嘉南藥理科技大學教師補助專題研究計畫成果報告

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執行期限：92 年 01 月 01 日至 92 年 12 月 31 日
主 持 人：王來好
題　　目：化妝品塑身燃脂霜中氨茶鹼經皮吸收代謝之研究

一、中文摘要

研究含皮膚促進劑之各種基劑與皮膚接觸後，以 ATR (attenated total reflection) 傅立葉轉換紅外線光譜儀 (FTIR)測定氨茶鹼在皮膚之傳送。由於存在光譜帶的 N-H 鍵頻率特性，可提供氨茶鹼在皮膚的吸收。研究三種皮膚促進劑(植物油、精油及親油性物質)，以親油性物質 β-cyclodextrin 對氨茶鹼促進吸收最大。

關鍵詞：
經皮吸收，氨茶鹼
促進劑，傅立葉轉換
紅外線，減弱全反射

Abstract

The delivery of aminophylline from several vehicles, including those containing penetration enhancers, was investigated in human skin. The skin after contact with the aminophylline formulation was examined by attenated total reflection (ATR) - Fourier transform infrared (FTIR) spectroscopy. The presence of spectral bands at frequencies characteristic of N-H bonds provides evidence for the adsorption of the aminophylline on skin. Of the three kinds penetration enhancers (plant oils, essentials oils and lipophilicities) were studied, β-cyclodextrin exhibited the largest increase intransdemal delivery when various enhancers were used .

Keywords:
Percutaneous absorption; aminophylline; enhancers; FT-IR; ATR.

二、緣由與目的

減肥塑身霜的成份源自於一種氣喘治療藥物，必須經由醫師開立處方才能使用的氨茶鹼(Aminophylline)。氨茶鹼爲黃票呤甲基(methylxanthine)衍生物，即茶鹼(theophylline)與乙二胺以 2:1 比例所形成的複鹽。可以提高茶鹼的水溶性，並促進生體可用率(bioavailability)及動力學性質。過去的研究着重於藥物口服或注射方式經腸胃吸引後，測尿液或血液中氨茶鹼及其代謝物含量。至今，有關基劑配方影響氨茶鹼釋放[1-3]和經皮吸收[4-6]之研究仍然很少。定量茶鹼或氨茶鹼分析方法多數爲液相層析法配合紫外光[7-20]、電化學[21-24]檢測器及免疫技術[25-26]。僅一篇用傅立葉轉換紅外線光譜儀 (FTIR)測茶鹼 IR 吸收帶的波長特性，提供形成新化合物的診斷值。減弱全反射 (attenated total reflection, ATR)- FTIR(Fourier transform infrared)可評估皮膚接觸藥物後，某鍵結頻率特性，提供藥物在皮膚的吸引。FTIR 的分析技術爲非破壞性，適合活體研究。所以本研究以 ATR- FTIR 評估氨茶鹼在各種配方中經皮吸收之變化量。

三、結果與討論

實驗條件

a. 塑身燃脂霜製品 (fat-burning preparations) (含 5 %氨茶鹼) :

配方 (A) 含促進劑植物油 W/O 乳霜;
配方 (B) 促進劑含植物精油 W/O 乳霜;
配方 (C) 不含促進劑 W/O 乳霜。

b. 被實驗者 (subjects)

六個健康自願者參與研究，他們年齡在 20-23 歲多，體重公斤。調製含 5 %氨茶鹼配方，使用於人體皮膚長 7.5 cm 寬 1.8 cm。經適當間隔時間，利用 ATR-FTIR 光譜儀偵測表皮的氨茶鹼含量。經二小時後，以吸附膠帶施力 15 秒，重覆此操作數次。再以 ATR-FTIR 測留在皮膚上氨茶鹼剩餘含量。

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Table 1 Aminophylline absorbances observed in spectra (ATR-FTIR) of fat-burning sample on the human skin.

Functionality		Absorption Froquencies (cm^{-1})	Absorbance band chosen for quantitation
N — H	Primary amine stretch	3493，3380	——
	Primary amine bend	1560	1560
O — H	Stretch (broad)	3398	——
C — H	Aliphatic carbons stretch	2921，2849	——
C ═ O	Ring	1701	——
	Ring conjugated	1649	——
C ═ C	Ring	1605，1525，1495	——

Table 2 Changes in N-H bending absorbance peak height after treatment with 5 % aminophylline in combination with 40 % plant oils.

Plant oils	% Decrease	
	30 min	60 min
Corn germ oil	3.73	14.90
Olive oil	——[a]	2.47

[a] No change

Table 3 Changes in N-H bending absorbance peak height after 60 min treatment with 5 % aminophylline 30 % / corn germ oil / 10 % essential oil.

Essential oils	% Decrease
Jojoba oil	28.53
Peppermint oil	24.58
Ylang oil	9.67
Lilacin oil	21.46

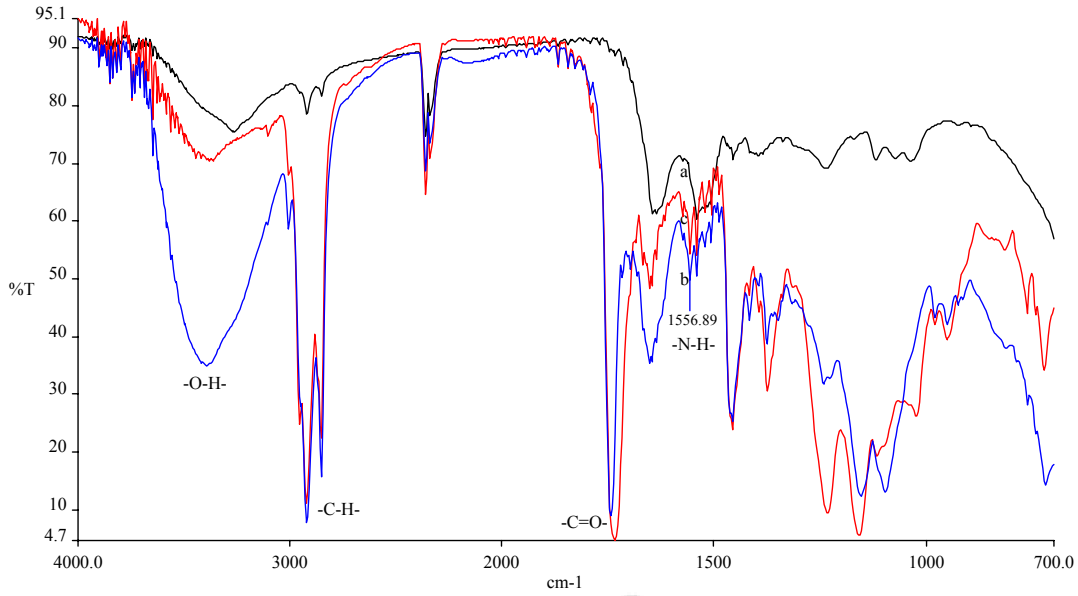

Fig.1 ATR-FTIR spectra of human skin treated with 34.25 mg/cm^2 and without fat-burning cream containing 5% aminophylline / 30% corn germ oil (a) untreated cream (b) treated cream at 0 min for N-H bending characteristic (c) at 60 min for N-H bending characteristic.

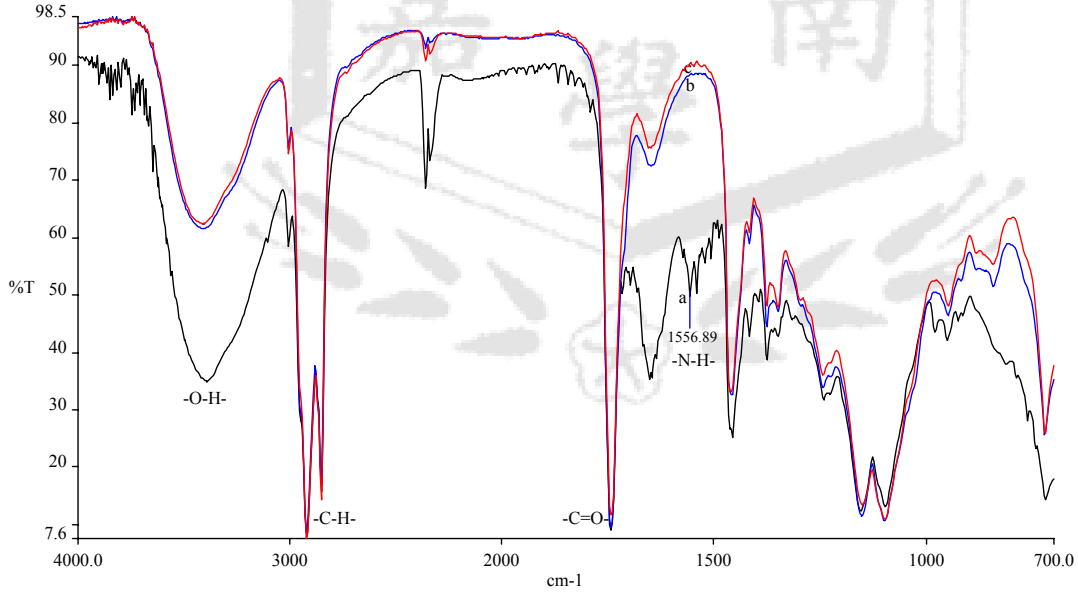

Fig.2 ATR-FTIR spectra of aminophylline stratum corneum treated with cream and essential oils (a) 5% aminophylline / 30% corn germ oil (b) 10% peppermint oil / 30% corn germ oil (c) 10% jojoba oil / 30% corn germ oil.

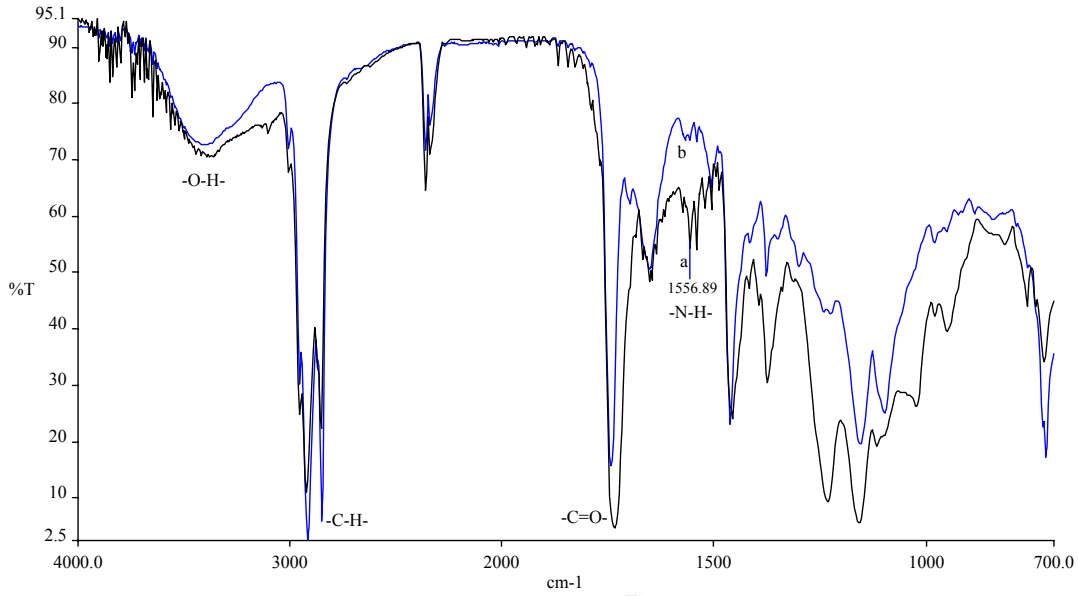

Fig.3 Percutaneous absorption of aminophylline after application of a formulation of 30 % corn germ oil / 10% jojoba oil cream (a) with and (b) without 5% β-cyclodextrin (penetration enhancer).

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