iceland.

Table 1  
The composition of the fluid (mg/kg) in the Blue Lagoon.

PH/temp.°C	7.70/24
SiO <sub>2</sub>	137
Na	9280
K	1560
Ca	1450
Mg	1.41
CO <sub>2</sub>	16.5
SO <sub>4</sub>	38.6
H <sub>2</sub> S	0.0
Cl	18500
F	0.14
Total dissolved solids: 31900 mg/kg fluid	

green algae called *Leptolyngbya erebi* var. *thermalis*, belonging to the *Cyanobacteria* species [5,6]. These algae grow very fast in the warm natural surroundings of the lagoon, and are not found under similar conditions anywhere else in the world [5]. The only type of bacteria isolated from the lagoon is a Gram negative rod belonging to the *Moraxella* species. No human coliform bacteria are isolated from the lagoon and none grow in water from the lagoon. No fungi or plants have been found in the lagoon or isolated from the water [5].

### 2.3. The bathing facilities

A new bathing facility was made for the purpose of this study situated beside the original lagoon measuring 25 × 6 meters. Facilities for changing clothes and showering were provided in small houses on the bank of the lagoon. A 10–20 cm layer of silica mud with abundance of blue green algae covered the bottom. The temperature was controlled by adjusting the inflow of hot water. No difference was found between the two lagoons regarding salts, silicates, algae, bacteria and pH [7].

### 2.4. The patients

Twenty eight psoriatics from different parts of Germany, selected by German dermatologists participated in the study. They were all treated at the same time. No skin treatment with drugs of any kind, was allowed during the study. Mois-

turisers and emollients were permitted. Patients aged 16–75 with plaque-psoriasis or extensive guttate psoriasis of more than one year duration, with more than 10% of the body surface involved were included. Minor arthritis was accepted. No active treatment for psoriasis was accepted, and treatment with other modalities had to be stopped 4 weeks prior to the start of the treatment in the Blue Lagoon.

Erythroderma and pustular forms of psoriasis were excluded. Subjects allergic to UV-radiation were not accepted. Serious heart condition or any disease rendering the patients unable to bathe in hot water for 1 hour three times a day was an exclusion criteria.

### 2.5. The treatment

The patients bathed in the Blue Lagoon for three weeks, three times a day for one hour at a time. The study was carried out in August–September 1992, to minimise the effect of UV-radiation. Subjects were advised to rub the silica mud on the skin while bathing and to take a quick shower afterwards.

### 2.6. The medical evaluation

The patients were examined upon arrival and after one, two and finally after 3 weeks. The severity of the disease was determined by the Psoriasis Area and Severity Index score (PASI) as described by Frederikson and Pettersson [8]. Photographs of the psoriasis lesions were taken before, during and after the study. The patients evaluated their disease by a similar PASI score each week and 5 weeks afterwards, but only for the whole body.

## 3. Results

Recruitment of patients took place in August and September 1992 to minimise the effect of UV-radiation. Twenty-eight patients came to the Blue Lagoon. One was excluded for medical reasons shortly after arrival in Iceland, as he failed to fulfill the protocol criteria. Twenty-seven pa-

Table 2  
Total PASI scoring during treatment expressed as mean  $\pm$  1 S.D.  $N = 26$

At start of treatment ( $n = 26$ )	16.1 $\pm$ 8.6
After 1 week ( $n = 26$ )	10.8 $\pm$ 5.7
After 2 weeks ( $n = 26$ )	8.5 $\pm$ 6.1
After 3 weeks ( $n = 26$ )	8.2 $\pm$ 12.4

tients, 15 men and 12 women, 25 to 62 years of age (mean 46.1 years) entered the study. The mean duration of their psoriasis was 25.5 years (range 1 to 40 years). Antipsoriasis treatment had been administered to all the patients in the previous year. Psoriasis lesions were widely distributed, affecting the trunk and both upper and lower limbs in most cases.

During the first week of the study one patient was withdrawn due to personal reasons. Both investigators and patients judged the change in psoriatic activity during the study at weekly intervals. The PASI values during the study are shown in Table 2. The mean PASI score fell significantly during the first week of treatment, from an average value of 16.1 to 10.8 ( $p = 0.01$ ). At three weeks 5/26 patients had an improvement rate of at least 75%. At that time psoriasis improved by less than 35% or deteriorated in only 4/26 patients. The effect of bathing on the different elements of PASI are shown in Fig. 2.

### 3.1. Adverse effects

Most patients reported mild adverse effects. The majority involved the skin. These were de-

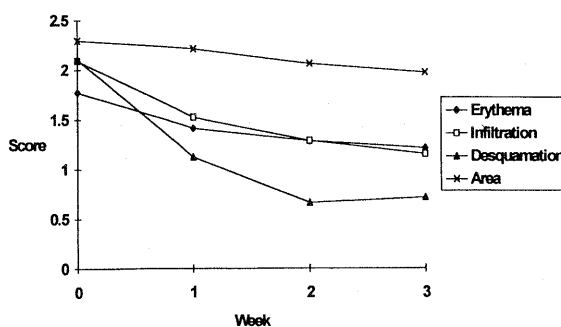


Fig 2. The score of the different elements of PASI during the treatment in the Blue Lagoon,

scribed as mild stinging, itching or burning during or shortly after bathing. Most patients noticed dry skin which was easily remedied with emollients. No patients were withdrawn due to side effects.

## 4. Discussion

The results show that the mean PASI score decreased from 16.1 to 8.2 by the end of the study. It is obvious from these results that bathing in the Blue Lagoon for three weeks has a favourable effect on psoriasis although in some cases it may not be sufficient as a single treatment. It has to be taken into account that most of the patients had been exposed to more sun than they were used to at the beginning of this study since the summer in Germany had been very warm and sunny. It has been pointed out that the standard thalasso- and heliotherapy is usually given over a 4 week period but in our case the treatment was only given for three weeks. This might explain why the patients did not heal completely and why they seemed to have relatively early relapse after the study was over.

Many studies have shown that natural UV-photo therapy and bathing in salt water has beneficial effect on psoriasis [9,10]. The Blue Lagoon treatment presents two noticeable differences compared to the usual thalassotherapy. The fluid and the minerals of the Lagoon are different to the salt content and composition of other areas. This is mainly due to the silica and the algae which are unique in the Blue Lagoon. The second difference is the relative lack of sun during the study. The weather during the study was not favourable, so the beneficial effect seen here must have other causes than UV-radiation. It is possible that the frequent hot baths in the lagoon may have a beneficial effect on psoriasis, but it has to be pointed out that although hot baths are very common in Iceland, reports of improvement of psoriasis from such hot baths are not documented. The silica mud has an abrasive effect when rubbed on the psoriasis plaques. This can explain the early desquamation seen in the study. However, the erythema decreased with the desquamation and did not increase as might be

expected when the scaling decreases and the inflamed lesion becomes evident [11]. The least effect of the bathing was on the area of the psoriatic lesions. The area usually decreases last after scaling erythema and infiltration, so the three week treatment simply might not have been enough to show an effect on the area. Many psoriasis patients who have been bathing in the Lagoon regularly believe that the blue-green algae have a curing effect, and therefore prefer this mud. This has not been studied yet. It is evident to us that another study must be done where bathing for four weeks in the Lagoon is compared to other forms of treatment. In spite of the many treatment modalities available for psoriasis there is no treatment suitable for all patients. Some patients are generally opposed to the use of drugs or they may not tolerate the sun so other treatment modalities have to be explored. Therefore bathing in the Blue Lagoon with its unique surroundings as well as the silica mud with the algae could be an alternative treatment, maybe with the addition of UVB-light as well. A study where UVB radiation and bathing in the Blue Lagoon is compared to other forms of treatment is being prepared.

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