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Detoxsan® Paste Formulation Containing Zeolites for the Treatment of Mycosis and Intertrigo Carried Out Under Climatic Conditions of Cuba

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Abstract

Objective: To offer an alternative therapy for the treatment of mycosis and intertrigo by a well investigated natural zeolite mineral embedded in a formulation of petrolatum and squalane.

Methods: A total of 43 patients, who were suffering from mycosis and intertrigo in the period started from July 2nd and ended on September 29th in 2018, were treated at the Policlínico Julio Grave de Peralta and dialysis department of the Hospital V. I. Lenin. Among them, 31 patients agreed with the application of the alternative therapy with Detoxsan® paste to overcome these dermatological diseases. The paste was applied semi-daily to the skin damaged by mycosis or intertrigo, respectively and every 5 days the patients had been controlled by the physicians with respect to the healing process. The observation period for each patient lasted 15 days.

Results: Symptoms of mycoses on patient's hands (6 patients) seem to be improved more rapidly between five and ten days than on feet (18 patients) which lasted about 15 days. In all the patients, the skin damaged by mycosis could be visually restored completely during 15 days. Most intertrigo patients showed a clinically restored skin surface already after 10 days. No adverse health effects were observed for all the patients.

Conclusions: The zeolite product Detoxsan® paste is able to restore skin damaged by mycosis and intertrigo. The formulation of the paste assures the adherence of the mineral to the skin and the properties of this zeolite with its excellent binding capacities for histamine and water, and efficiently promotes the healing process.

Keywords: Mycosis; Intertrigo; Zeolite; Clinoptilolite; Mordenite; Alternative therapy

Introduction

Superficial mycoses are the most common diseases of the skin, hairs and nails. These are caused by dermatophytes, yeasts and molds and occur worldwide with a higher incidence in the tropical region than in the temperate countries. Therefore, especially in Cuba therapeutic information for the different superficial mycoses is established dealing with both pharmacological and alternative treatments [1]. Among these mycoses *Tinea pedis* and *Tinea manuum* are very common, localized in the keratinized epidermis of the skin in feet and hand, respectively. The prevalence of superficial infection worldwide is 20-25% [2]. Onychomycosis is a fungal infection of the nails that causes discoloration, thickening and separation from the nail bed [3]. The healing process of this infection requires a longer period and, therefore, it was not included in this preliminary investigation. In the surgery of general practitioner and in the kidney department of the hospital occur frequently patients with mycoses or intertrigo, which have to be treated appropriately without an additional visit to a dermatologist. For this reason, it requires tools to non-specialist physicians to manage the situation and apply a helpful treatment [4]. In addition to the common drugs, which are used prevalently in Cuba, the traditional natural medicine plays an important role [5]. Therefore, we offered the patients optionally a natural product Detoxsan® paste, which contains natural zeolite mineral to overcome mycoses and intertrigo.

In addition to mycosis we applied Detoxsan® paste also to areas of intertrigo, an inflammation produced by chafing of adjacent areas of skin. This may provide an optimal environment for proliferation of microorganisms to result in secondary skin infections [6]. The therapies of intertrigo concerned mostly the topical application of antimycotics, corticosteroids, antibiotics and others [7]. Furthermore, intertrigo also known as intertriginous dermatitis is moisture-associated skin damage [8]. In particular, we have applied anhydrous Detoxsan® paste in order to dry the damaged skin area.

Zeolites possess attractive properties, such as adsorption, ion-exchange, water sorption/desorption, molecular sieving and excellent binding capacity for toxins and other harmful substances owing to their bio-stability and biocompatibility. Due to these excellent inherent properties, they are finding increasing interest in research and use in biotechnology and medicine [9,10]. The Cuban zeolite used in Detoxsan® paste is composed of two different crystal structures clinoptilolite and mordenite and possess high internal surface area [11]. Furthermore, it is able to adsorb the inflammation promotor histamine in a large extent and shows antiphlogistic effect as determined by a murine inflammation model [11-13]. Also clinoptilolite alone is able to reduce inflammation processes in liver

cell cultures [14]. The high water adsorption capacity [15] of the zeolite used in the present study is about 60% in addition to the structural water content of 15%, which helps in keeping dry the affected parts of the skin surface [13].

Superficial mycosis involves the epidermis and is frequently accompanied with an inflammatory reaction [16]. Advances in pathophysiology and management of this cutaneous disease result in various possibilities of oral and topical application but every therapy includes one or several pharmacological substances or photochemical treatments [2,17-19]. In the present investigation, an anhydrous formulation containing a natural zeolite was applied topically for patients with four aims in mind: (1) zeolite should adsorb inflammation factors like histamine and possibly other toxic compounds; (2) zeolite forms a thin mineral layer on the skin surface, which adsorbs the water and prevents microbial growth; (3) squalane, which maintains elasticity and moisture of the skin; and (4) petrolatum helps the formulation adhere well on the skin.

Materials and Methods

A total of 43 patients, who were suffering from mycosis and intertrigo in the period started from July 2nd and ended on September 29th in 2018, were treated at the Policlínico Julio Grave de Peralta and dialysis department of the Hospital V. I. Lenin. Among them, 31 patients agreed with the application of the alternative therapy with Detoxsan® paste to overcome these dermatological diseases.

Age	Gender		Total
	Female	Male	
20 ≤ 30	4	5	9
30 ≤ 40	8	7	15
40 and older	2	5	7
Total	14	17	31

Table 1: Age structure of patients included.

Disease	Gender		Total
	Female	Male	
Diabetes	4	7	11
Hypertension	7	7	14
Chronic kidney disease	3	4	7
Obviously healthy	2	2	4
Total	16	20	36

Table 2: Main disease pattern of patients included (multiple diseases are mentioned).

The age structure and disease pattern of the 31 patients included in this investigation are shown in Tables 1 and 2. Patients of chronic kidney disease suffer frequently by diabetes or hypertension resulting in a difference of total number of patients and disease pattern because multiple diseases if pronounced are mentioned. Localization of mycosis was most frequently in male patient's feet as summarized in Table 3. The male patients of intertrigo suffered especially in the inguinal region. Intertrigo of female patients was localized in the armpit, below the breast and in the inguinal region, too.

Localization	Gender		Total
	Female	Male	
Feet	7	11	18
Hands	4	2	6
Intertrigo	3	4	7
Total	14	17	31

Table 3: Localization of mycosis.

Detoxsan® paste bases on petrolatum, contains additionally squalane, is germfree and the active component is natural Cuban zeolite [11]. The paste adhere on the skin, the mineral cannot come off, is invisible and the damaged skin area is so covered by a thin mineral layer. The paste was applied semi-daily to the skin damaged by mycosis or intertrigo, respectively, and every 5 days the patients had been controlled by the physicians with respect to the healing process. The observation period for each patient lasted 15 days.

Results and Discussion

All patients enrolled in this study reported a pacification of the treated skin area without itching symptoms. This is not very surprising because acute itch is a common sensory experience with inflammatory skin disease on the histaminergic pathway and an enhanced histamine level can be adsorbed by the zeolite [11,12,20].

The clinical recovery of the skin area in any patient could not be observed within the first 5 days of treatment (Table 4). Five days later especially the skin area of intertrigo patients showed a clinically restored skin surface. This result seems to be attributed at least partially to the high water adsorption capacity of zeolite, which dries the moisture-associated skin area of intertrigo patients and promote in this way the recovery of damaged skin [8,13].

Treatment time	Mycosis				Intertrigo	
	Feet		Hands			
	Female	Male	Female	Male	Female	Male
5 days	0	0	0	0	0	0
10 days	0	2	2	1	2	3
15 days	7	9	2	1	1	1
Without effect	0	0	0	0	0	0
Total	7	11	4	2	3	4

Table 4: Number of patients in which mycosis and intertrigo, disappeared clinically after different time of treatment.

Symptoms of mycoses on patient's hands seem to be improved more rapidly than on feet. Mycoses on feet lasted about 15 days for clinical disappearance while on hands between one and two weeks. In all the

patients, the skin damaged by mycosis could be visually restored completely.

Thus, the effect of Detoxsan® paste is mainly based on the adsorptive properties of the zeolite against water and histamine on skin surface, where it forms a thin mineral layer. The additional formulation components like petrolatum and squalane make the zeolite applicable and guarantee the adherence on skin surface. While petrolatum is a widespread ingredient in many cosmetic and medical formulations, the squalane and squalene have unique properties for making stable and non-toxic emulsions and they are widely employed in the cosmetics industry as an emollient [21]. Squalane is actually the reduced product of squalene without any double bonds. Human sebum also contains 13% squalene as one of its major constituents and certain bioactivities of squalene and squalane are described among them maintenance of water and elasticity of the skin [22]. Possibly due to these properties, we never observed symptoms like drying of skin after application of Detoxsan® paste. While squalane shows a much better oxidative stability than squalene with double bonds we used this lipid component in order to avoid rancidity [23].

The waterless formulation of Detoxsan® paste forms on the skin surface a mineral layer creating conditions of a dry environment below this layer and prevents the growth of microorganisms, which play in mycosis an important role. A similar principle of forming a dry surrounding atmosphere using the socks made of modified cotton yarn with natural zeolite mineral, which has been shown to protect from diabetic foot infection. Patients reported on better comfort and freshness due to the dryer foot atmosphere within these modified socks [24]. Thus, our approach in zeolite application differs basically from the widespread therapy with healing clays in aqueous systems like mud therapy or peloid therapy to adsorb grease or dirt from the facial skin and to interact with skin surface on the microbiome level and substance transfer for skin benefit [25-27]. Clays like montmorillonite belong to the layered aluminium silicates with high thixotropy while zeolites used in this study are characterized by 3-dimensional crystal lattices with different characteristics and without any swelling capacity [27-29]. The water of the crystal lattice in the zeolite used in Detoxsan® paste of about 15% is not available for microorganisms, belongs to their mineral structure, does not have liquid-like properties and can be eliminated only at high temperature [13,30]. However, its water uptake capacity of about 60% in addition to the 15% structural water content underlines the high adsorptive power of this zeolite for water [13].

Finally, in spite of the fact that we have not determined histamine level at the skin surface damaged by mycosis or intertrigo, it is well known that this native amine has classical roles in the inflammatory processes as well as it is a key player in immune regulation. The pleiotropic effect of histamine is associated with increased mast cell numbers and tissue histamine levels and is a consequence of the existence of four different receptors [31,32]. Therefore, we assume that the application of Detoxsan® paste adsorbs histamine from inflamed skin tissue due to its really high adsorption capacity against histamine and water as proven by previous investigations [11-13].

Conclusions

The waterless Detoxsan® paste can restore skin surface damaged by mycosis or intertrigo within 5 to 15 days if applied semi-daily. The effect seems to be due to the high histamine and water adsorption capacity of zeolite contained in the formulation [11-13], which are both involved in the inflammation processes of mycosis and intertrigo patients. No adverse side effects were observed. Thus, the damaged skin surface can be restored by a natural zeolite paste without additional pharmaceutical additives.

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