

A New Approach for the Topical Treatment of Acne Vulgaris by Clindamycin HCl Supported on Kaolin

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Date of acceptance 24/10/2005

Abstract:

Background: the treatment of acne vulgaris should act against hyperkeratinization, inflammation, bacterial proliferation and sebum production. At the present, there is no topical anti-acne medication that acts against all of the above pathophysiological features of acne. The acne vulgaris response to the clindamycin is better than other available antibiotics. Kaolin by itself can be useful in sorption of bacteria, pus, toxins and free fatty acids.

Aim of the study: The aim of this work is to study the role of the adsorption – desorption process in prolonging the action of the clindamycin drug .

Patients and Methods: adsorption of clindamycin HCl from 70% ethanol solution on different amounts of kaolin as adsorbent was studied using UV-spectrophotometry technique at 210nm. Desorption process of the adsorbed clindamycin HCl from kaolin surface was also studied.

Results: A stable formula consisting kaolin, clindamycin HCl and 70% ethanol aqueous solution has been prepared for the treatment of acne vulgaris.

Conclusion: The formula provides prolonged action accompanied with a certain mechanism of clindamycin adsorbed on kaolin upon application on the skin leading to fairly good results in the treatment of acne vulgaris. The mechanism of action of the formula is based on the adsorption-desorption processes of the antibiotic on the clay. *Keywords:* Clindamycin; kaolin; adsorption; acne vulgaris

Introduction:

A large number of people of all over the world especially teenagers are suffering from acne vulgaris. It is a chronic inflammatory condition, in which excessive sebum secreted by over active sebaceous glands is unable to escape from the hair follicles⁽¹⁾. The increase and abnormal keratinization at the exit of pilosebaceous follicles obstructs the flow of sebum; this state will let the bacteria, propionobacterium acne, to play a pathogenic role. propionobacterium acne is a normal skin commensal; it colonizes the

pilosebaceous ducts. breakdown the triglycerides releasing free fatty acids, produces substances chemotactic for inflammatory cells and induces the ductal epithelium to secrete pro-inflammatory cytokines⁽²⁾. Hence, the treatment of acne vulgaris should act against hyperkeratinization, inflammation, bacterial proliferation and sebum production. At present, there is no topical anti- acne medication that acts against all of the above pathophysiological features of acne⁽³⁾. The combination of two or more medications may be necessary to

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integrate the effect of the drugs towards acne features. Many preparations containing clindamycin as an antibiotic to act against Gram positive cocci anaerobic⁽⁴⁾ have been prescribed and used topically⁽⁵⁻⁸⁾.

The use of antibiotics alone is associated with the problem of resistant strains of propionobacterium acne^(9, 10). However, the p-acne response to the clindamycin is better than other available antibiotics⁽¹¹⁻¹³⁾. The main mechanism of action of topical antibiotics for acne treatment is the inhibition of inflammation caused by bacteria rather than a direct bactericidal effect⁽¹⁴⁾.

Kaolin is widely used as adsorbent of many substances including drugs⁽¹⁵⁻¹⁶⁾, bacteria and their toxins⁽¹⁷⁾. Iraqi kaolin was investigated in previous studies⁽¹⁸⁻¹⁹⁾ for its adsorption ability of some drugs. The clay was found of appreciable surface activity and exhibiting a good adsorption capacity for many drugs. In traditional medicine, kaolin has been used for multiple purposes, particularly, in the treatment of acne vulgaris and for removal of hair dandruff.

In this work, an attempt was made for the preparation of a new formula containing a mixture of the antibiotic, clindamycin, in 70% v/v ethanol aqueous solution and kaolin clay as a surface active adsorbent. Kaolin is expected to play a significant role as an adsorbent for bacteria and sebum as well as its possible function as a clindamycin adsorbent which may result in gradual and prolonged contact of the drug with the skin through the adsorption process.

Experimental

A- Materials:

Pure clindamycin (B.P.) obtained from the Arab Company for Antibiotic Industries (ACAI). Ethanol 99% v/v obtained from BDH and the

kaolin from Dwaikhla mine supplied by the (Iraqi General Company for Geological Survey and Mining). Analysis of kaolin has shown the following w/w% composition: $\text{SiO}_2=54.68$, $\text{Al}_2\text{O}_3=30.19$, $\text{Fe}_2\text{O}_3=1.02$, $\text{TiO}_2=1.00$ and the loss on ignition =10.94.

B-Methods

In all experiments, pure clindamycin was brought into solution using 70% v/v ethanol aqueous solution as a solvent. Kaolin samples were prepared by washing the clay with distilled water followed by 70% ethanol aqueous solution. The clay was then dried at the 160°C for three hours, grinded to 75 μm and kept in tight container.

A volume of 5ml of eight different initial concentrations (C_0) in the range 3-10 g/L of pure clindamycin HCl solution was added to 500 mg of the kaolin adsorbent in test tubes supplied with tight covers. The contents of each tube were vortexed and incubated at 25C for one hour (the time required to reach equilibrium that determined in independent experiments and found not to exceed one hour) and then centrifuged at 3000 rpm for 15 minutes. Clindamycin HCl equilibrium concentration in each tube (C_e) was estimated spectrophotometrically in the UV-region using a (UV/VIS Pye-Unicam PU-8600 spectrophotometer) at the wave length ($\lambda=210$ nm.) of maximum absorbance. Calibration was done in the usual manner by making the appropriate dilution to fit Beer-Lambert law.

The above procedure enables us to study the adsorption isotherms of clindamycin on kaolin system. The reverse process (desorption of the drug from the solid adsorbent) is carried out by isolating the residues obtained from the adsorption experiments followed by 5ml addition of 70% aqueous ethanol to each residue . The samples