新芳奈米科技

宇宙的誕生創造了萬物
奈米科學以實踐真理為目的
不是以利益為權利讓自己盲然又可憐
盡善盡美永遠是發明人的夢想
創造人生智慧的附加價值
恆河世界亦如微塵
知無常　覺究竟
即所創造　元始自然　無為發明

發明人: 張仁鴻題

大綱

- 公司簡介
- 微奈米研粉機系統介紹
- 神之手保健產品、功效介紹
- 奈米化保健產品功效提升
- 國際知名期刊SCI之論文
- 新芳奈米珍珠粉相關研究

關於 新芳奈米公司

- 1943年 創立台灣歷史最悠久、設備最完善的研粉機製造廠
- 1978年 美國紐約世界博覽會發明家大展獲金牌獎殊榮
- 1987年 美國紐約世界博覽會發明家大展榮獲銀牌獎肯定
- 1991~2001年 奈米級特殊超微研粉機開發成功，獲得世界各國認同，並成功取得各國國際專利。

- 2002年 成立微奈米材料製造及研發中心，為國際上首座專業奈米化加工中心。
- 2006年 新芳公司、工業技術研究院、SGS瑞士遠東公證集團與國立成功大學共同組成【奈米產品製造與檢測研發聯盟Nano Union】。
- 2007年 與台大食科所博士共同發表論文刊登於國際知名SCI期刊，新芳奈米珍珠粉之功效備受學術界肯定及認同。

- 2008年 國際專利技術-【抗電磁波、抗靜電材料及塗料】系列產品問世。

- 2009年 總經理張仁鴻先生榮獲日本親王頒授國際學士院 - 榮譽生技學博士，表彰多年對生技及奈米產業的貢獻，此學位為【聯合國世界大學總長會議】認定並授證登錄；首位在台灣生技界獲此殊榮，實為台灣之光。

公司簡介

- 1943年成立，是台灣歷史最久，設備最完善的研粉機製造工廠
- 2002年成立國內首座”專業奈米化加工中心”
- 主力研粉機：
  奈米級超微研粉機

各項服務

- **代工研磨**：國內首座專業奈米化研粉示範工廠，比照GMP規範，受理各產業代工研磨業務。
- **機械設備**：銷售奈米級特殊超微研粉機，製程電腦精控，品質嚴格控管，設備整廠輸出，產能大，成本低。
- **粉體檢測**
- **材料供應**：
  - **功能性材料**：相關奈米化粉體材料供應，如遠紅外線材料、抗菌材料、導體材料、抗電磁波材料。
  - **生技產品**：如**奈米化珍珠粉、奈米化樟芝子實體、奈米化冬蟲夏草子實體、奈米靈芝子實體、奈米竹炭、奈米離子鈣、奈米膠原蛋白**等粉體材料。
  - **其他有機/無機材料**：均可依需求提供生產。

新芳奈米粉末高科技研究中心

- 2002年成立奈米材料研發中心及材料供應公司，全力研發奈米材料

- 國際專利
  - 奈米級特殊超微研粉機為全國第一家通過G.M.P.研粉機專利
  - 擁有中國、日本、大英國協、美國、德國、韓國等國際專利，為現代研粉工業之尖端科技，外銷世界各地，深獲讚譽

生技材料應用奈米化研磨技術之目的

- **保護原成分**：新芳奈米公司採用國內一流之特殊超微研粉機，超低溫研磨可保護原成分。
- **方便吸收**：奈米化後比表面積增加，可方便人體吸收，減少攝取量，增加功效，並降低器官不必要的負擔，同時降低成本。
- **防止成分破壞**：奈米化超微顆粒，除直接攝取機能性成分外，甚至可藉由舌下口腔黏膜或皮膚吸收，同時減少胃酸的破壞。
- **替代濃縮萃取技術**：改變粉體之微結構，降低粉體之顆粒大小，有效成分直接釋放。

新芳- 奈米製程榮獲世界各國專利

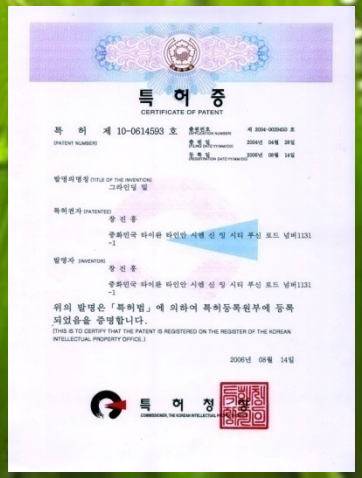
英國

日本

美國

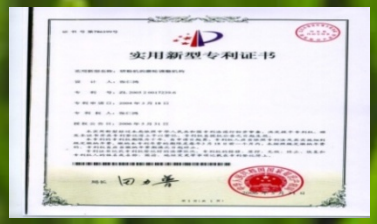
德國

台灣



韓國

中國



新芳公司-成就與榮耀

發明家金牌獎

參加美國紐約世界博覽會發明家大展，以特殊超微研粉機榮獲一金牌獎

世界名人錄

獲頒英國劍橋大學傑出人仕獎，列入世界名人錄

新芳公司-成就與榮耀

美國國際學士院
博士學位證書

國際學士院榮譽生技學
博士學位證書

新芳公司-成就與榮耀

國際學士院教授資格認證書

張仁鴻 博士經本院審議評鑑委員會依其專業學術領域之認知，審核其著作及主講內涵之評鑑，一致通過其教授資格之認定，並由本院國際學士院大學特聘為**專任教授**，依「聯合國世界大學總長會議」決議，敬請各國教育部及大專學院校予以肯定，並支持其授課與研究工作之進行。特此認證

二〇〇九年 九月 二十三日

國際學士院

總裁 伏見博明

亞細亞總裁 蘇炳郎

國際學士院教授資格認證書

榮譽章證

仁鴻 博士

國際文化經貿交流事務，促

日本親王頒授皇室榮譽章證

奈米產品製造與檢測研發聯盟

2006年成立於工業技術研究院

由各線條組成的同心圓，可說是奈米結構，線條彼此交叉，意涵著環環相扣、生生不息；正如現今奈米已與人類的生活結為一體。

組織架構

聯盟總召集人兼主任委員
新芳奈米科技有限公司

聯盟副主任委員
工業技術研究院
SGS瑞士遠東公證集團

技術委員會
國立成功大學航太研究所

聯盟宗旨

1. 有效結合產、官、學、研各界資源，建立奈米技術應用產品製程、設備、檢測技術準則及共同標準作業規範等共通平台，藉由上、中、下游技術整合與市場資訊的交換合作，提昇產品研發速度確保品質一致性，帶動相關應用產品之產業發展。
2. 上、中、下游技術整合共同研發，降低研發成本及縮短奈米技術應用產品產業化時程。

奈米牛樟芝、奈米冬蟲夏草、奈米靈芝、奈米珍珠粉原料開發流程

- 奈米化研磨技術研究
- 功能性研究
  - 成分分析
  - 溶離測試
- 奈米化檢測
  - 粒徑檢測
  - 穩定性測試、安全性測試
  - 機能性提升測試
- 產品認證
  - 奈米產品製造暨檢測研發聯盟認證

呂 前副總統 秀蓮參訪新芳奈米科技

呂前副總統於99年1月17日參訪新芳奈米公司,贈送總經理張仁鴻,她的個人著作

呂前副總統盛讚新芳奈米科技是全球唯一擁有特殊超微研粉機製造商,獲國際SGS認證肯定

由總經理張仁鴻先生親自解說奈米技術相關生產製程應用於生技及科技材料

張仁鴻博士親自示範抗電磁波吹風機及相關抗電磁波產品

新芳奈米產品製造與檢測研發聯盟

2006成立於工業技術研究院

奈米產品製造與檢測研發聯盟(抗EMI檢測)座談會
2008.4.16-攝於新芳奈米科技有限公司

奈米聯盟高階會議-攝於瑞士遠東公證集團台灣總公司
SGS副總裁邱志宏、SGS執行副總裁竹正高、
新芳奈米科技總經理張仁鴻

新芳公司整合研發單位資源

左起：成大醫學院廖寶琦教授、食品工業研究所朱兆秀博士、新芳公司張仁鴻總經理、成功大學林仁輝教授、成功大學微奈米中心品質主管粘博士

林仁輝 - 美國機械工程學會院士、行政院國科會微奈米中心主任兼國立成功大學微奈米研究所所長，及機械系教授蒞臨新芳公司洽談合作計劃案

神之手幕後功臣
新芳微奈米研粉機

- 主要特色：
  - 平均顆粒粒徑(D_{50})可研磨至100nm以下
  - 無重金屬汙染：研粉機採用特殊超硬合金製成，確保研磨過程中，無重金屬成分進入研磨材料
  - 可研磨材料範圍廣，包括各式研磨礦物以及纖維材料等有機/無機材料
  - 產能高

奈米級研粉機生產製程及性能說明

- **全自動化**：自動化並採用電腦精控系統，提高奈米材料生產品質，節省人員管銷費用。
- **乾式研磨**：使用乾式研磨，成分不易流失，冷卻系統自動調節，研粉溫度低，確保粉末的原品質。
- **細度高**：高細度生產、粉末研粉細度為一般研粉機之5~10倍。
- **空氣自動分離**：無網無篩、細度由空氣自動分離、細度變換調節迅速。
- **壽命長，易保養**：採用特殊耐磨合金，無金屬污染，壽命長，容易簡單保養。

奈米級研粉機生產製程及性能說明

- 零件磨損小：採用分子碰撞原理，低轉速100r.p.m左右研磨，降低零件磨損。
- 佔地小：長4m X寬2.5m X高3m，不需地基。
- 無公害：符合GMP環保衛生要求，機械運轉無震動、無噪音、粉塵不外揚。
- 無交互污染：奈米級特殊超微研粉機安裝在獨立式空間做隔離生產，可防止材料交互污染。
- 無菌生產：整廠採用UV照射滅菌系統，在無塵無菌室下，有效防止微生物污染。

奈米研粉機適用研磨材料範圍

有機粉末

- 珍珠粉
- 綠茶粉
- 膠原蛋白
- 左旋C
- 幾丁質
- 生技材料（樟芝、冬蟲夏草、靈芝、桑黃...等各種植物纖維材料）
- 中草藥、蔬菜、水果
- 其他各種含糖質、油質或黏質之高難度粉末

無機粉末

- 光觸媒材料
- 各項金屬氧化物
- 各項遠紅外線材料（陶瓷材料）
- 各類礦石
- 煤炭
- 化學原料
- 農藥、西藥、濃縮製藥
- 陶黏土
- 金屬
- 各項塑膠材添加劑

依需求研製5nm~100nm之各種有機/無機粉末

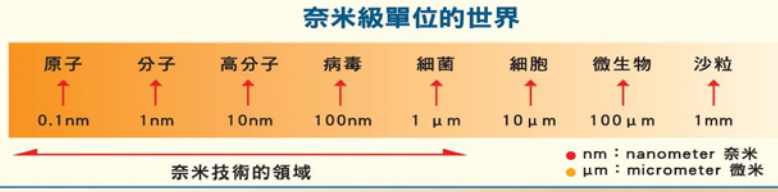
新芳奈米科技有限公司 NANO 06-6520707 nano@hsinfang.com.tw

奈米細度國際對照表

粒徑細度國際對照表

	各種標準篩目				微米換算成奈米x1000	
	美國式 吋 (mesh)	日本式 目(吋)	獨逸式 公分(cm)	粒子的大小 微米(um)	粒徑米的負次方數 (m)	粒徑的奈米數 (nm)
微米級	175	209	4750	86	10^{-5}	86000
	180	215	5050	84	10^{-5}	84000
	200	238	6200	74	10^{-5}	74000
	230	274	8200	65	10^{-5}	65000
	240	286	8900	63	10^{-5}	63000
	250	298	9700	61	10^{-5}	61000
	280	322	11300	53	10^{-5}	53000
	300	358	14000	46	10^{-5}	46000
	325	388	16400	43	10^{-5}	43000
	400	477	24800	35	10^{-5}	35000
	500	596	38700	28	10^{-5}	28000
	600	715	55800	23	10^{-5}	23000
	800	955	99000	18	10^{-5}	18000
	1000	1193	155000	13	10^{-5}	13000
	1340	1800	278000	10	10^{-5}	10000
	2000	2380	620000	6.5	10^{-6}	6500
	5000	5960	3880000	2.6	10^{-6}	2600
	8000	9550	9900000	1.6	10^{-6}	1600
	10000	11930	15500000	1.3	10^{-6}	1300
	12700	18000	25000000	1.0	10^{-6}	1000nm(數學單位最大值)
奈米級		180000		0.1	10^{-7}	100nm
		1800000		0.01	10^{-8}	10nm
		18000000		0.001	10^{-9}	1nm

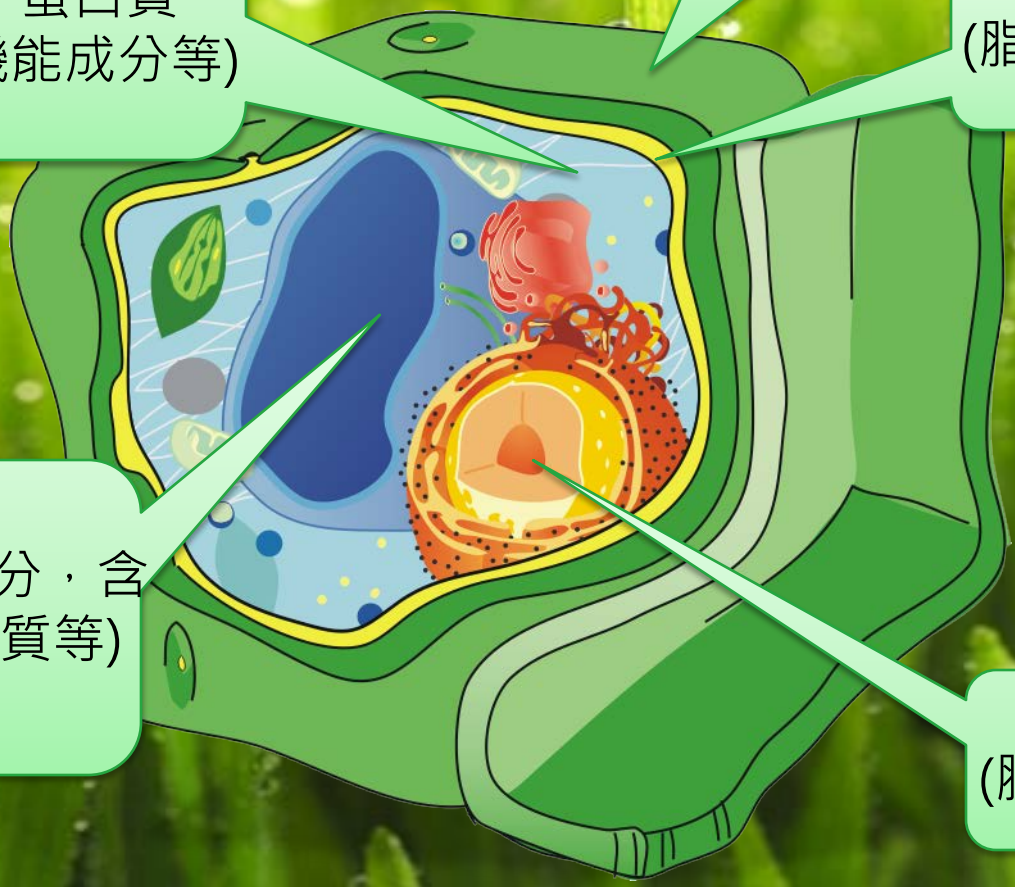
奈米尺寸的關係深遠 影響人類科技的發展



神之手奈米化保健產品之優勢

- **破壁(碎)後有效成分釋放**
  - 新芳微奈米研粉機改變粉體微結構，有效碎化植物細胞壁，將實質機能性成分自細胞內完整釋出
- **有效成分研磨至奈米化**
  - 可提高人體之吸收率，提高時效性，完整吸收有效成分，以提高產品功效，直接降低成本

植物細胞組織成分(以樟芝為例)



細胞質
(多醣成分、三萜類成分、固醇類成分、蛋白質類成分、其他機能成分等)

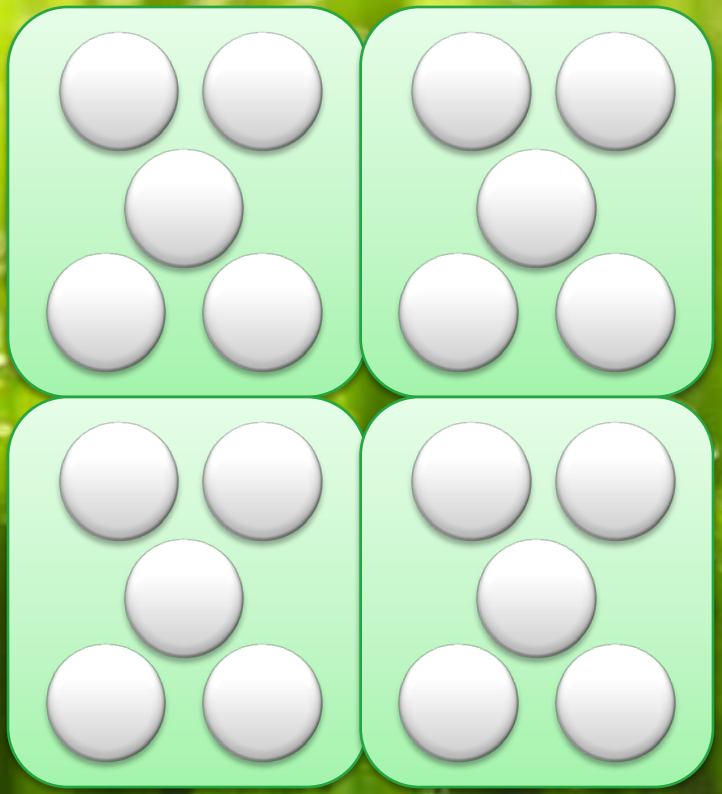
細胞壁
(多醣成分)

細胞膜
(脂質、三萜類成分)

液泡
(水溶性機能成分，含維生素、礦物質等)

細胞核
(腺苷成分)

研磨前之植物細胞壁組織與有效成分



細胞壁

有效成分

- 植物細胞壁之纖維成分包住有效成分

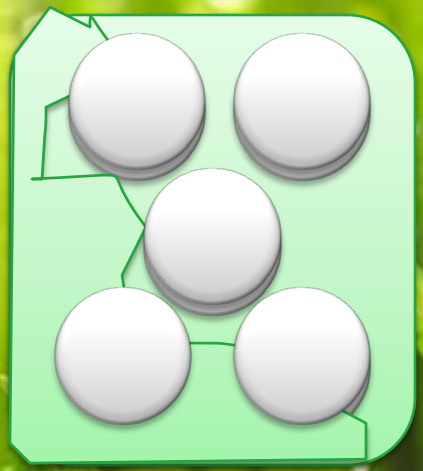
傳統研磨法---細胞壁無法破壞

細胞壁

有效成分

- 傳統研磨方法將植物細胞壁之纖維成分破碎，但有效成分仍無法完全釋放

新芳神之手研磨技術(一) 破壁

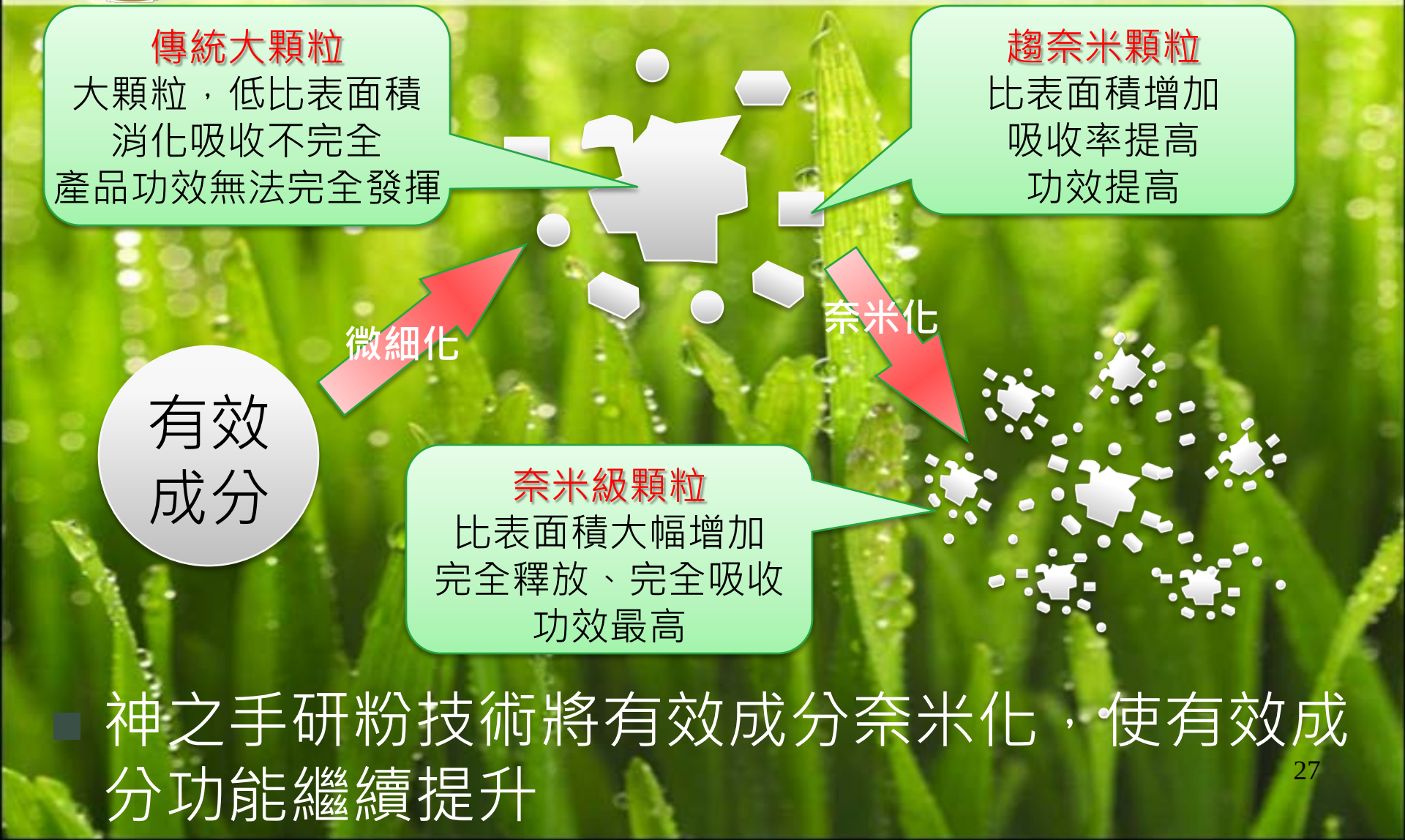


細胞壁

有效成分

- 神之手研粉技術將植物細胞壁之纖維成分完全粉碎，使有效成分完全釋放出來

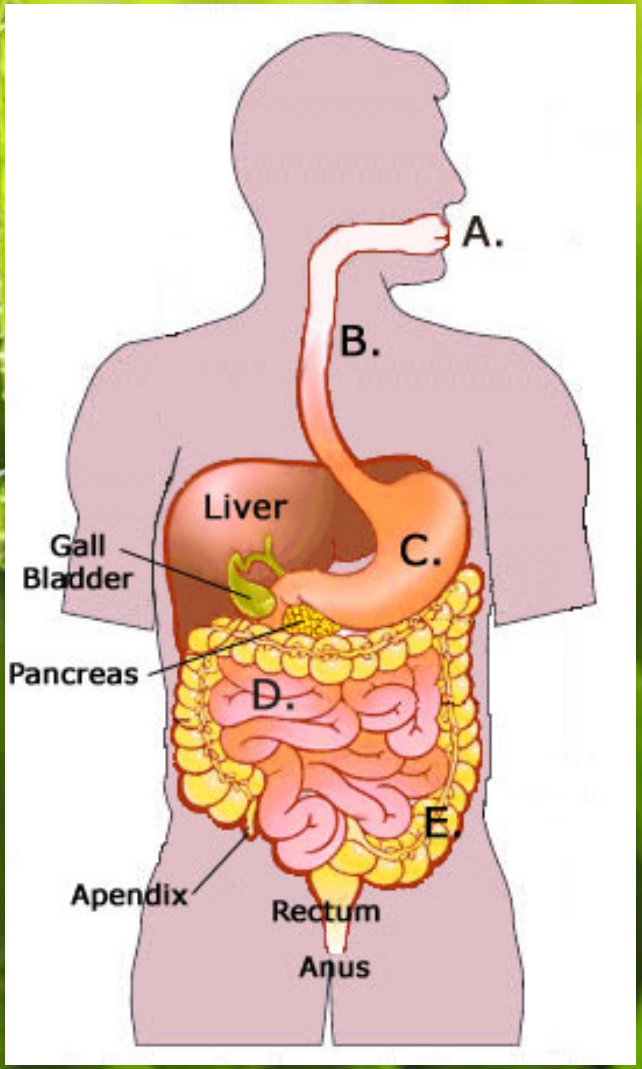
新芳神之手 奈米化研磨技術（二）



- 神之手研粉技術將有效成分奈米化，使有效成分功能繼續提升

人體保健食品消化吸收過程

- 口腔：攝取
- 食道：運送
- 胃：消化
- 小腸
  - 十二指腸：消化
  - 空腸：消化、吸收
  - 迴腸：消化、吸收
- 大腸
  - 結腸：儲存廢物、排泄
  - 直腸：排泄
- 肛門：排泄



大腸

12-14小時

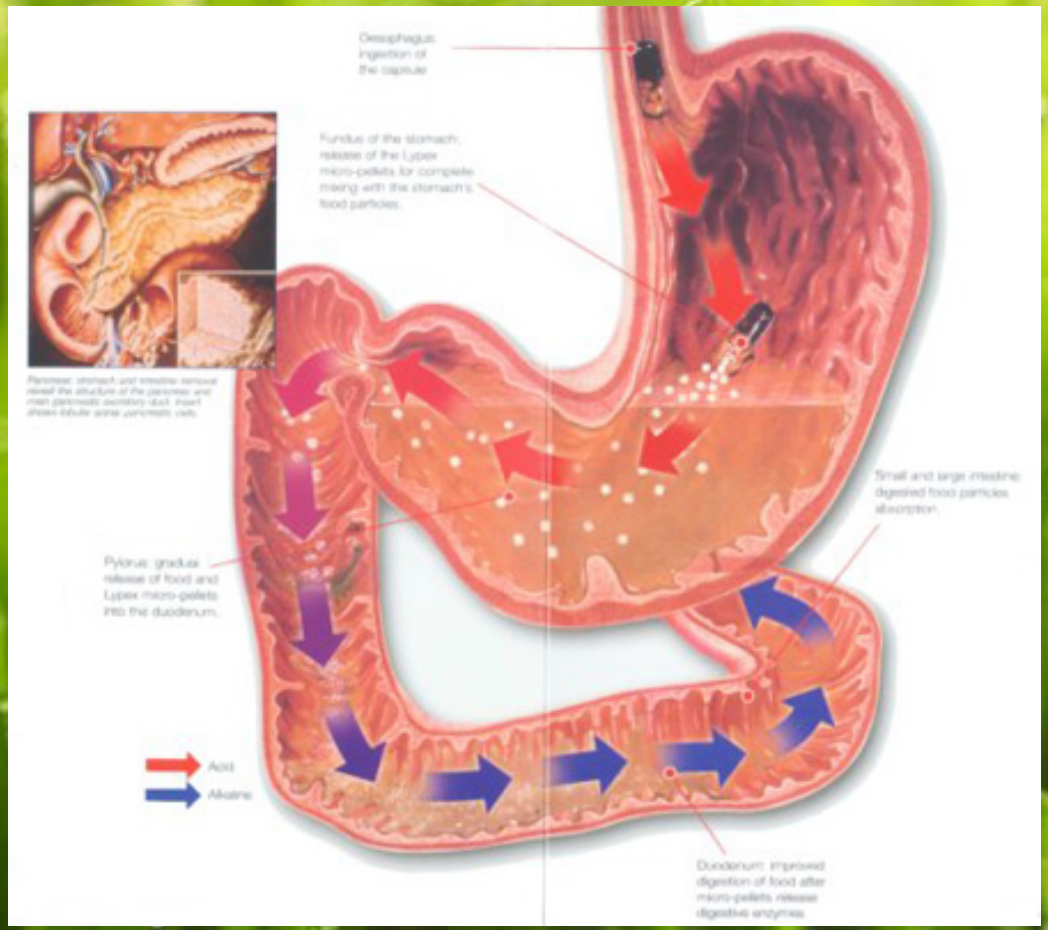
吸收水分和電解質，接受食物殘渣供微生物進行消化分解，末段的直腸暫時儲存腸道廢物。肛門控制排便

棲營養素由小腸細胞吸收進入體內，食物殘渣送至大腸

消化系統食物保留時間

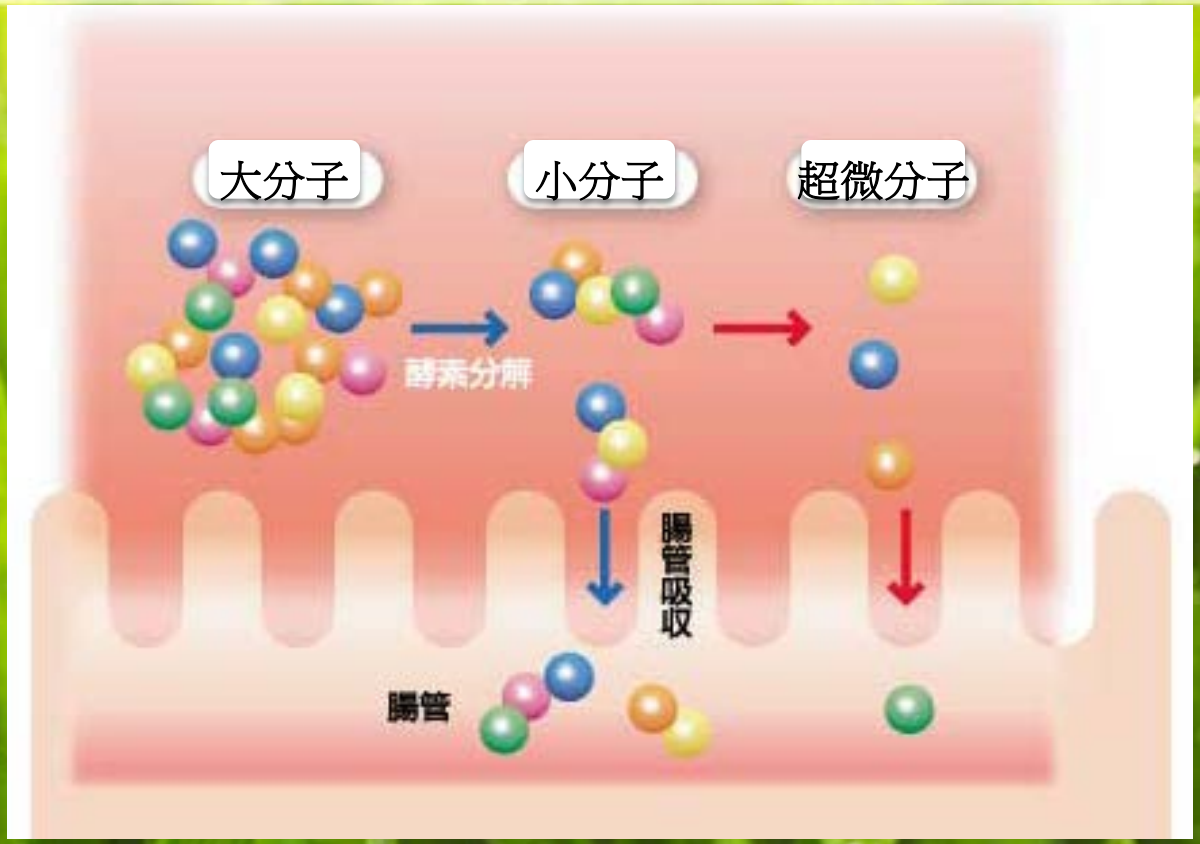
器官名稱	食物停留時間	主要功能
Mouth(口腔)	少於1分鐘	攝取食物，牙齒咀嚼嚼碎食物，接受唾液，消化碳水化合物
Salivary glands(唾液腺)		分泌唾液澱粉酶
Esophagus(食道)	約10秒	食物的通道，藉由肌肉收縮，將食物送到胃中
Stomach(胃)	1-2小時	接受食道來的食物，與胃酸結合，開始消化蛋白質，可以吸收酒精，儲存食物，緩緩送入小腸進行消化
Small intestine (小腸)	約7-8小時	接受胃部消化的食物，以及來自肝臟與胰臟的分泌液，進行機械性與化學性的消化反應，將食物充分分解，各種營養素由小腸細胞吸收進入體內，食物殘渣送至大腸
Liver (肝臟)		分泌膽汁到十二指腸，幫助脂肪消化，體內營養素代謝的第一關
Gall bladder (膽囊)		儲存膽汁，以供消化之用
Pancrease (胰臟)		分泌消化液，含有種類含有種類豐富的消化酵素，在十二指腸內分解食物中各類營養成分
Large intestine (大腸)	約12-14小時	吸收水分和電解質，接受食物殘渣供微生物進行消化分解，末段的直腸暫時儲存腸道廢物。肛門控制排便。

機能性成分在胃中開始釋放



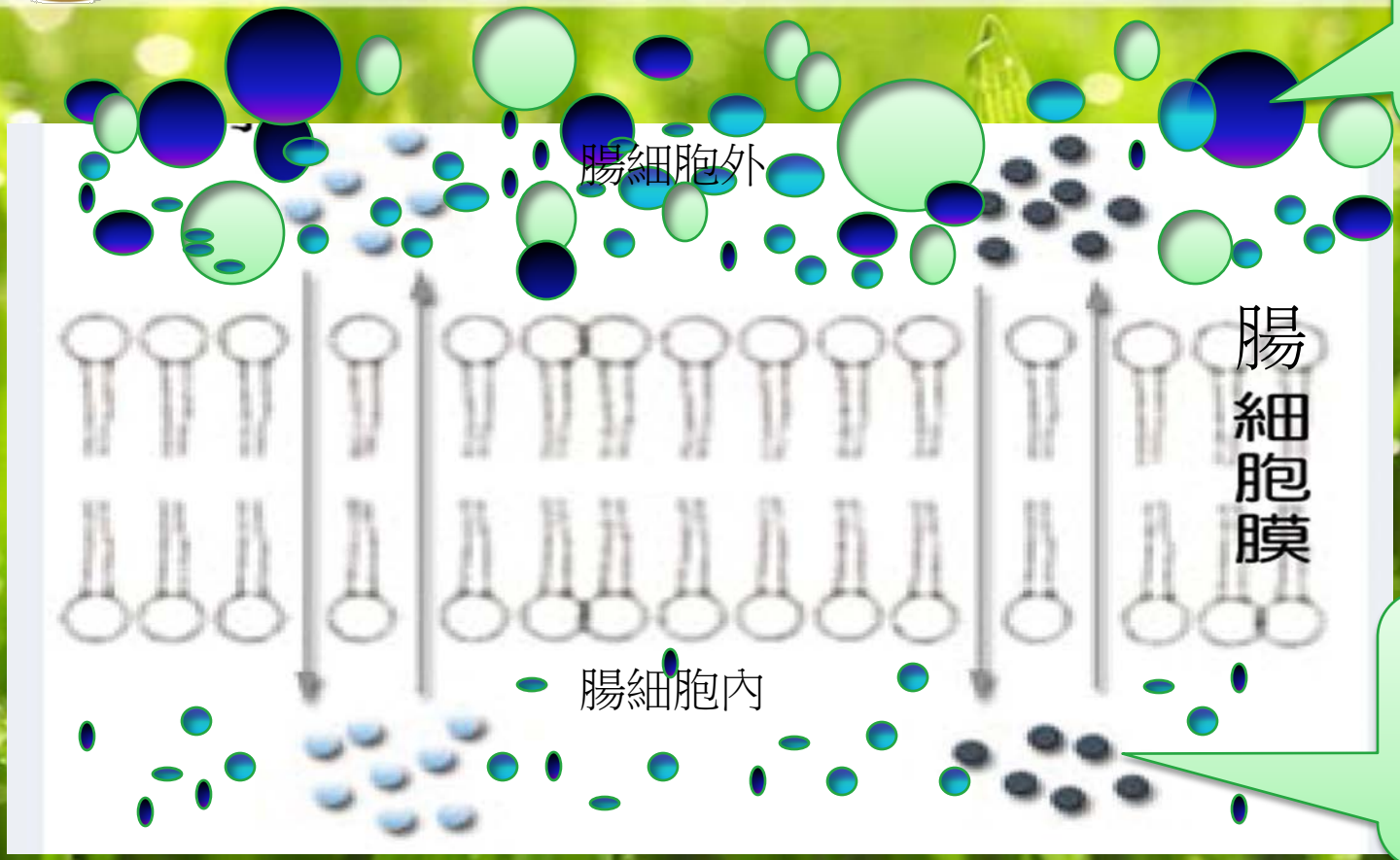
奈米化後將加速機能性成分在消化道中消化吸收

腸道吸收機能性成分之機制



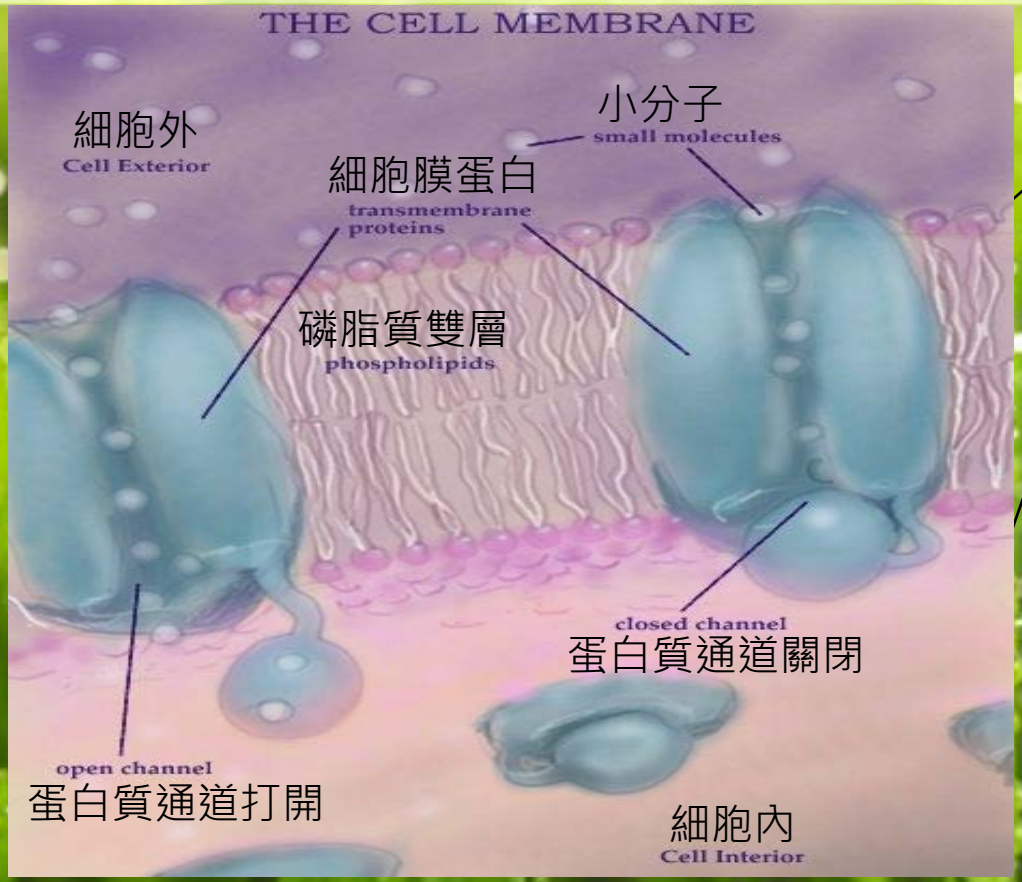
- 奈米小分子容易經由消化道腸黏膜吸收進入人體血液中，供應各器官所需成份

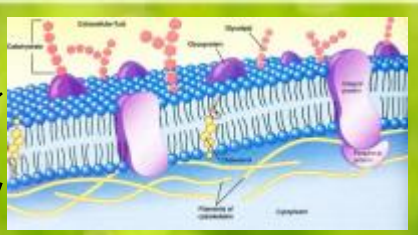
機能性成分擴散進入腸細胞膜吸收



奈米食品經胃酸消化後，將機能性之分子結構解離至1nm以下，再由小腸之腸黏膜直接吸收，若過大粒徑之食品因無法直接完整吸收，而停滯於大腸，體內毒素無正常代謝，造成腎臟與肝臟的負荷

奈米機能性成分經由腸細胞膜吸收模型





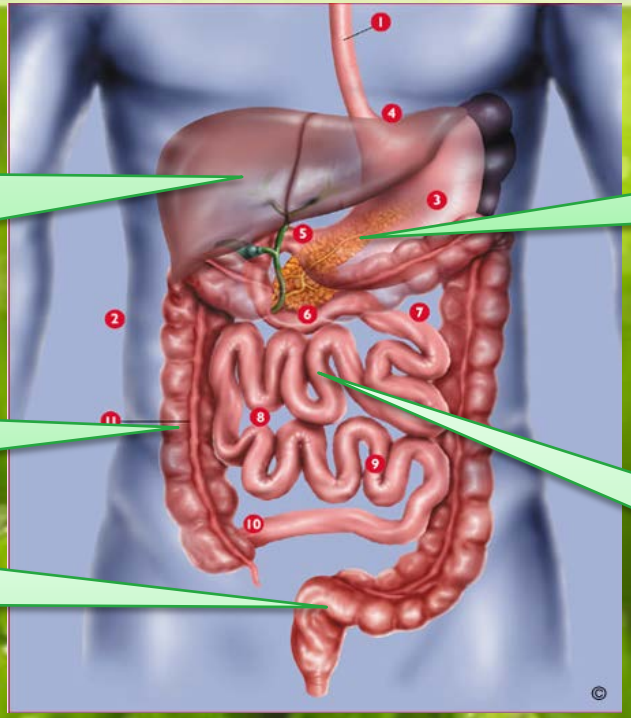
小分子機能性成分經由細胞膜中的磷脂質滲透或蛋白質通道吸收進入細胞內，大分子無法進入

奈米級機能性成分可在消化道完整吸收

3. 肝
開始代謝機能成分
並經血液運送至
身體其他器官

4. 大腸
未吸收之機能成分
暫時累積

5. 直腸
未吸收之機能分
排泄出體外



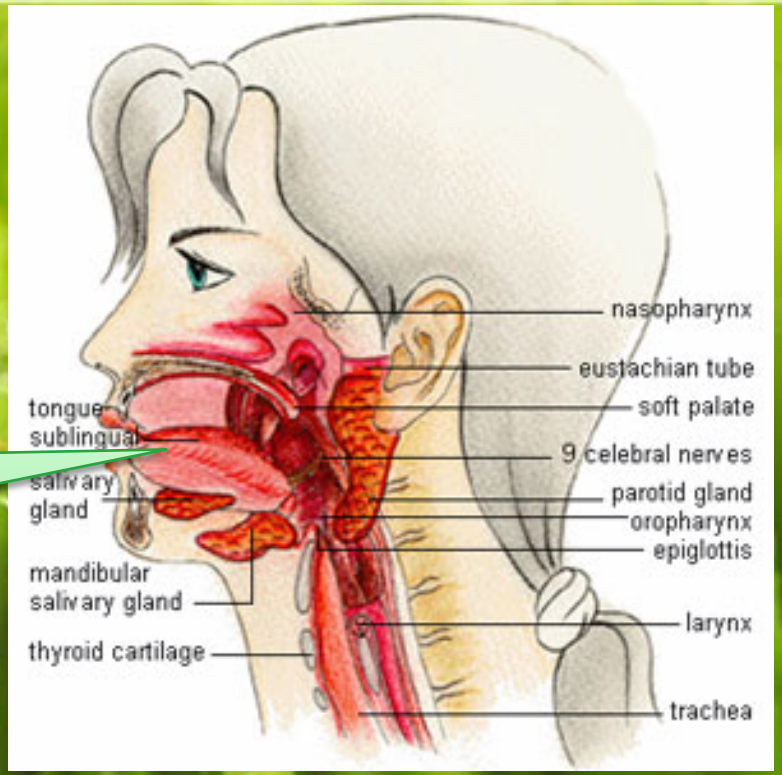
1. 胃及十二指腸
消化機能成分

2. 空腸、迴腸
消化兼吸收
機能成分

- **奈米化小顆粒：**機能成分可在小腸(十二指腸、空腸、迴腸)完整消化吸收
- **微米級大顆粒：**機能成分無法完全在小腸消化吸收，因此容易留滯在大腸(結腸、直腸)，直接排泄，使產品功效大大降低

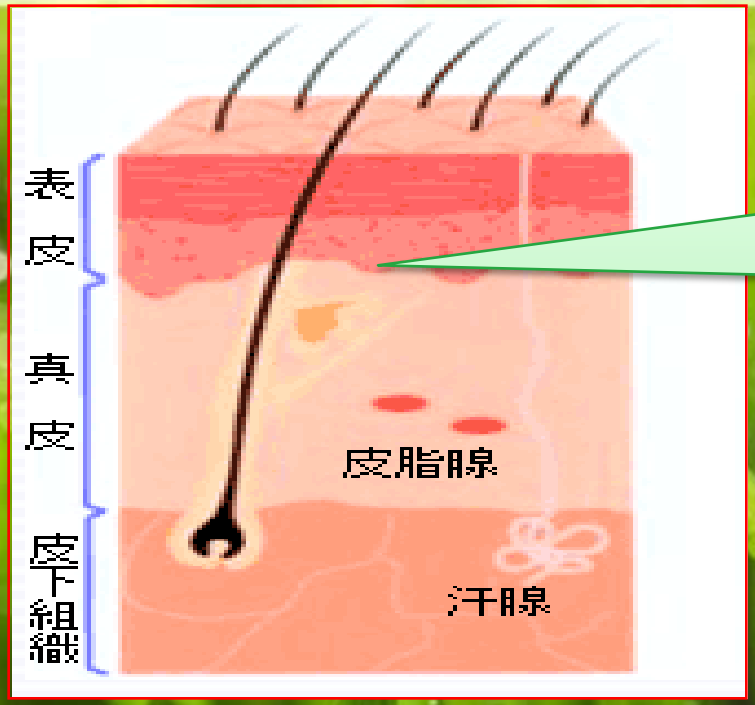
奈米級機能性成分可直接在口腔黏膜吸收

口腔黏膜
可直接吸收奈米級
機能性成分



- 直接食用：其中奈米級機能性成分，可在口腔黏膜快速吸收

奈米級機能性成分可直接在皮膚吸收



皮膚
直接吸收奈米級
機能性成分

- 若直接塗抹皮膚，奈米級機能性成分，亦可在皮下直接吸收

奈米化技術使功效增加、成本降低

傳統微米級大顆粒
不易消化吸收
功效最差
成本最高

趨奈米級顆粒
消化吸收率提高
功效提高
成本降低

奈米級超微顆粒
完全釋放
完整吸收
功效最高、成本最低

傳統大顆粒

- 顆粒大小介於厘米至微米之間(mm~μm)
- 消化道消化時間太長，無法完整消化，故吸收效果最差、功效最差、成分浪費，需使用更高成本才能達到相同功效

趨奈米顆粒

- 次微米級小顆粒(<1 μm)
- 顆粒小尺寸效應，表面積增加，可使大部分機能性成分短時間內消化，經由消化道進入人體消化道細胞，增加吸收效果，功效提高，成本降低

奈米級顆粒

- 奈米級超小型顆粒(<100 nm)
- 高比表面積、小尺度效應，顆粒低於細胞間隙與細胞膜大小，故有效成分直接經由消化道吸收進入血液中，功效最高、成本相對最低。

適合奈米化之保健食品

- 不易消化吸收產品：奈米化後改變溶解性，增加消化吸收率。
- 高附加價值產品：奈米化後產生高附加價值，機能性官能基裸露釋出。
- 高單價產品：奈米化後機能性成分人體完整吸收，功效提高，使用量降低，相對降低成本。
- 如高單價之奈米珍珠粉、牛樟芝、冬蟲夏草、生技相關高纖維植物...等，因奈米化使每單顆粒結構降低分子量，相對增加吸收比表面積之分子數，如植物類之細胞壁破壞，機能性成分完全釋放，在人體之吸收率全面提高，超越傳統濃縮與萃取製程之功能

食品奈米化之功效提升舉例

- 奈米化珍珠粉
  - 鈣質生體可用率提高
- 奈米化紅麴
  - 生物成分(monacolin K, citrinin)容易釋出
- 奈米化幾丁聚糖(甲殼質)
  - 抗菌效果提高

刊登於國際知名期刊SCI之論文

CALCIUM BIOAVAILABILITY OF NANONIZED PEARL POWDER FOR ADULTS

奈米珍珠粉提升鈣質生體可用率

...um Bioavailability of Nanonized ... Powder for Adults

... J.H. CHANG, AND J.S.B. WU

ABSTRACT: The present study was aimed to evaluate the calcium bioavailability of pearl powder for humans. Both the nanonized pearl powder (NPP) and the micronized pearl powder (MPP) prepared by a dry grinder were tested. A group of healthy adults free from hyperthyroidism, hypercalcemia, and hypocalcemia were recruited as the subjects for oral administration with the pearl powder. The bioavailability was evaluated by the serum total calcium increment, the serum intact parathyroid hormone (iPTH) reduction, and the urine calcium/creatinine ratio increment in 6 h after administration. The results show better absorption and retention of calcium from NPP, as reflected with the shorter time elapsed before the maximum concentration of calcium appeared in the serum, higher iPTH reduction, more calcium absorption, and higher maximum calcium concentration (C_{max}) in serum after ingestion, than that from MPP. We conclude that pearl powder is a beneficial source of calcium for adults and that nanonization improves its calcium bioavailability.

Keywords: bioavailability, calcium, human, nano, pearl

Introduction

Pearl powder has been a health supplement to Chinese people for more than 1000 years. It is taken to be a good source of calcium that helps to maintain the health of skeleton. Osteoporosis is a worldwide problem of the old people, along with it associated age-related fractures. One of the major reasons for the occurrence of osteoporosis is calcium deficiency (Nordin 1997).

The uptake of various calcium supplements, including calcium carbonate, calcium citrate, calcium phosphate, calcium gluconate, calcium glubionate, calcium lactate, tricalcium phosphate, calcium gluconolactate, calcium citrate malate, and tricalcium phosphate/calcium lactate were investigated before (Shires and Kessler 1990; Reginster and others 1993; Yang and others 1994; Gregory 2000; Patwardhan and others 2001; Heaney 2003; Hanzlik and others 2005; Heaney and others 2005). Among them, calcium carbonate prepared from oyster shell is the most common one on the market (Gregory 2000).

Nacre is a calcified structure that forms the inner lustrous layer of shells of some mollusks such as giant oysters. Many studies, *in vitro* and in animals, pertaining to the biocompatibility, biodegradability, osteogenic activity, and the bone repairing effect of nacre have been reported. For examples, nacre powder has been found to stimulate the growth of bone forming cells in sheep (Lamghari and others 1999a, 1999b, 2001; Berland and others 2005) and in humans (Westbroek and Marin 1998), the growth of cutaneous fibroblasts in rats (Liao and others 2000, 2002; Lopez and others 2000), and the degradation of animal and human osteoclasts *in vitro* (Duplat and others 2007). Pearl, another natural product from mollusks with composition similar to nacre, was found to have osteogenic activity *in vitro* (Shen and others 2006). Few studies in the application of nacre and pearl in humans, including calcium supplementation, have been reported.

Nanotechnology is a new technology in many industries including food and pharmacy. The characteristics of materials change significantly in nanonization. For example, nanonization may improve the absorption rate of drugs or nutrients in humans, resulting from an enlarged specific surface area and an increased solubility of the particle (Liversidge and Cundy 1995; Merisko-Liversidge and Cooper 2003; Douroumis and Fahr 2006). Also, for example, nanonization of sodium selenite may increase the free radical scavenging efficiency while decrease the acute toxicity in mice (Huang and others 2003; Zhang and others 2004, 2005; Wang and others 2007). Wu and Ho (2006) evaluated the *in vitro* activity and the *in vivo* bioavailability of a nanonized anticancer drug, arsenic trioxide, and suggested that the nanonization of realgar particles could enhance the bioavailability substantially.

The oral administration with nanonized pearl powder was found to result in better long-term absorption of calcium, higher gain in body weight, and higher gains in the weight and length of rat femurs than that with the micronized pearl powder (Cui and others 2005; Gao and others 2006). No human clinical study in the calcium bioavailability of pearl and nacre powders has been reported yet.

Traditionally, pearl powder is processed by wet-milling. The procedure includes boiling in water for at least 2 h, cooling down to room temperature, milling, separation by buoyancy in water, collection of the dispersed particles, and drying in hot air. The sediment in the buoyancy separation is collected, and milled again to recover more powder. The entire process takes about 7 d. Virtually all the soluble components including soluble protein are lost. In comparison with the traditional wet-milling, the novel dry cryo-nanonization grinding method achieves better retention of all components in the raw material because the process is operated under low temperature and involving no solvent (Chang 2006). Therefore, the novel method was used to grind pearl in the present study. The calcium bioavailabilities of the nanonized pearl powder and the micronized pearl powder were then evaluated and compared in human clinical trials.

MS 20080447 Submitted 6/16/2008, Accepted 8/22/2008. *Authors Chen and Wu are with Graduate Inst. of Food Technology, Natl. Taiwan Univ., Taipei City 106, Taiwan. Author Chang is with Nano Union, Sinying City, Tainan Prefecture 730, Taiwan. Direct inquiries to author Wu (E-mail: jsbwu@ntu.edu.tw).*

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Materials and Methods

pearl (*Hyriopsis cumingii* Lea) over 3 y old was obhejiang Province of China. Nanonized pearl powder ronized pearl powder (MPP) were prepared at Hsin- Co. Ltd. (Sinying City, Tainan Prefecture, Taiwan) by ryo-nanonization grinding system integrated with a r (Figure 1).

ents and standard solutions used in this study were of grade from Wako Chemical (Osaka, Japan).

Composition and heavy metal analysis

Crude protein, crude fat, moisture, and ash contents were analyzed referring to AOAC (1984). Carbohydrate content was calculated by subtracting the crude protein, crude fat, moisture, and ash contents from the total. The calcium content was analyzed by an inductively coupled plasma atomic emission spectrometer (ICP-AES, Model JY 24, Jobin Yvon, Longjumeau, France). The As Pb, Cd, and Hg contents were analyzed using an atomic absorption spectrometer (Model Aanalyst 600, PerkinElmer, Washington, D.C., U.S.A.).

Particle size distribution

The particle size distribution was revealed following the method reported by Choi and Ring (2004) with some modifications. Briefly, a pearl powder sample (<50 mg/L) was added to a beaker of distilled water, and then dispersed by ultrasonic for 20 min. A dynamic laser scattering analyzer (Model LS230, Coulter, Miami, Fla., U.S.A.) was used to monitor the particle sizes of NPP and MPP by number and by volume.

Human calcium absorption assessment

The absorption assessment was done in God's Heart Hospital (Taibao City, Chia-Yi Prefecture, Taiwan) on 28 selected healthy adult employees free from hyperthyroidism, hypercalcemia, and hypocalcemia, including 14 males and 14 females. All subjects were asked to maintain their dietary habit as usual and to take neither extra calcium supplement nor vitamin D for the entire duration of the study. All women were neither pregnant nor lactating. The project was approved by the ethics committee in the hospital and each subject gave written his/her consent.

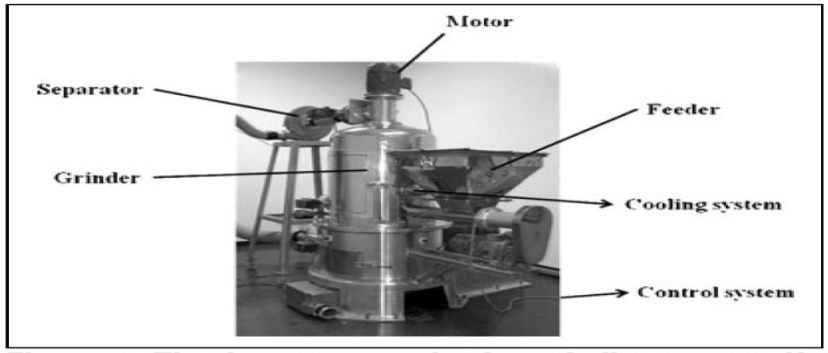

Figure 1—The dry cryo-nanonization grinding system. No solvent was used and the temperature was controlled under 40 °C in the milling process. Loss of soluble components and the denaturation and alteration of heat-labile components was thus minimized. The grinder was to disintegrate pearls, and then the separator to collect NPP and MPP separately.

The official method for assessing the calcium bioavailability of health food in Taiwan was referred. Briefly, the experiment was in double-blind design. Each portion of NPP or MPP containing 130 mg calcium equivalent was packed into a capsule. Six capsules in a batch were orally administered to a subject at 8:00 A.M. after fasting for 12 h. The time when the capsules were swallowed was taken as time zero. The urine and vein blood samples were taken every 2 h in 6 h after oral administration. The subjects were not allowed to consume any food or drink except 600 mL pure water before the urine and vein blood sampling was done. After sampling, the subjects were sent back to normal life for 1 wk at least, and then administered with the other type of pearl powder.

The contents of serum total calcium, urine total calcium, serum intact parathyroid hormone (iPTH), and urinary creatinine excretion were analyzed in the evaluation of calcium bioavailability. These analyses are described as follows.

Serum total calcium and urine total calcium

A blood or urine sample was centrifuged using a table-top centrifuge (Model KN-70, Kubota, Osaka, Japan) at 1500 × *g* for 5 min to collect the supernatant as the serum or the clear urine for the following experiments.

The total calcium content in the supernatant was measured by an automatic biochemical analyzer (Model 7170A, Hitachi, Tokyo, Japan) based on the orthocresophthalein complexone (OCPC) method (Heaney and others 2005).

Serum iPTH

Serum iPTH contents in blood samples taken at 0 and 4 h after oral administration were measured using an automated immunoassay analyzer (Model Advia-Centaur, Ciba-Corning, Bayer, East Walpole, Mass., U.S.A.) based on direct chemiluminescence technology (Yang and others 1994). The reductive percentage of iPTH was calculated as:

$$\text{iPTH reductive percentage} = [(\text{iPTH}_{0h} - \text{iPTH}_{4h})/\text{iPTH}_{0h}] \times 100\% \quad (1)$$

Urine creatinine

The content of creatinine in the urine supernatant was measured within 1 h after sampling using an automatic biochemical analyzer (Model 7170, Hitachi, Tokyo, Japan) based on Jaffe reaction under 37 °C (Shires and Kessler 1990). The urinary creatinine level was calculated by the difference in absorption at 505 nm between the reaction mixture and the standard creatinine solution.

Calcium bioavailability

Bioavailability was evaluated following the pharmacokinetic method reported by Heaney (2003) and Heaney and others (2005). C_{max} was defined as the maximum concentration of calcium in the serum (Hanzlik and others 2005). T_{max} was defined as the time when the C_{max} appears, and taken as a measure of the absorption rate (Hanzlik and others 2005; Venkatesan and others 2005). The area under the curve (AUC) was the total area between the curve of serum total calcium in 0 to 6 h after ingestion and the baseline (AUC_{0-6h}) was measured (Heaney and others 2005). The comparative bioavailability (%) was defined as:

$$\text{...arative bioavailability} = [AUC_{0-6h,NPP}/AUC_{0-6h,MPP}] \times 100\% \quad (2)$$

...analysis

... are presented as means ± SD. One-way analysis of ...OVA) and Student's paired *t*-test at 5% probability level ...heck the significance of difference.

Results and Discussion

...nd MPP are similar in proximate composition and min...al contents (Table 1). The predominant proximate component in either type of pearl powder is ash at approximately 96%. The calcium content is 35.9%, corresponding to a calcium carbonate content around 90%. The 2nd most abundant proximate component is protein, being approximately 2% only. No heavy metals were detected, indicating the safety of these pearl powders to be consumed. Pearl was reported to be safer than oyster shell, which may contain contaminants such as lead, as a source of calcium carbonate (Gregory 2000). In Taiwan, every batch of food supplement must be checked for the contamination of heavy metals include Pb, As, Cd, and Hg before marketing. We would like to recommend the same practice on pearl powder anywhere else in the world.

Table 1—Composition of NPP and MPP.

Item	NPP	MPP
Carbohydrate (%)	1.0	1.1
Crude fat (%)	0.1	0.1
Crude protein (%)	2.1	2.0
Moisture (%)	0.8	0.7
Ash (%)	96.0	96.1
Calcium (%)	35.9	36.2
Arsenic (As) (ppm)	ND[a]	ND
Lead (Pb) (ppm)	ND	ND
Cadmium (Cd) (ppm)	ND	ND
Mercury (Hg) (ppm)	ND	ND

[a]ND = not detectable at detection limits 0.125 ppm for As, 0.025 ppm for Pb, 0.01 ppm for Cd, and 0.025 ppm for Hg.

The temperature in the dry cryo-nanonization grinding system was controlled under 40 °C in operation by a cooling system (Figure 1). The grinder was to disintegrate pearls, and then the separator to collect NPP and MPP separately. Denaturation and alteration of protein and other organic materials was thus minimized. No soluble materials were supposed to lose in dry milling. Effective retention of all the components in pearl could therefore be expected.

Figure 2 shows the particle size distributions of NPP and MPP. The mean particle sizes of NPP and MPP were 84 nm and 29.4 μm by number, and 470 nm and 172 μm by volume. Comparing Figure 2A with 2C and Figure 2B with 2D reveals no overlap in the distribution of these 2 types of pearl powder, indicating the effectiveness of the grinding system to separate micronized and nanonized pearl powders.

Table 2 shows the characteristics of subjects in the clinical test. The ages of the subjects were 23 to 45 y old with 33 y as the average. The average height was 1.63 m. The average body weight and the average body mass index (BMI) were 72 kg and 25.3 kg/m^2 for males, and 58 kg and 23.0 kg/m^2 for females. There is no significant difference between the male group and the female group in BMI value.

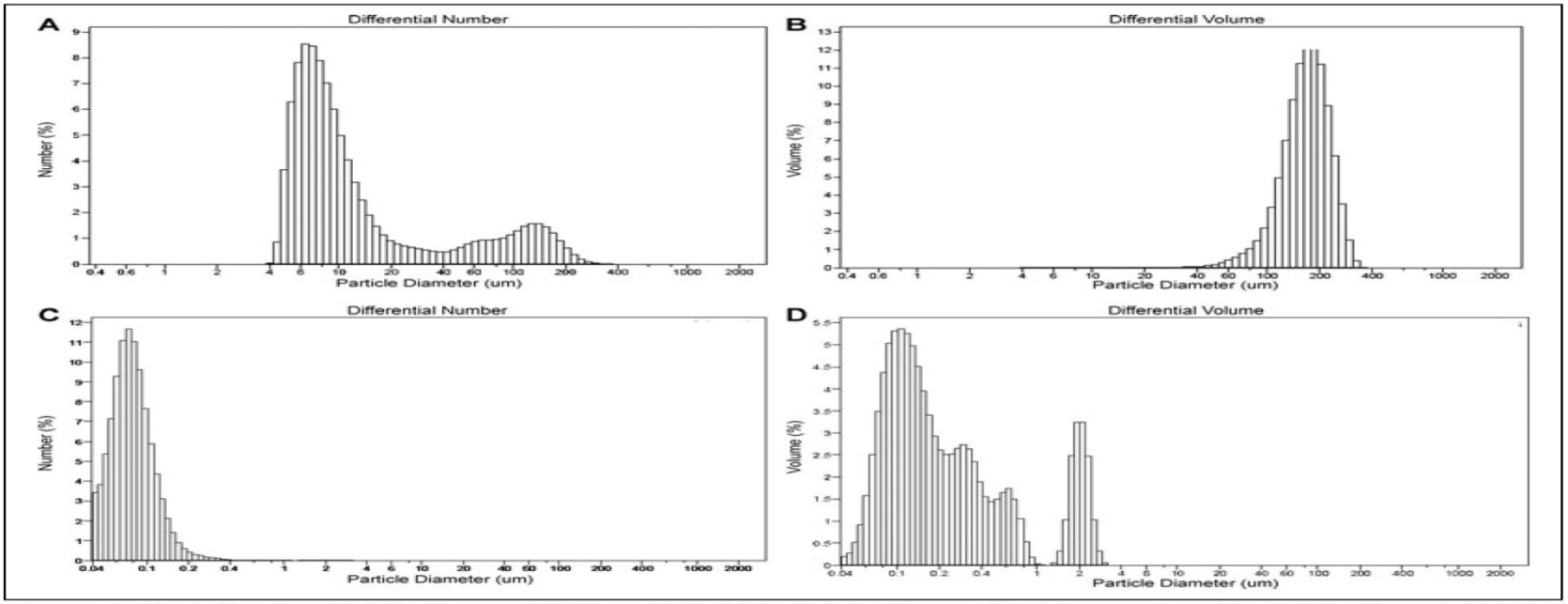

Figure 2—Particle size distributions of NPP and MPP (A: distribution of MPP by number; B: distribution of MPP by volume; C: distribution of NPP by number; D: distribution of NPP by volume).

hows the change in serum total calcium after ingesting . A rapid increase in the calcium content occurred in < 0.01) after ingesting either NPP or MPP, which is previously reported findings in the experiments with e malate and tricalcium phosphate/calcium lactate thers 2005). Between the 2 types of pearl powder, r than MPP in supplying calcium to human body, as per increase in serum total calcium in the 1st 2 h after d confirmed by paired t-test ($P < 0.01$).

pling periods in calcium bioavailability study after oral stration of the supplement vary among previous reports, being 0 to 4 h (Shires and Kessler 1990; Yang and others 1994), 0 to 4.5 h (Hanzlik and others 2005), 0 to 6 h (Reginster and others 1993), and 0 to 9 h (Heaney and others 2005). Among them, Heaney and others (2005) also stated that the T_{max} was 2 to 3 h after administration. Subjects in the present study were fasted for 12 h prior to the oral administration. Therefore, the sampling period in the present study was ended at 6 h to cover the T_{max} while avoiding too much detrimental effect to health caused by over-fasting.

The serum total calcium in subjects administered with NPP reached the maximum concentration (C_{max}) at 0.63 mg/dL in about 2 h ($T_{max} = 2$ h), whereas those administered with MPP reached the C_{max} at 0.54 mg/dL in about 4 h ($T_{max} = 4$ h). The $AUC_{0-6h,NPP}$, 3.11 mg × h/dL, is higher than $AUC_{0-6h,MPP}$, 2.25 mg × h/dL ($P < 0.01$). The comparative bioavailability, $AUC_{0-6h,NPP}/AUC_{0-6h,MPP}$, reaches 138%, indicating better human absorption of calcium from NPP than that from MPP. All the above-mentioned parameters, including C_{max}, T_{max}, and AUC, show that NPP is more effective than MPP in supplementing calcium to adults and that the particle size of pearl powder is an influential factor for the uptake of calcium.

The recommended calcium intake for adults is 1000 mg/d in Taiwan and the United States. The tolerable upper level is 2500 mg/d in Taiwan. The suggested dose of calcium supplementation in the literature ranged from 800 to 1500 mg/d (Goddard and others 1986; Arnaud and Sanchez 1990). Various preparations for calcium supplementation are available, with their own advantages and drawbacks (Yang and others 1994). Heaney and others (2005) administered their subjects with juice fortified with 500 mg Ca as a part of a meal in normal metabolism study, whereas Shires and Kessler (1990), Yang and others (1994), and Hanzlik and others (2005) used a single dose as high as 1200 mg in the study for acute metabolic effects. The present study was to elucidate the acute effect of pearl powder in calcium metabolism. The subjects were administered with pearl powder and pure water only. Therefore, the dosage of calcium was set at 780 mg Ca, somewhat below the lowest suggested dosage of 800 mg Ca for common calcium supplements in the above-cited literatures to account for the expected higher uptake for a nanonized supplement.

Vitamin D is well-recognized to be an influential factor for calcium uptake. However, the incidence of vitamin D deficiency among normal healthy adults in the age 23 to 45, as our subjects belong to, in Taiwan as a subtropical country with lots of sunshine and abundant food of animal origin is very low. Besides, the subjects were free from hypocalcemia. Therefore, vitamin D deficiency was supposed no concern in the present study.

Calcium is essential to many physiological processes. The blood calcium in healthy adults is usually in the range of 8.5 to 10.5 mg/dL. In the present study, the blood calcium in all subjects remained in the range of 9.18 to 9.99 mg/dL. No evidence of hypercalcimia was shown. The supplementation of calcium in the present study was a proper practice.

Figure 4 shows the changes in serum iPTH in 4 h after ingesting NPP and MPP. The serum iPTH concentration remained within the normal range of 10 to 65 pg/mL. The iPTH mobilizes calcium from bone by stimulating osteoclast activity. An increase in plasma calcium suppresses iPTH secretion via the calcium sensing receptor and also decreases parathyroid cell growth. A decrease in iPTH retards demineralization from bone (Bass and Chan 2006). The

Table 2—Characteristics of subjects.

	Male	Female	Total
Number	14	14	28
Age (year)[a]	32.2 ± 8.0	33.4 ± 5.7	32.8 ± 6. 8
Height (m)	1.68 ± 0.04	1.59 ± 0.04	1.63 ± 0.06
Body weight (kg)	72 ± 16	58 ± 8	64 ± 14
Body mass index (kg/cm²)	25.3 ± 5.3	23.0 ± 2.4	23.8 ± 4.1

Data were presented as means ± SD.
[a]The ages of the subjects were 23 to 45 y old. There is no significant difference between the male group and the female group in BMI value.

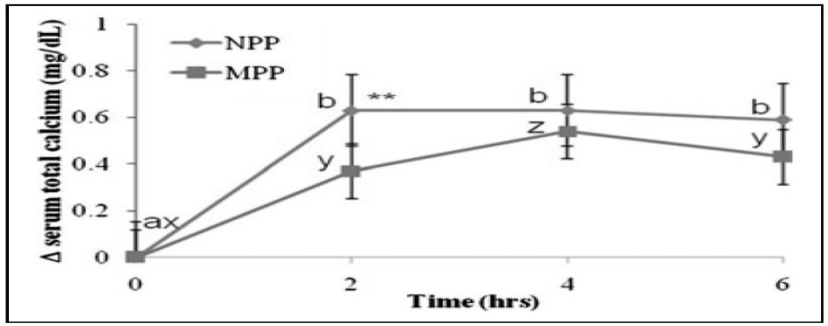

Figure 3—The changes in serum total calcium after ingesting pearl powder. **$P < 0.01$ in a paired t-test between samples taken from NPP and MPP treated subjects at the same duration after ingestion; a, b: $P < 0.05$ in ANOVA among samples taken from NPP treated subjects in different durations after ingestion; x, y, z: $P < 0.05$ in ANOVA among samples taken from MPP treated subjects in different durations after ingestion.

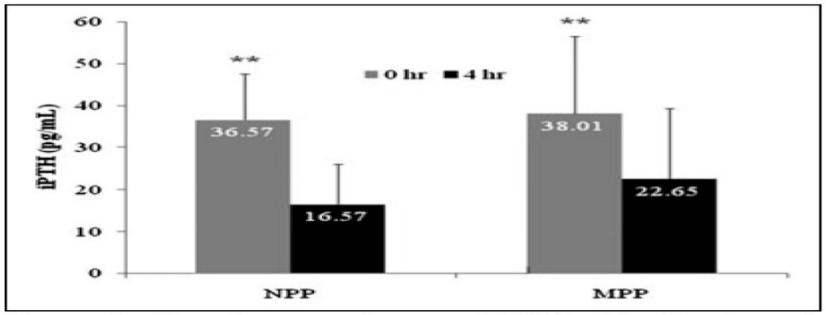

Figure 4—The changes of serum iPTH in 4 h after ingesting NPP and MPP. The reductions in serum iPTH in 4 h after ingesting NPP and MPP were 19.99 and 15.36 pg/mL, respectively. Both treatments reduced serum iPTH effectively ($P < 0.01$). NPP treatment resulted in a higher percentage reduction (53.54%) in serum iPTH than MPP did (39.11%) ($P < 0.05$).

in serum iPTH in 4 h after ingesting NPP and MPP were .36 pg/mL, respectively (Figure 4). Both treatments re- iPTH effectively ($P < 0.01$), revealing that NPP and ficial calcium supplements. NPP treatment resulted rcentage reduction (53.54%) in serum iPTH than MPP $P < 0.05$, indicating that NPP is more effective in sup- alcium.

and others (1993) administered gluconolactate, cal- onate, tricalcium phosphate, or calcium citrate at calcium equivalent to adult and evaluated serum iPTH r. All of these calcium supplements induced significant suppression of iPTH (−38.4% to −57.4%). The present study used pearl powder at less calcium equivalent (780 mg), while obtained similar percentage reduction in serum iPTH (−39.1% to −54.5%) at a shorter time after ingestion (4 h), indicating that the calcium bioavailability of pearl powder is superior to the calcium supplements used in the previous report.

Figure 5 shows the changes in total calcium/creatinine (Ca/Cre) ratio of urine after ingesting pearl powder. The serum total calcium in healthy adults is in the range of 8.5 to 10.5 mg/dL. Any surplus of blood calcium as a result of pearl powder ingestion has to be removed in homeostasis. Creatinine is a biochemical waste generated from muscle metabolism and excreted continually at a constant rate from kidney into urine in healthy people. The urinary Ca/Cre ratio is a measure of urinary calcium excretion (Wills 1969). An increased total urine Ca/Cre ratio indicates an increased calcium loss into urine, and a higher calcium bioavailability in the food as well (Shires and Kessler 1990; Yang and others 1994). The Ca/Cre ratio started to increase within 2 h after ingesting NPP or MPP ($P > 0.05$). The highest increment occurred in 2 to 4 h after ingestion, and then leveled off.

The absorption of calcium from NPP is higher than that from MPP (Figure 3). However, there was no significant difference between NPP and MPP ingestions in the change of urine total Ca/Cre ratio ($P > 0.05$) (Figure 5). Restated, NPP may supply more "net absorbed calcium" (Nordin 1997), or the calcium to be retained in the body, than MPP does, at least in a short term.

People are often suspicious about the toxicity of nanonized particles (Zhang and others 2004, 2005; Wang and others 2007). The present study found no abnormal data in iPTH, serum total calcium, urine calcium, and urine creatinine, suggesting that nanonization causes no acute toxicity of pearl powder in oral administration. Nevertheless, future studies to collect the long-term chronic toxicological data, such as the change in calcium transport proteins, will be worthwhile.

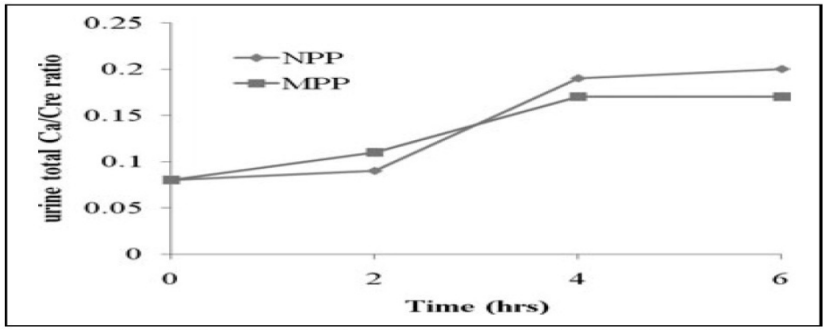

Figure 5—The changes in urinary total Ca/Cre ratio after ingesting NPP and MPP. No significant difference between NPP and MPP treatments in the change of urine total Ca/Cre ratio was found ($P > 0.05$).

Dalie (1998) reviewed the literatures regarding to the uptake of nano- and microparticle drugs in the gastrointestinal tract, and concluded that *in vivo* bioavailability study would be the most proper measurement of uptake. Cui and others (2005) and Gao and others (2006) reported nano- and micro-pearl powder, which contains calcium carbonate as the major component, as beneficial sources of calcium based on the data of femur dry weight, femur length, and calcium retention in rats. The present study is the 1st report on calcium bioavailability of pearl powder in human pharmacokinetic clinical trials.

The increases in serum total calcium and urine total Ca/Cre ratio and the reduction in serum iPTH concentration indicate that both NPP and MPP are beneficial calcium supplements for adults. Between these 2 types of pearl powder, NPP has a lower value of T_{max} and higher values of total calcium absorption, C_{max}, comparative bioavailability of calcium, and serum iPTH reduction. All these data indicate that NPP is a more effective calcium source than MPP.

Conclusions

Pearl powder is a beneficial source of calcium supplement. The particle size of pearl powder is an influential factor for calcium bioavailability in humans. The present study provided a good example of the successful application of nanonization in the processing of food supplements.

Acknowledgments

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新芳奈米珍珠粉

最先進的保健聖品

- 珍珠食用『**最早**』可追朔自埃及豔后(西元前70年)其他著名歷史人物如：楊貴妃、慈禧太后等皆有利用珍珠粉養顏美容之習慣
- 珍珠特性研究『**至今**』仍可在國際學術期刊中看到蹤跡，最著名的為西元2000年Lopez等人發表在一流國際期刊“Science”上，對珍珠層刺激皮膚纖維母細胞生長的研究有關
- 最新研究發現，『**奈米級**』珍珠粉除了有利於人體快速吸收鈣質以外，對於美容、自律神經失調、支氣管炎、氣喘、高血壓、肝炎、過敏性鼻炎、關節風濕症、狹心症等皆有幫助

珍珠粉對人體益處

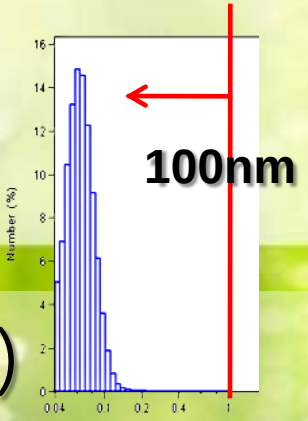
作用系統	有效症例(已證實) (蔡仁逵，2000)
中樞神經系統	失眠、神經衰弱、疲勞綜合症、癲病、煩燥不安
呼吸系統	氣管炎、肺炎、咳嗽痰多
循環系統	心率失常、高血壓、高血脂、動脈硬化、中風、貧血、冠心病、心臟衰弱
消化系統	胃潰瘍、十二指腸潰瘍、胃腸炎、萎縮性肺炎、口臭、病毒性肝炎、病毒性肝炎、糖尿病、食道炎、腹瀉
生殖系統	陽痿、不孕症、胎毒、子宮糜爛、子宮頸炎、子宮功能性出血、白帶過多、難產、胎盤不下
其他	雀斑、黃褐斑、濕疹、皮膚潰瘍、燒燙傷、瘡癤、耳鳴、白內障、口腔潰瘍

珍珠粉治療各種疾病的有效率

- 美容：73~86%
- 自律神經失調：88~92%
- 骨質疏鬆：67~83%
- 支氣管炎、氣喘：70~80%
- 高血壓：65~83%
- 肝炎：78~84%
- 過敏性鼻炎：65~82%
- 關節風濕症：70~77%
- 狹心症：79~89%

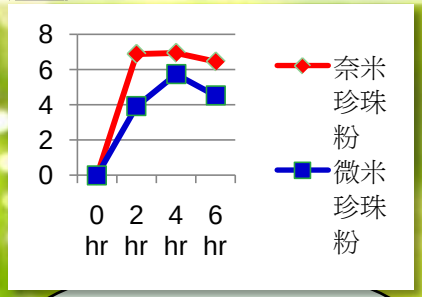
(黃青萍與盤紅梅，2000)

新芳奈米珍珠粉
三大品質保證

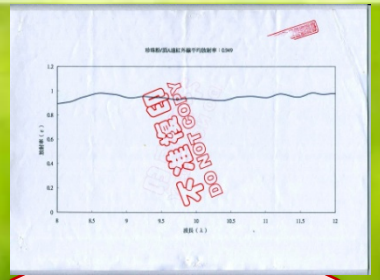


1. 顆粒數**平均粒徑D_{50}**小於**100nm**(100奈米)
2. 採用『**低溫研粉製程**』(<40度)，不傷及珍貴的珍珠蛋白成分。相較之下，傳統水飛法必須將珍珠與豆腐一同進行煮沸，以利於後續研磨，故高溫會破壞寶貴的珍珠蛋白。
3. 100%純珍珠(具合格產地證明)，並通過各項安全檢驗，如重金屬檢測，成分分析等。相較之下，市面上許多惡德廠商多以貝殼粉冒充珍珠粉販售，不但欺騙消費者的錢包，也可能危及消費者的健康！

新芳奈米珍珠粉功能介紹(選單)



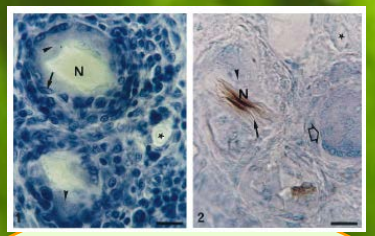
鈣質補充劑



遠紅外線材料
(放射生育光線)

新芳奈米
珍珠粉

天然胺基酸
補充劑



修復皮膚組織
(美容、傷口修復)

胺基酸檢測報告

奈米化製程成分釋放高於傳統研粉法的百倍到千倍，證明了奈米後的成分釋放功能，提昇產品的附加價值。


華友科技顧問股份有限公司
HWAYO TECH & LAB CO., LTD.
檢驗報告
委託單位/人：新芳奈米科技有限公司
樣品/委託編號：95F0203-001-02
樣品名稱：奈米珍珠粉　收件日期：2006 年 06 月 07 日
樣品外觀：粉末　檢驗日期：2006 年 06 月 08 日
樣品來源：委託單位自行提供　報告日期：2006 年 06 月 20 日
檢驗類別：含硫胺基酸
檢驗結果
胺基酸組成　檢驗結果(%)
Cystine　Cyst　胱胺酸　3.9344
Methionine　Meth　甲硫胺酸　2.7663
備註：N.D.= not detected (未檢出)
實驗室主任：莊清堯 博士

名稱	蛋白質(%)	含量(mg/kg)
天門冬胺酸(Asp)	11.11	2.332
酥胺酸(The)	2.25	0.472
絲胺酸(Ser)	7.71	1.618
麩胺酸(Glu)	5.86	1.231
甘胺酸(Glc)	18.89	3.964
丙胺酸(Ala)	22.96	4.820
胱胺酸(Cys)	0.34	0.072
纈胺酸(Val)	3.13	0.657
甲硫胺酸(Met)	0.53	0.112
異白胺酸(Ile)	2.31	0.485
白胺酸(Leu)	6.11	1.282
酪胺酸(Tyr)	1.95	0.409
苯丙胺酸(Phe)	5.21	1.093
離胺酸(Lys)	3.06	0.642
組胺酸(His)	1.16	0.244
精胺酸(Arg)	5.60	1.176
脯胺酸(Pro)	1.82	0.381

珍珠蛋白含各種胺基酸成分

本技術使用乾式研粉法直接將珍珠奈米化，使胺基酸成份直接釋放，解決傳統水飛法或食煮法研粉製程中高溫破壞胺基酸的問題。

- 15種水解胺基酸：
  天門冬胺酸、羥丁胺酸、絲胺酸、麩胺酸、甘胺酸、丙胺酸、纈胺酸、異白胺酸、白胺酸、酪胺酸、苯丙胺酸、組胺酸、離胺酸、精胺酸、脯胺酸，藉由酸產生溶解，被人體吸收，如人體的胃酸就可達到分解的效果，若採用奈米製程，吸收效果更佳。
- 非水解胺基酸：
  色胺酸、含硫胺酸(胱胺酸及甲硫胺酸)、牛磺酸以上成分沒有經過奈米化的製程，因粒徑過大，無法將珍珠內含蛋白質之胺基酸成分，充分釋放被人體吸收。

奈米珍珠蛋白
各種胺基酸成分說明(一)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檢驗報告

委託單位/人：新芳奈米科技有限公司
樣品/委託編號：95F0203-001-02
樣品名稱：奈米珍珠粉　收件日期：2006 年 06 月 07 日
樣品外觀：粉末　檢驗日期：2006 年 06 月 08 日
樣品來源：委託單位自行提供　報告日期：2006 年 06 月 20 日
檢驗類別：含硫胺基酸
鑑別及檢驗方法：胺基酸自動分析儀(Beckman Amino Acid Analyzer)

檢驗結果

胺基酸組成			檢驗結果(%)
Cystine	Cyst	胱胺酸	3.9344
Methionine	Meth	甲硫胺酸	2.7663

備註：N.D.= not detected (未檢出)

注意事項：
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2. 本報告所列檢體資料係由委方提供，本實驗室僅負責試驗分析。
3. 本檢驗報告未經本公司書面同意，不得部份複製、轉載或其他有損本公司權益之行為。
4. 送檢樣品已消耗完畢。

實驗室主任：莊清堯 博士

華友科技顧問股份有限公司
HWAYO TECH & LAB CO., LTD.
243臺北縣泰山鄉明志路三段423號4樓
TEL：02-2906－0887
藥物及工業衛生認證實驗室
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報告

收件日期：2006 年 06 月 07 日
檢驗日期：2006 年 06 月 08 日
報告日期：2006 年 07 月 11 日

Amino Acid Analyzer)
果

檢驗結果(mg/100g)

33.78

CHUANG, PH.D. 莊清堯博士 DIRECTOR ACCREDITED LABORATORY

國藥學博士

1.離胺酸(必須胺基酸Lysine)

離胺酸可幫助鈣質吸收，促進膠原蛋白形成，幫助抗體荷爾蒙及酵素之製造,可以輔助治療單純性泡疹。

2.甲硫胺酸(必須胺基酸Methionine)

甲硫胺酸能防止頭髮、皮膚及指甲之病變，可以降低膽固醇濃度、降低肝脂肪、防止中毒、協助腎臟排泄(阿摩尼亞Ammonia)。

3.苯丙胺酸(必須胺基酸Phenylalanine)

苯丙胺酸是腦部及神經細胞製造神經傳導物(新腎上腺素Norepinephrine)的原料，新腎上腺素可以始我們精神上保持警覺，改善記憶及對抗憂鬱。

4.酥胺酸(必須胺基酸Threonine)

酥胺酸是人體膠原蛋白、及牙齒琺瑯質之重要成分，它還可以防止肝臟脂肪堆積、及促進胃腸道功能更平順。

5.纈胺酸(必須胺基酸Valine)

促進腦力，改善肌肉協調功能及安定情緒。

奈米珍珠蛋白
各種胺基酸成分說明(二)

6.白胺酸及異白胺(必須胺基酸 Leucine&Isoleucine)

為身體許多重要生化成份的原料，包括與能量代謝有關的物質，以及 腦中與警覺性有關的神經傳導物。

7.精胺酸(Arginine)

精胺酸可以增強人體對抗細菌、病毒及腫瘤之免疫力、促進生長激素之分泌，促進傷口癒合及肝細胞再生。精胺酸還能促進肌肉形成及減少脂肪囤積。

8.酪胺酸(Tyrosine)

它是腦中神經傳導物之一,可協助克服憂鬱、改善記憶。促進甲狀線，腎上腺及腦下垂體之功能。

9.甘胺酸(Glycine)

協助從血液中釋放氧氣到組織細胞，幫助荷爾蒙的製造，加強免疫功能。

10.絲胺酸(Serine)

幫助肌肉及肝臟儲存肝糖，協助製造抗體，合成神經纖維之外鞘 。

11.麩胺酸(Glutamic acid)

麩胺酸又稱“腦細胞的食物”可以提高腦部功能，促進傷口癒合，減輕疲勞，減輕酒癮，降低對醣類之嗜好。它還可以促進生長激素合成，增加肌肉量及減少脂肪囤積。

12.天門冬胺酸(Aspartic acid)

幫助阿摩尼亞(Ammonia)排泄、消除疲勞，增加身體耐力。

13.胱胺酸(Cystine)

清除自由基，延續老化及抗幅射，抗空氣污染，中和毒物，它是皮膚的重要成份(10~14%)，幫助皮膚再生，使燙傷及外傷加速癒合。

14.脯胺酸(Proline)

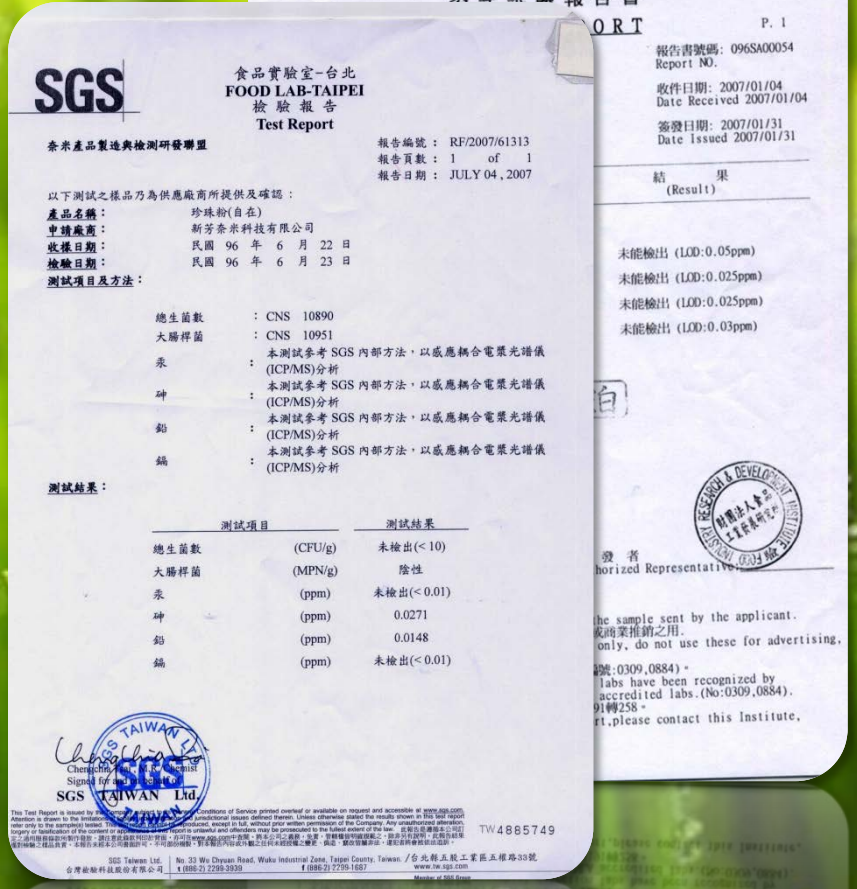
對於維持關節及肌腱的正常功能有舉足輕重的地位，它還可以強化心肌的功能。

15.丙胺酸(Alanine)

丙胺酸是肌肉組織及腦部中樞神經之能源之一，可幫助產生抗體，協助醣類及有機酸的代謝

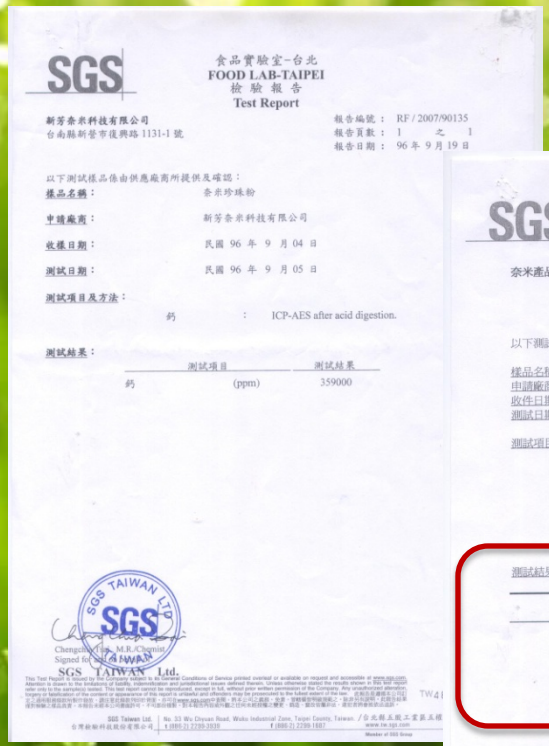
微量元素檢測

嚴格控管重金屬成分，如汞、砷、鉛、鎘等，均在安全食用範圍。



成分	含量(克/克)	成分	含量(克/克)
鍶(Sr)	2.8×10^{-4}	釷(Th)	$<3\times10^{-9}$
鋇(Ba)	8.9×10^{-5}	銫(Cs)	$<0.9\times10^{-9}$
鈧(Sc)	1.2×10^{-9}	銠(Rh)	0.91×10^{-7}
鈷(Co)	0.7×10^{-9}	硒(Se)	$<1\times10^{-4}$
鋅(Zn)	0.43×10^{-6}	鈉(Na)	1.7×10^{-4}
鉻(Cr)	$<0.1\times10^{-7}$	銅(Cu)	1.3×10^{-4}
鐵(Fe)	$<12\times10^{-5}$	鉀(K)	5.2×10^{-4}
溴(Br)	$<5\times10^{-7}$	金(Au)	3.8×10^{-4}
銀(Ag)	14×10^{-9}	鎢(w)	$<0.3\times10^{-4}$
鉿(Hf)	$<0.4\times10^{-3}$	鑭(Ld)	$<3\times10^{-4}$
錳(Mn)	3.1×10^{-4}	鍺(Ge)	1.12×10^{-4}

五大營養成分檢驗報告


SGS
食品實驗室-台北
FOOD LAB-TAIPEI
檢 驗 報 告
Test Report

新芳奈米科技有限公司
台南縣新營市復興路 1131-1 號

報告編號： RF / 2007/90135
報告頁數： 1 之 1
報告日期： 96 年 9 月 19 日

以下測試樣品係由供應廠商所提供及確認：

樣品名稱： 奈米珍珠粉
申請廠商： 新芳奈米科技有限公司
收樣日期： 民國 96 年 9 月 04 日
測試日期： 民國 96 年 9 月 05 日

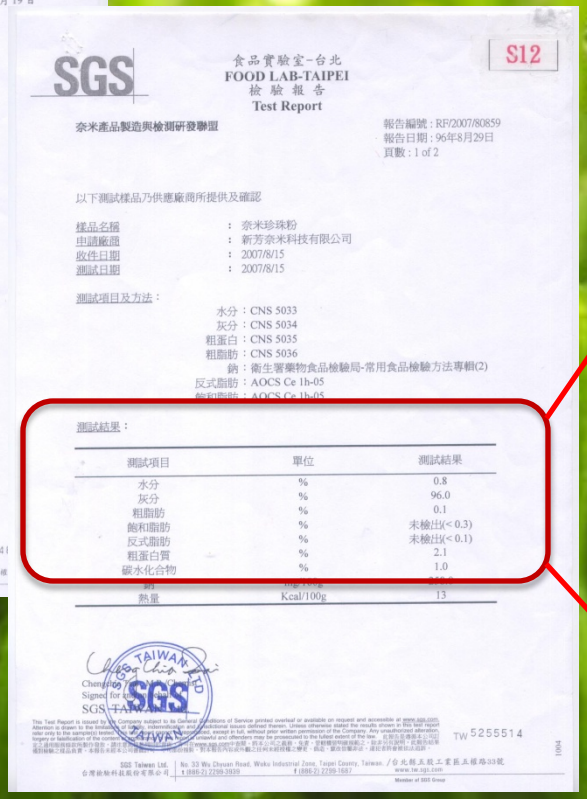
測試項目及方法：

鈣 : ICP-AES after acid digestion.

測試結果：

測試項目		測試結果
鈣	(ppm)	359000

SGS TAIWAN Ltd.


SGS
食品實驗室-台北
FOOD LAB-TAIPEI
檢 驗 報 告
Test Report

S12

奈米產品製造與檢測研發聯盟

報告編號：RF/2007/80859
報告日期：96年8月29日
頁數：1 of 2

以下測試樣品乃供應廠商所提供及確認

樣品名稱 : 奈米珍珠粉
申請廠商 : 新芳奈米科技有限公司
收件日期 : 2007/8/15
測試日期 : 2007/8/15

測試項目及方法：

水分：CNS 5033
灰分：CNS 5034
粗蛋白：CNS 5035
粗脂肪：CNS 5036
鈉：衛生署藥物食品檢驗局-常用食品檢驗方法專輯(2)
反式脂肪：AOCS Ce 1h-05
[illegible]：AOCS Ce 1h-05

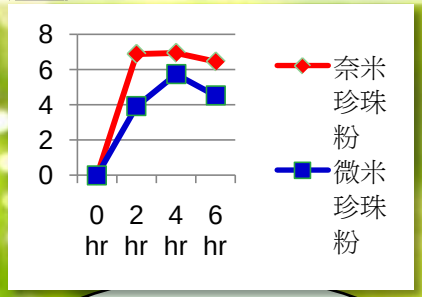
測試結果：

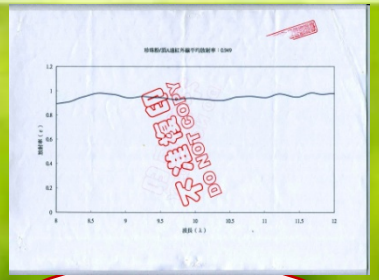
測試項目	單位	測試結果
水分	%	0.8
灰分	%	96.0
粗脂肪	%	0.1
飽和脂肪	%	未檢出(< 0.3)
反式脂肪	%	未檢出(< 0.1)
粗蛋白質	%	2.1
碳水化合物	%	1.0
[illegible]	[illegible]	[illegible]
熱量	Kcal/100g	13

TW 5255514

粗蛋白(%)	2.1
粗脂肪(%)	0.1
不飽和脂肪(%)	0(<0.3)
反式脂肪(%)	0(<0.1)
碳水化合物(%)	1.0
鈉(mg/100g)	258
鈣(mg/100g)	35900

新芳奈米珍珠粉功能介紹(選單)

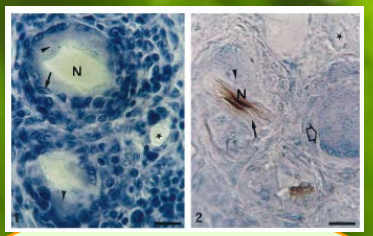




鈣質補充劑

遠紅外線材料
(放射生育光線)

新芳奈米
珍珠粉



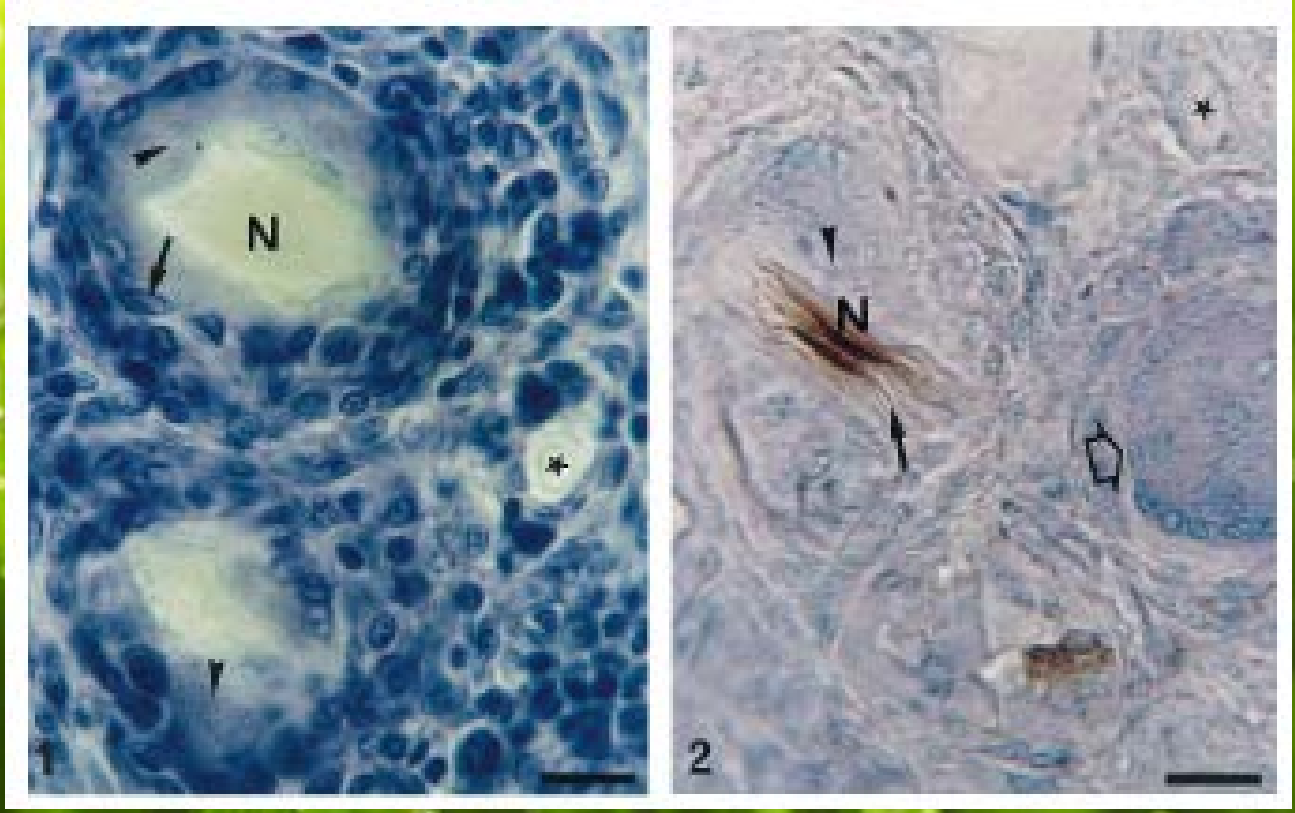
天然胺基酸
補充劑

修復皮膚組織
(美容、傷口修復)

珍珠層物質
對皮膚細胞之作用機制

- **提高SOD活性：**
  加速清除自由基，防止膠原蛋白失去彈性而產生皺紋
- **修復皮膚組織：**
  皮膚修復過程中，創傷組織吸收大量之 Se, Mn, Zn，參與皮膚損傷組織之再生
- **促進ATPase活性**
  Ca進入細胞間質，促進ATPase活性，調節酸鹼平衡，參與細胞緩衝作用
- **Taurine能增強細胞對營養物質之通透性**
- **反射吸收陽光中之紫外線**

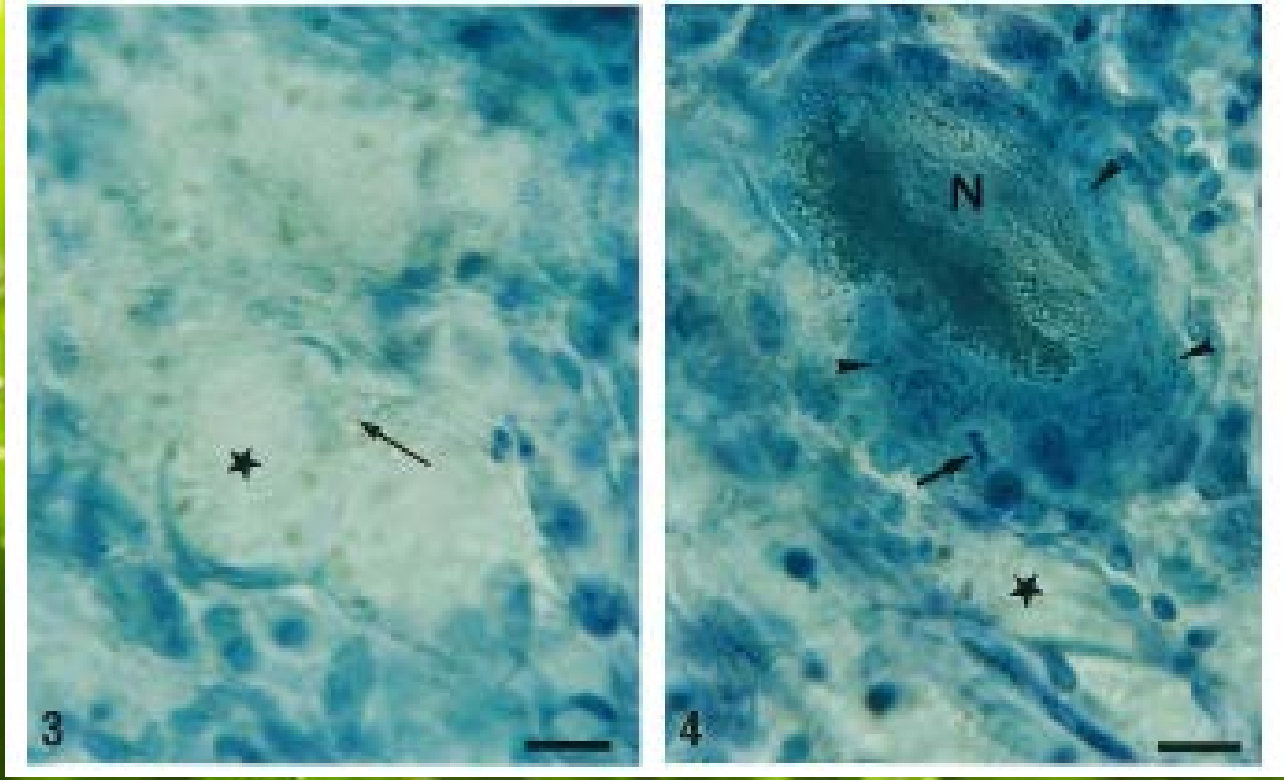
珍珠成分能有效
刺激皮膚纖維母細胞生成



- 珍珠成分移植皮膚組織，發現可以刺激並調節老鼠成骨細胞的生長

(Lopez and others, 2000)

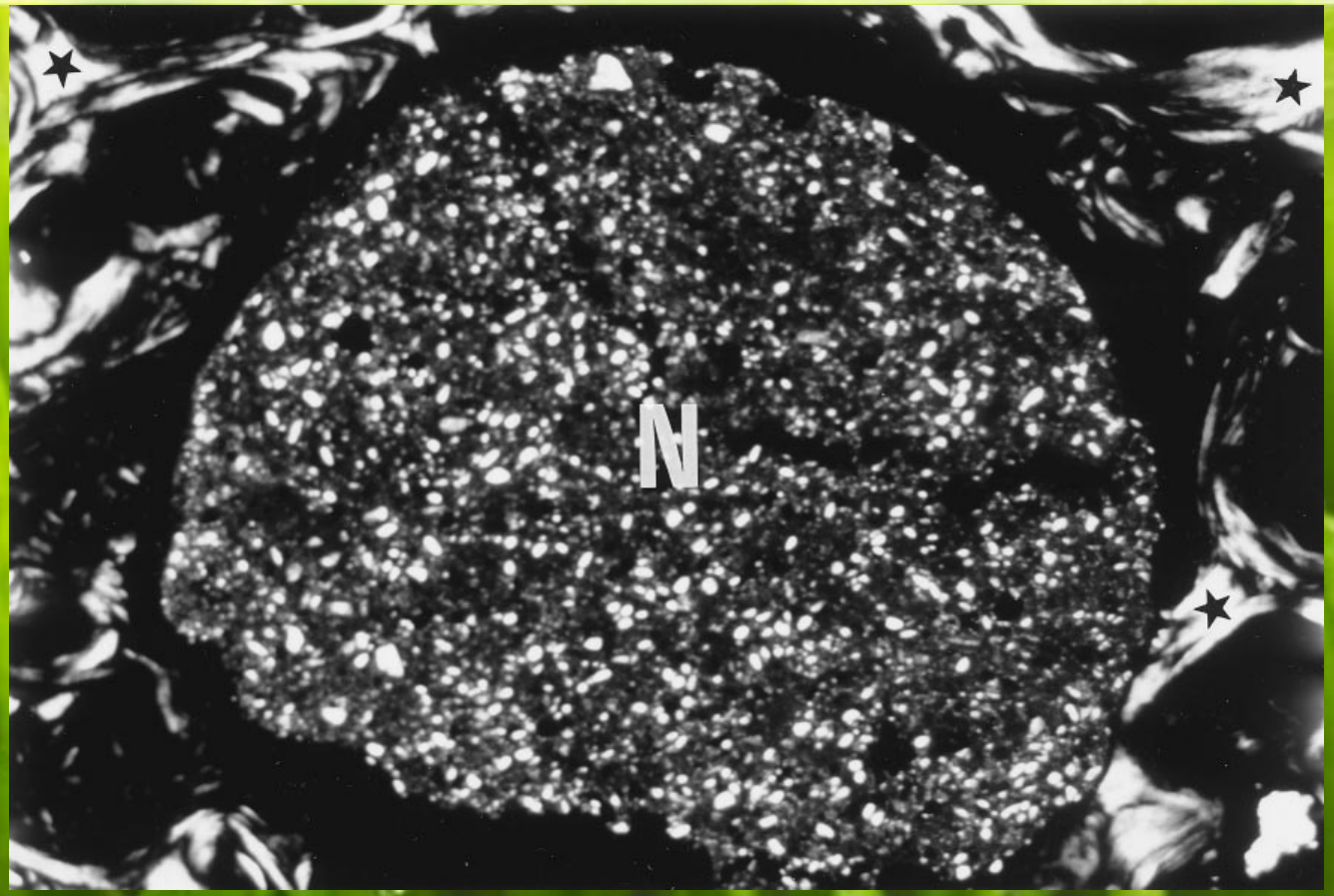
珍珠成分活化皮膚纖維母細胞



- 珍珠成分活化皮膚纖維母細胞功能與誘導活化皮膚生理

(Lopez and others, 2000)

珍珠可以刺激骨髓細胞成長與骨質形成



- **Transverse section through a bone defect at 1 week postsurgery. Cavity filled with nacre (N); and vertebral trabecular bone (star) (polarized** light microscopy); original magnification 325.
(Lamghari and others, 1999)

珍珠層刺激骨髓細胞增生

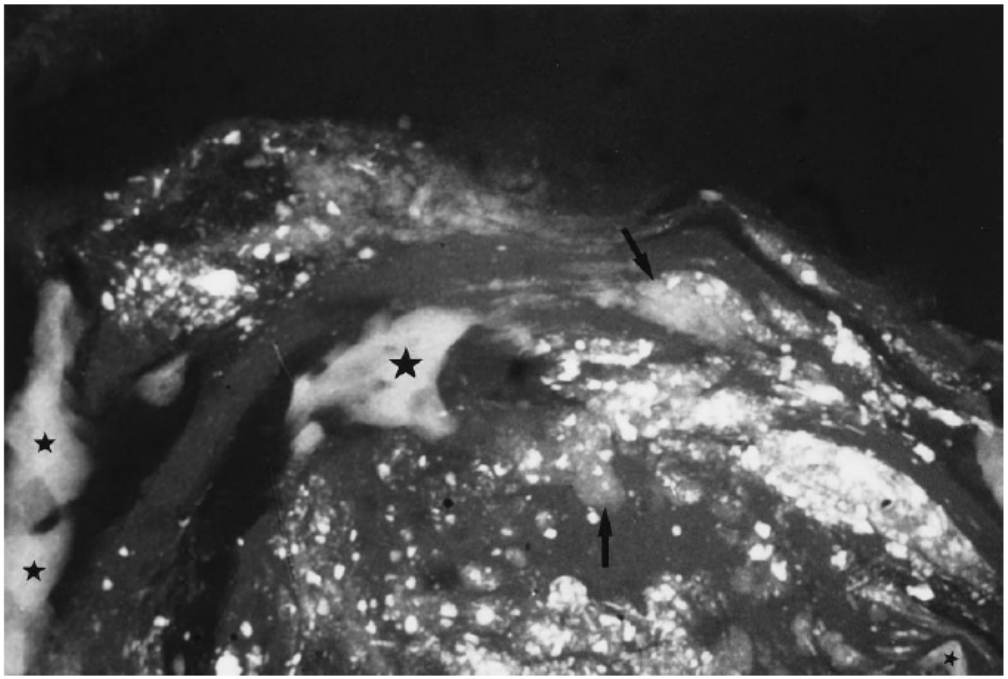
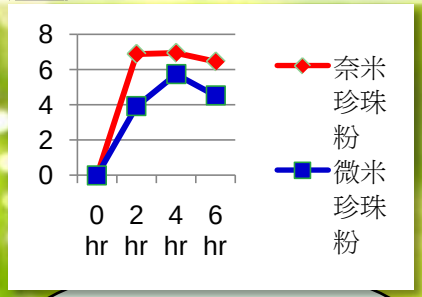


Figure 3. Microradiography of transverse section through a bone defect showing newly formed bone (star) at 12 weeks postsurgery. Nacre gradually dissolved (arrow) (original magnification ×50).

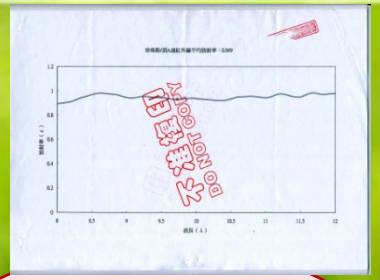
- 體內與體外研究證實珍珠層成分中含一種或多種活化骨髓細胞之訊息分子並導致骨骼形成

(Lamghari and others, 1999)

新芳奈米珍珠粉功能介紹(選單)



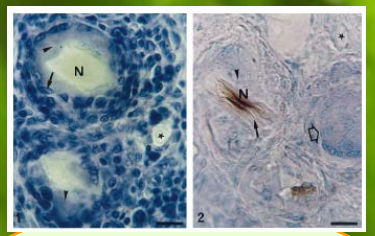
鈣質補充劑



遠紅外線材料
(放射生育光線)

新芳奈米
珍珠粉

天然胺基酸
補充劑

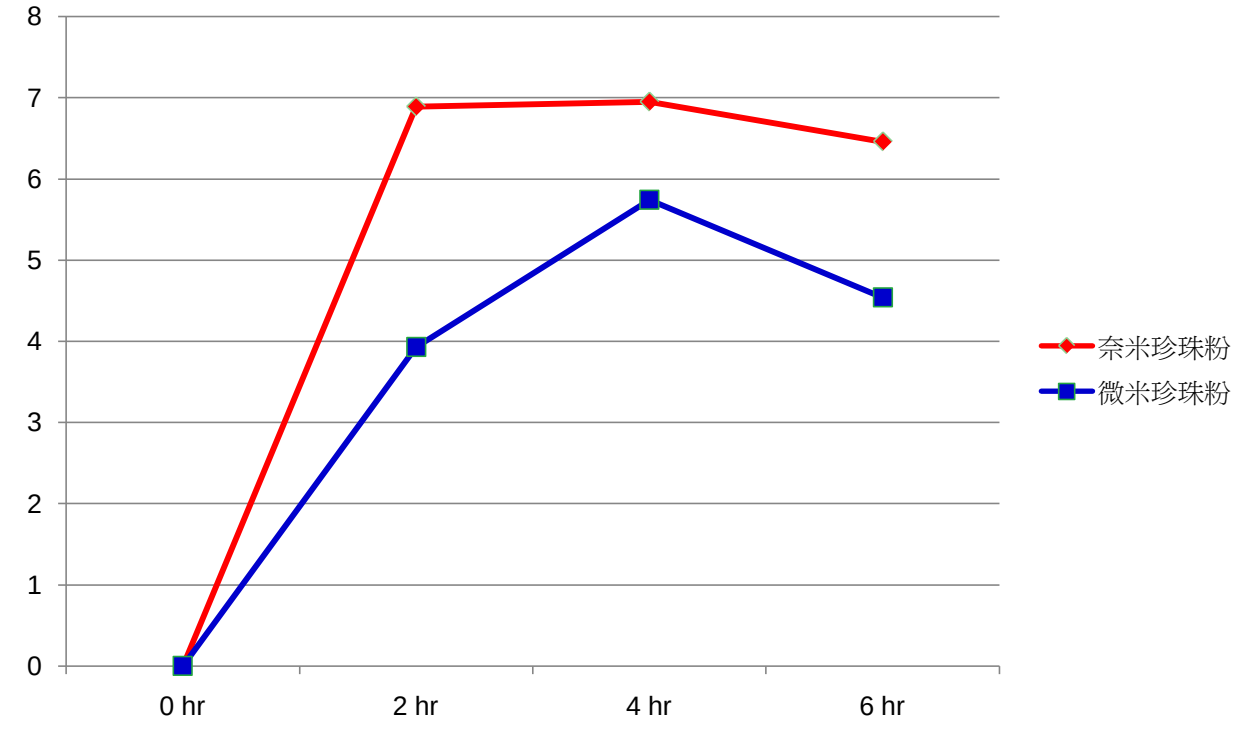


修復皮膚組織
(美容、傷口修復)

新芳奈米珍珠粉
有效提高鈣吸收率

經實驗證實，神之手奈米珍珠粉較一般傳統微米珍珠粉更容易讓人體吸收

血液總鈣提高百分比				
	0 hr	2 hr	4 hr	6 hr
奈米珍珠粉	0	6.89	6.95	6.46
微米珍珠粉	0	3.93	5.74	4.54



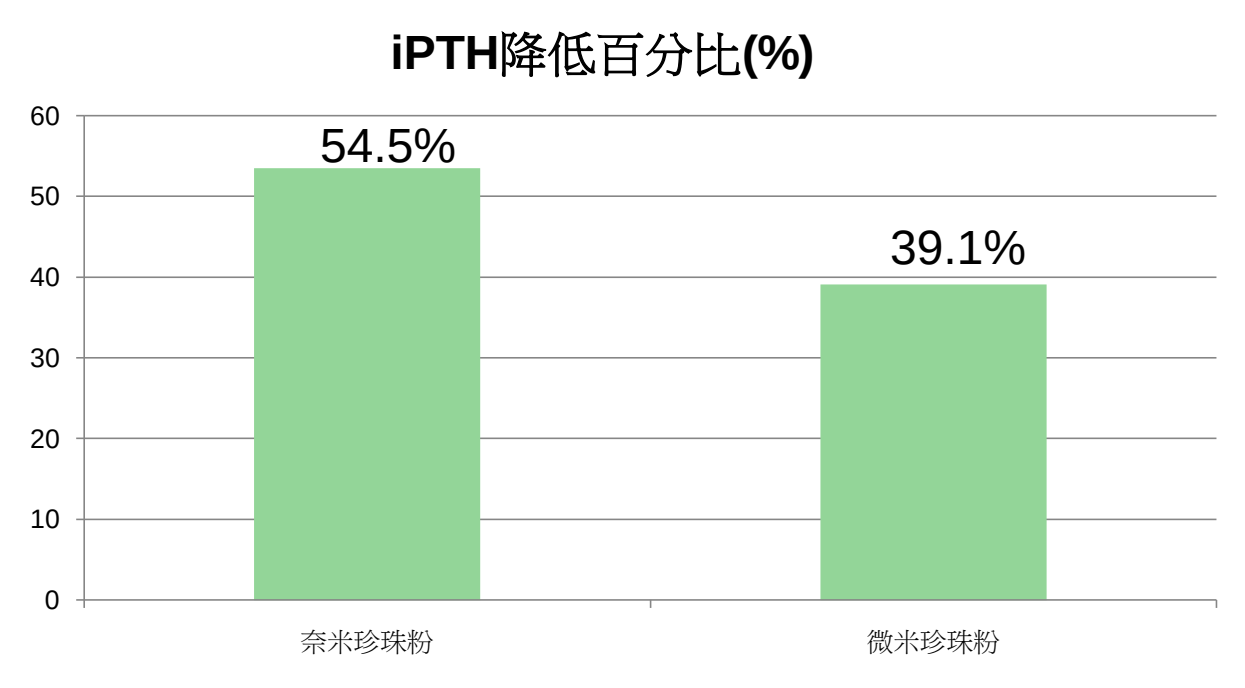
- 攝取奈米珍珠粉後，人體血液總鈣質變化百分比高於微米珍珠粉

新芳奈米珍珠粉

能有效降低副甲狀腺素(iPTH)

經實驗證實，神之手奈米珍珠粉能有效抑制副甲狀腺素，有效將鈣質鎖在骨骼中

	奈米珍珠粉	微米珍珠粉
0 hr	36.57	38.01
4 hr	16.57	22.65
iPTH降低百分比(%)	53.54	39.11



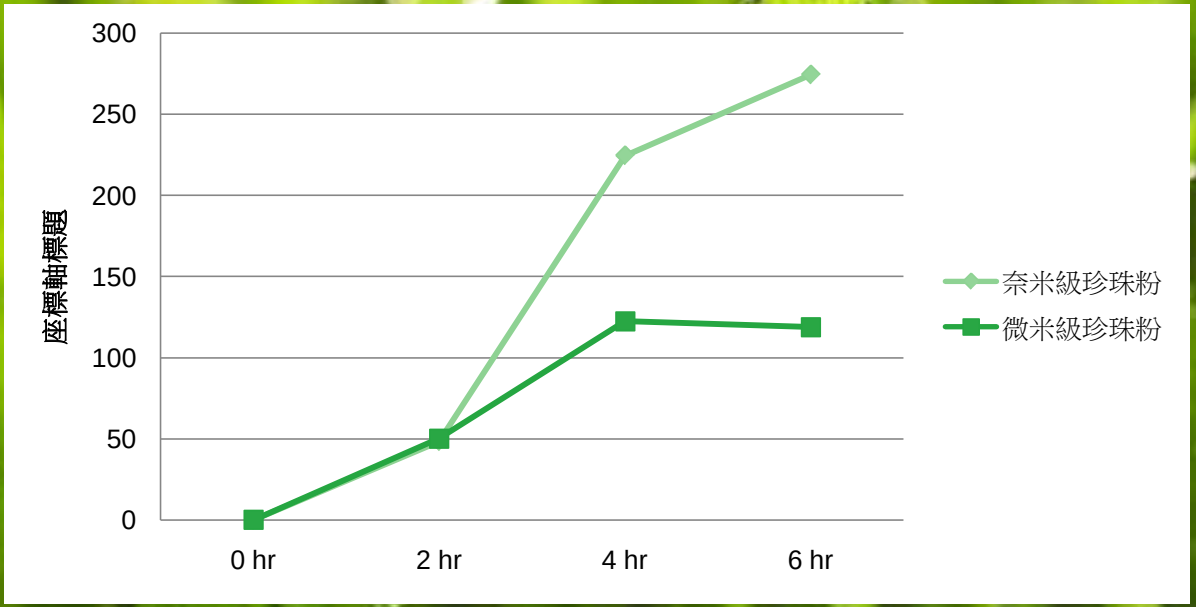
攝取奈米級珍珠粉4小時後，血液中副甲狀腺素降低效果優於微米級珍珠粉

攝取奈米珍珠粉對副甲狀腺素調節血鈣說明

- 當血液鈣濃度降低時，副甲狀腺素(iPTH)即分泌，以活化維生素D(幫助腸道鈣質吸收)與促進尿液鈣質再吸收，促進骨質釋出鈣，以維持血鈣濃度，但骨鈣釋出後即無法再補充。
- 當攝取鈣質補充劑後，血鈣濃度升高，副甲狀腺素即降低，防止骨鈣再流失。
- 奈米化之珍珠粉在腸黏膜吸收效果較佳，故對於副甲狀腺素降低百分比高於微米級珍珠粉，顯示鈣質之生體可用率較佳，防止骨質疏鬆效果亦較佳

奈米珍珠粉對人體尿液中總鈣質/肌酸酐比例優於微米珍珠粉

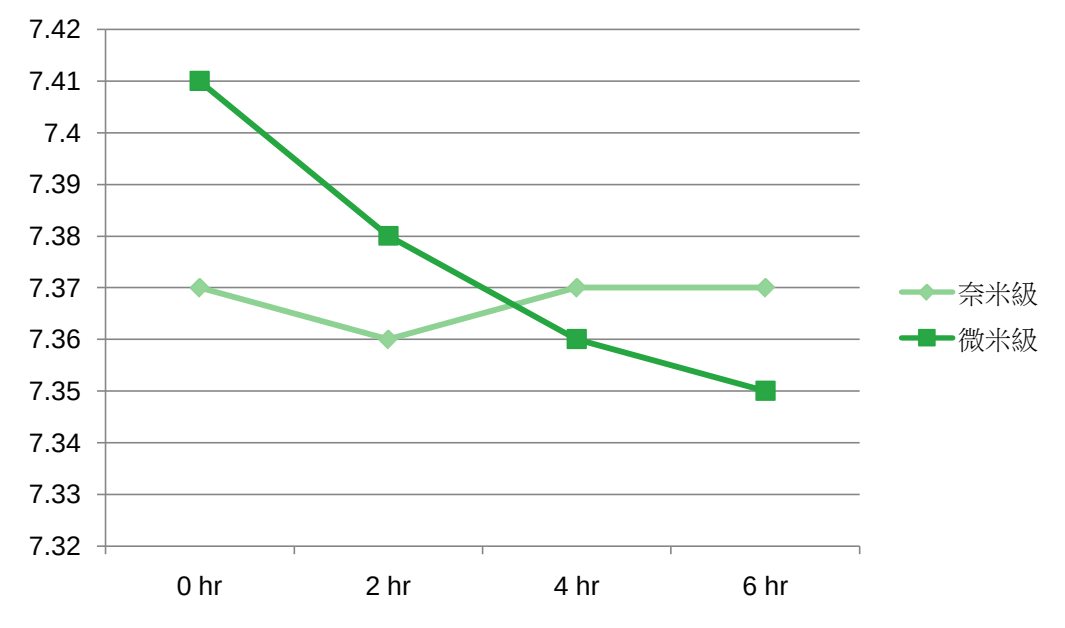
尿液總鈣/肌酸酐變化百分比	0 hr	2 hr	4 hr	6 hr
奈米級珍珠粉	0	48.45	224.73	274.55
微米級珍珠粉	0	50.11	122.51	118.75



- 奈米級珍珠粉對人體尿液中總鈣質/肌酸酐比例優於微米珍珠粉，於 2小時後明顯升高，顯示為較優良之珍珠粉

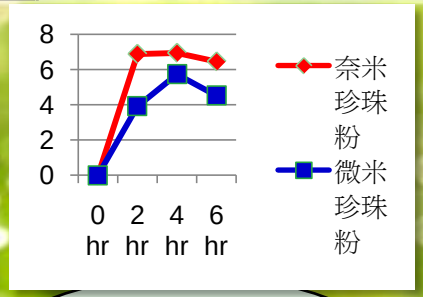
奈米珍珠粉可維持人體血液中穩定pH值

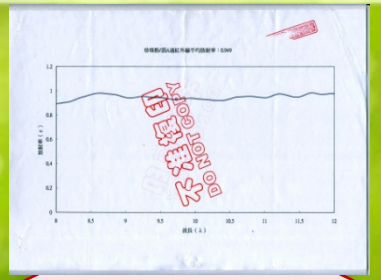
血液pH改變				
	0 hr	2 hr	4 hr	6 hr
奈米級	7.37	7.36	7.37	7.37
微米級	7.41	7.38	7.36	7.35



正常血液pH需維持穩定(pH 7.35~7.45)，攝取奈米珍珠粉維持人體血液中pH值的穩定，優於微米珍珠粉

新芳奈米珍珠粉功能介紹(選單)



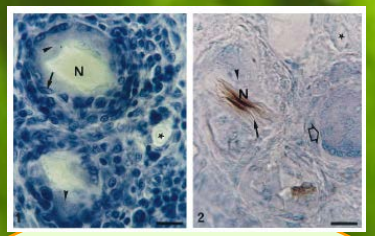


鈣質補充劑

遠紅外線材料
(放射生育光線)

新芳奈米
珍珠粉

天然胺基酸
補充劑



修復皮膚組織
(美容、傷口修復)

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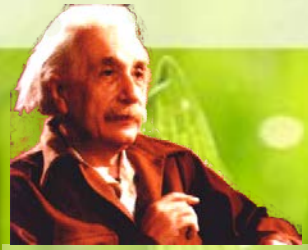
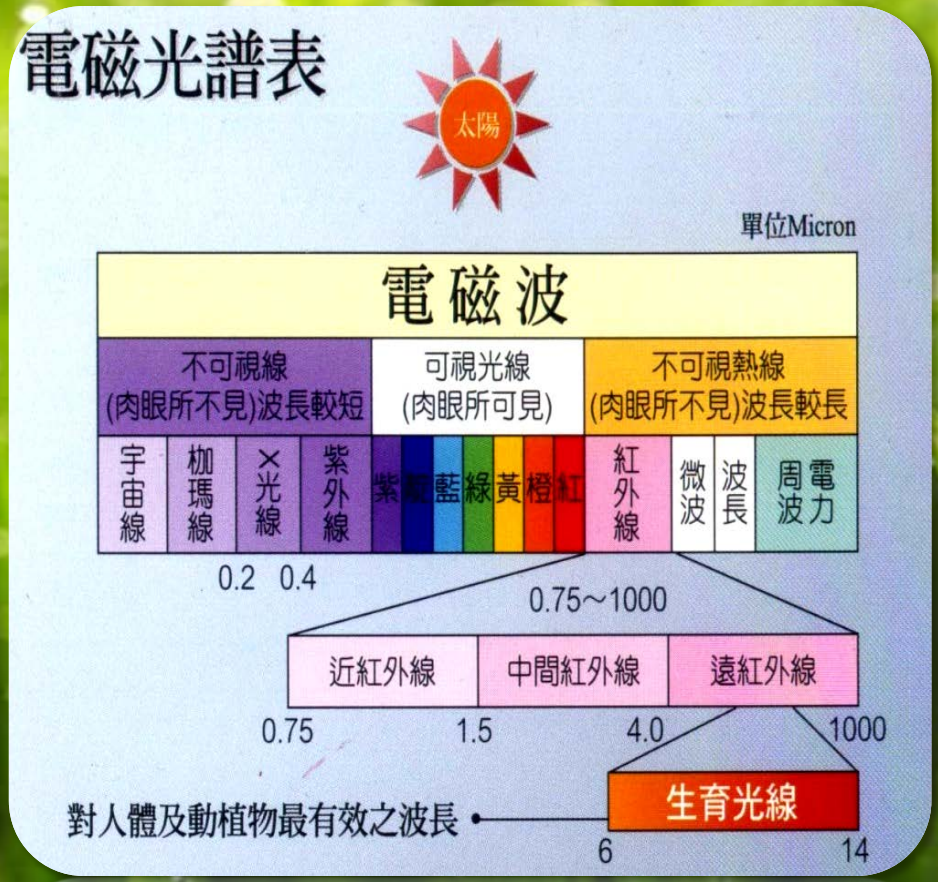
奈米珍珠粉與遠紅外線之關係

奈米珍珠粉釋放遠紅外線波長高達95%之生育光線，可促進細胞因子活化、修護、美白、抗衰老之功能。

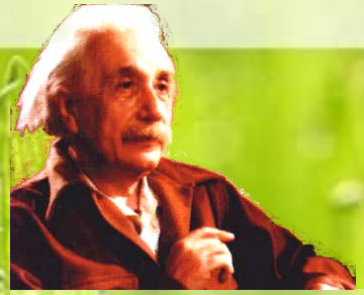




■紅光外側的光線是不可見光，其中90%的波長介乎8~14微米，能刺激細胞活化，促進動植物生長，所以亦被稱為生命光線，有益人體健康。

■波長由0.76~1000μm稱為紅外光，當中4~400μm的波長稱為遠紅外光

工研院遠紅線生育波長量測



遠紅外線之生育光線
(8至12μm)
達到0.949=94.9%放射率

生育光線波長對人體細胞活化、修護有很大的幫助。

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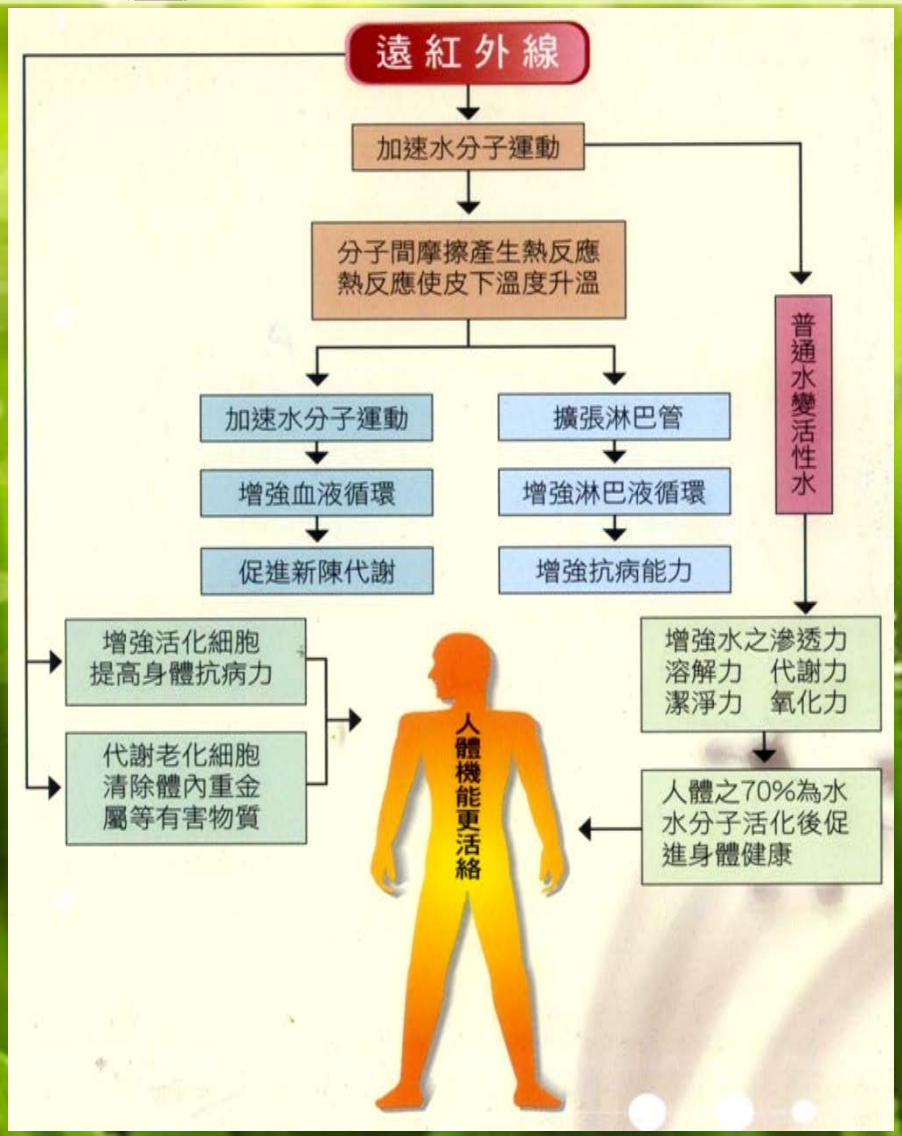


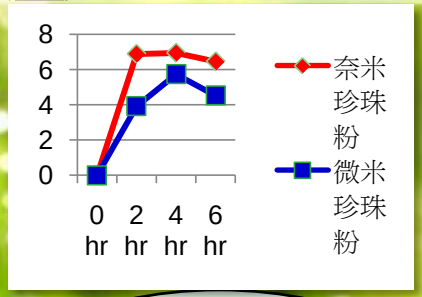
改善微循環系統

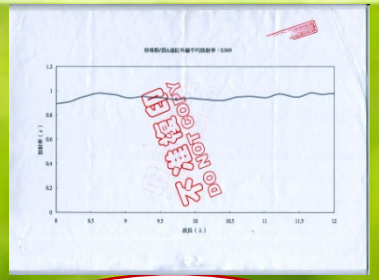
微絲血管的總長度可圍繞地球三周被稱為人體的第二個心臟。遠紅外線可自由出入細胞之間，轉化為熱能，令皮下深層的溫度微升，血流速度加快，微絲血管擴張，進而降低心臟的壓力，同時促進新陳代謝產生的廢物排出體外。若微循環系統出現毛病，包括高血壓、心血管疾病、腫瘤、關節炎、四肢冰冷麻痺等。成年人

促進新陳代謝

微循環系統若得到改善，新陳代謝產生的廢物便可迅速排出體外，減輕肝臟及腎臟的負擔。這些廢物包括引致癌症的重金屬；引致疲勞及老化的乳酸、游離脂肪酸和皮下脂肪；引致高血壓的鈾離子，以及引致疼痛的尿酸。

新芳奈米珍珠粉功能介紹(選單)

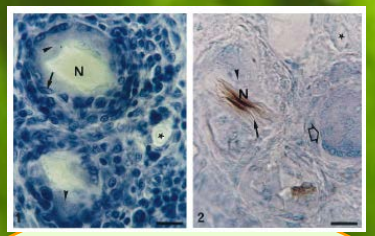




鈣質補充劑

遠紅外線材料
(放射生育光線)

新芳奈米
珍珠粉



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歡迎來電洽詢或蒞臨指教