健康議題講座
環境汙染-PM2.5

匯報人：大漢酵素生物科技股份有限公司

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- 大漢酵素廠廠長

專業證照

- 專業食品技師（國家級）
- 微生物食品釀造師

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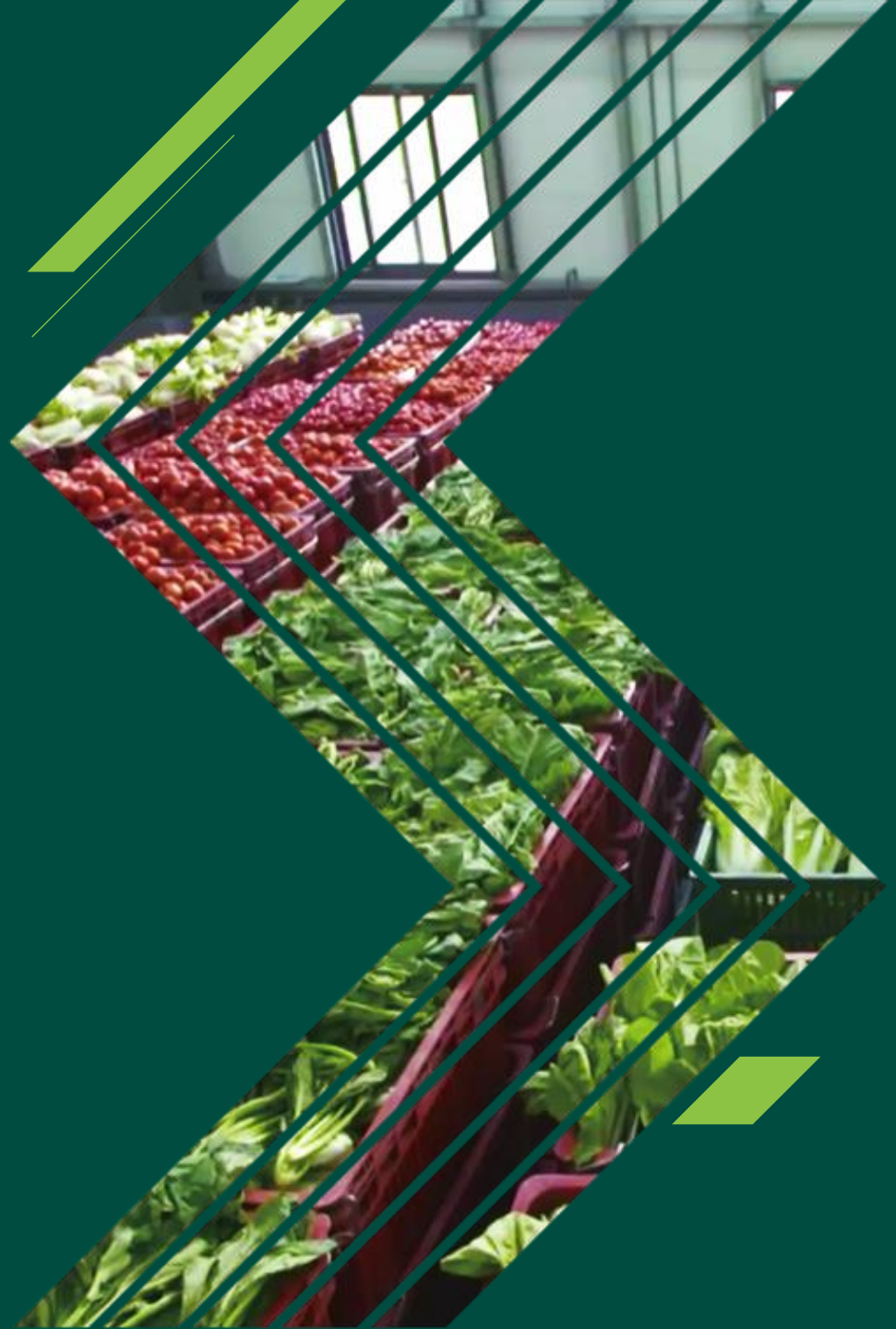


PART

1

何謂PM2.5

大家好，我是 PM2.5
雖然你們不認識我
但我存在於你們生活當中

粒徑<100μm

總懸浮微粒（TSP）

約為海灘沙粒，可懸浮於空氣中。

粒徑<10μm

懸浮微粒（PM_{10}）

約為沙子直徑的1/10，容易通過鼻腔鼻毛與彎道到達喉嚨。

粒徑<2.5μm

細懸浮微粒（$PM_{2.5}$）

約頭髮直徑的1/28，可穿透肺部氣泡，直接進入血管中隨著血液循環全身。

PM2.5的成因???

當地、跨區

- 其中以工業污染、汽機車排放、及營建業造成的污染為大宗。

境外傳輸

- 鄰近國家的空氣汙染物隨著大氣環流傳送至我國。
- 大陸霾害於冬季往往隨著東北季風及冷氣團南下影響台灣，也是我國秋冬季PM2.5濃度較高的原因之一。

其他汙染

- 社區汙染源，例如夜市燒烤油煙、民俗節慶活動燃燒金紙、燃放鞭炮等

小年夜
華視 CTS HD
台中17間廟
封爐
台中
減少空氣汙染 宮廟封爐不燒金紙
澎湖
0%
14-25
19:20:35
酒駕肇事
男涉酒駕高速行駛肇事 釀一死一傷

空汙造成的影響???

對大自然的危害

酸雨

- 由空氣中的水氣和汙染物混合而成。pH值小於5-6，會隨著風向破壞自然生態、生物體(動、植物)、建築物。

臭氧層破洞

- 漂浮在空氣中的化學氣體會破壞臭氧層。

溫室效應

- 許多汙染物質(如：二氧化碳)為溫室氣體，太多的溫室氣體會導致地球整體的氣候溫度升高，引發溫室效應。

對人體的危害

呼吸系統

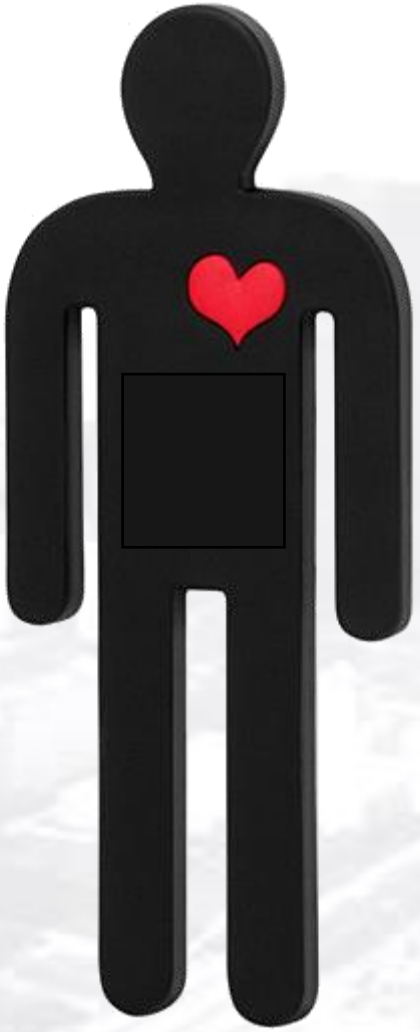
吸入的PM2.5 50%會堆積在肺泡，造成肺部纖維化進而導致肺癌。

容易導致其他呼吸道疾病如過敏。

血液循環系統

PM2.5 溶於血液後會造成血液系統毒性。

還會造成凝血異常以及血黏度增高風險。



神經系統

影響中樞神經退化，如阿茲海默症、巴金森氏症。

心血管系統

刺激肺內迷走神經系統，造成自主神經系統紊亂而涉及心臟。

其致癌物質會經由血液造成心臟受損。

生殖系統

15種致癌物造成胎盤毒性導致畸胎或發育遲緩。

卵巢癌死亡率相對提高。

Press Room

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IARC Concludes: Outdoor Air Pollution a Leading Environmental Cause of Cancer Deaths. Particulate Pollution also Classified as a Group I Carcinogen

Statement of the American Lung Association

WASHINGTON, D.C. (October 17, 2013)—The American Lung Association welcomes the conclusion announced today by the International Agency for Research on Cancer (IARC) that outdoor air pollution and particulate matter both cause cancer in humans, assigning these pollutants the strongest category of evidence. The IARC, an arm of the World Health Organization, concluded that outdoor air pollution is a leading environmental cause of lung cancer. Cancer is in the air, and it does not need to be.

This review by a multidisciplinary, international panel of experts concluded that the strength of the scientific evidence demonstrates that outdoor air pollution causes lung cancer deaths. The review looked at the latest studies conducted around the globe. Further this group of experts identified fine particles as a specific carcinogen.

The human toll is profound. They cited one 2010 study that estimated fine particles (PM2.5) contribute to 223,000 deaths from lung cancer worldwide.

According to the IARC, both outdoor air pollution and fine particulate matter meet the strongest standard evaluation, placing them in the Group 1 category. As they explained, the Group 1 category "is used when there is *sufficient evidence of carcinogenicity* in humans. Exceptionally, an agent may be placed in this category when evidence of carcinogenicity in humans is less than *sufficient* but there is *sufficient evidence of carcinogenicity* in experimental animals and strong evidence in exposed humans that the agent acts through a relevant mechanism of carcinogenicity."

Thanks to the Clean Air Act, the air quality in the United States has improved significantly over the past 40 years. However, too many people remain exposed to dangerous levels of cancer-causing air pollution and particulate matter. As a nation, we owe protection from lung cancer to our families, our children and our neighbors. The Clean Air Act provides the tools to clean up power plants, motor vehicles, and industrial processes, as well as the woodstoves used to heat homes.

Big polluters and their allies on Capitol Hill have tried time and again to dispute the science, even though these published studies have stood multiple, thorough, independent reviews. This IARC review is only the latest and most comprehensive.

The Lung Association hopes that this IARC review will end the debate about the need to clean up air pollution.

2013 年10月IARC 已將PM2.5公告為

一級致癌物質

ORIGINAL CONTRIBUTION

Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution

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Michael J. Thun, MD
Eugenia E. Calle, PhD
Daniel Krewski, PhD
Kazuhiko Ito, PhD
George D. Thurston, ScD

Context Associations have been found between day-to-day particulate air pollution and increased risk of various adverse health outcomes, including cardiopulmonary mortality. However, studies of health effects of long-term particulate air pollution have been less conclusive.

Objective To assess the relationship between long-term exposure to fine particulate air pollution and all-cause, lung cancer, and cardiopulmonary mortality.

Design, Setting, and Participants Vital status and cause of death data were collected by the American Cancer Society as part of the Cancer Prevention II study, an ongoing prospective mortality study, which enrolled approximately 1.2 million adults in 1982. Participants completed a questionnaire detailing individual risk factor data (age, sex, race, weight, height, smoking history, education, marital status, diet, alcohol consumption, and occupational exposures). The risk factor data for approximately 500 000 adults were linked with air pollution data for metropolitan areas throughout the United States and combined with vital status and cause of death data through December 31, 1998.

Main Outcome Measure All-cause, lung cancer, and cardiopulmonary mortality.

Results Fine particulate and sulfur oxide–related pollution were associated with all-cause, lung cancer, and cardiopulmonary mortality. Each 10-μg/m³ elevation in fine particulate air pollution was associated with approximately a 4%, 6%, and 8% increased risk of all-cause, cardiopulmonary, and lung cancer mortality, respectively. Measures of coarse particle fraction and total suspended particles were not consistently associated with mortality.

Conclusion Long-term exposure to combustion-related fine particulate air pollution is an important environmental risk factor for cardiopulmonary and lung cancer mortality.

JAMA. 2002;287:1132-1141 www.jama.com

Based on several severe air pollution events,[1-3] a temporal correlation between extremely high concentrations of particulate and sulfur oxide air pollution and acute increases in mortality was well established by the 1970s. Subsequently, epidemiological studies published between 1989 and 1996 reported health effects at unexpectedly low concentrations of particulate air pollution.[4] The convergence of data from these studies, while controversial,[5] prompted serious reconsideration of standards and health guidelines[6-10] and led to a long-term research program designed to analyze health-related effects due to particulate pollution.[11-15] In 1997, the Environmental Protection Agency adopted new ambient air quality standards that would impose regulatory limits on fine particles measuring less than 2.5 μm in diameter ($PM_{2.5}$). These new standards were challenged by industry groups, blocked by a federal appeals court, but ultimately upheld by the US Supreme Court.[16]

Although most of the recent epidemiological research has focused on effects of short-term exposures, several studies suggest that long-term exposure may be more important in terms of overall public health.[4] The new standards for long-term exposure to $PM_{2.5}$ were originally based primarily on 2 prospective cohort studies,[18,19] which evaluated the effects of long-term pollution exposure on mortality. Both of these studies have been subjected to much scrutiny,[5] including an extensive independent audit and reanalysis of the original data.[17] The larger of these 2 studies linked individual risk factor and vital status data with national ambient air pollution data.[18] Our analysis uses data from the larger study and

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Downloaded from www.jama.com on January 17, 2008

Each 10-μg/m³ elevation in fine particulate air

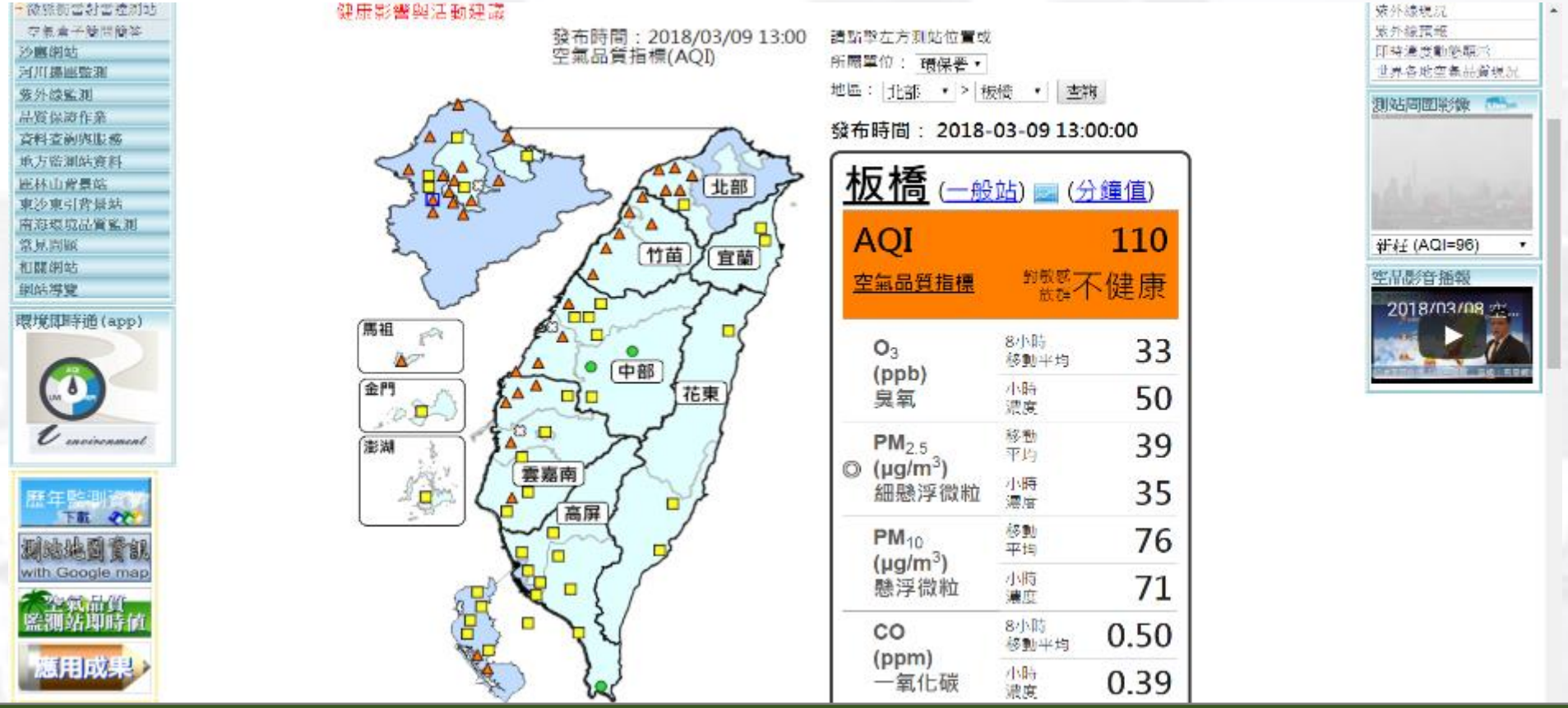
10微克/立方米 ↑ 6% 心血管死亡率

10微克/立方米 ↑ 8% 肺癌死亡率

cancer mortality, and others respectively.

關心預報

空氣品質監測網 → 即時細懸浮微粒指標 → 點選自家區域



了解指標

警報值 7-9 (紅燈區)

PM2.5濃度70(μg/m3)以下

一般民眾：若出現癢、咳嗽、喉嚨痛症狀，應減少戶外活動

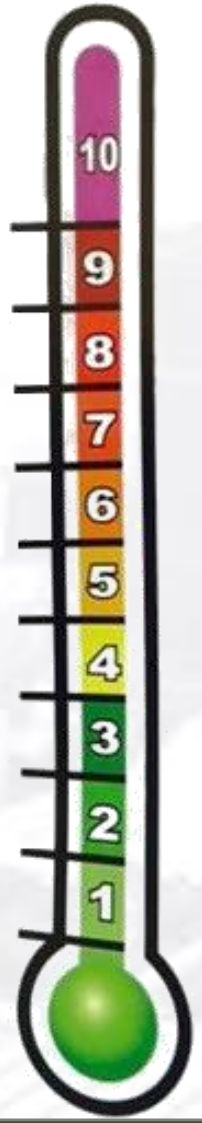
敏感族群：避免外出，並隨時注意身體狀況

警報值 1-3 (綠燈區)

PM2.5濃度35(μg/m3)以下

一般民眾：正常活動

敏感族群：正常活動



警報值 10 (紫燈區)

PM2.5濃度71(μg/m3)以上

一般民眾：不要出門

敏感族群：不出門，備好藥物預防急性發作

警報值 4-6 (黃燈區)

PM2.5濃度53(μg/m3)以下

一般民眾：正常活動

敏感族群：避免外出，並隨時注意身體狀況

歷史空汙事件

1940年美國洛杉磯光化學煙霧事件

- 因城市汽機車與工業大量排放廢氣，夏季晴朗的日子，城市上空就會出現淺藍色煙霧，使人眼睛發紅、喉嚨疼痛、呼吸困難、頭昏、頭痛，導致大量市民患上紅眼病，超過400名老人因呼吸系統衰竭死亡。

1952年英國倫敦煙霧事件

- 冬季取暖燃煤和工業排放的煙霧是元兇。12月持續多日的無風，加上不斷排放的煙霧，使倫敦上空大氣中煙塵濃度比平時高10倍，能見度極低，各醫院大量湧入之氣管炎、肺炎、心血管疾病重症患者，整起事件合計死亡人數超過12,000人。

歷史空汙事件

2013年中國霾害事件

- 中國大陸因高速經濟發展，導致空氣汙染物大量排放，在靜穩天氣型態下，汙染物累積，造成嚴重霾害。當年1月霾害影響境內1/7國土，鄰近國家如：日本、韓國、台灣等均受影響。

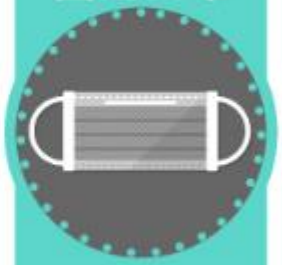
2013年東南亞霾害事件

- 東南亞霾害主因印尼農民常以火大面積的燒芭(火耕)方式清理農地。大量的煙塵隨季風飄散，危害當地民眾健康，造成龐大經濟損失，鄰近新加坡、馬來西亞等東南亞國家皆受波及。

防護三要點???

1.善用口罩保護健康

若口罩選錯、用錯、戴錯了，
其實「完全沒有用，等於白忙一場。」

	N95（美規）	FFP1（歐規）	醫用口罩	活性炭口罩
				
作用	過濾懸浮微粒	過濾懸浮微粒	防止醫療人員飛沫沾到病人	吸附揮發性有機物及口臭
PM2.5防護力	95%以上	80%以上	30%-70%	30%
優點	密合度高阻隔力強	密合度、阻隔力，舒適感介於N95與醫用口罩之間	舒適感較佳價格不高	降低異味價格不高
缺點	可能產生呼吸困難頭暈價格較高	價格較高購買管道少	密合度阻隔力較弱	密合度阻隔力較弱

2.待在室內護健康

- 可搭配空效率過濾網(HEPA)空氣清淨機來淨化空氣 。
- 若家中有燒香拜拜，可考慮減少次數或打開門窗，並搭配抽風設備，增加通風。

3.自我管理好健康

- 呼吸道疾病與心血管疾病患者，隨身攜帶藥物，避免症狀加重。一但有不適應立即就醫。
- 保持良好生活習慣，多喝水、均衡飲食並適當運動，提升自我免疫力。

排毒新星-硫代葡萄糖苷化合物

十字花科蔬菜為常見食用蔬菜，包含高麗菜、青花菜、花椰菜、甘藍等，葉序呈現放射十字狀，許多研究證實十字花科具有良好的抗癌活性，主要因其含有豐富**硫代葡萄糖苷化合物**。

十字花科除含葉綠素A、葉綠素D、葉黃素及胡蘿蔔素外，還含有硫代葡萄糖苷化合物，如**蘿蔔硫素**(Sulforaphane)及芥子苷(Sinigrin)，原為植物當中的植化素，但易受溫度破壞，以傳統烹調方式並不易於攝取。

蘿蔔硫素排出PM2.5研究

Cancer Prevention Research

Research Article

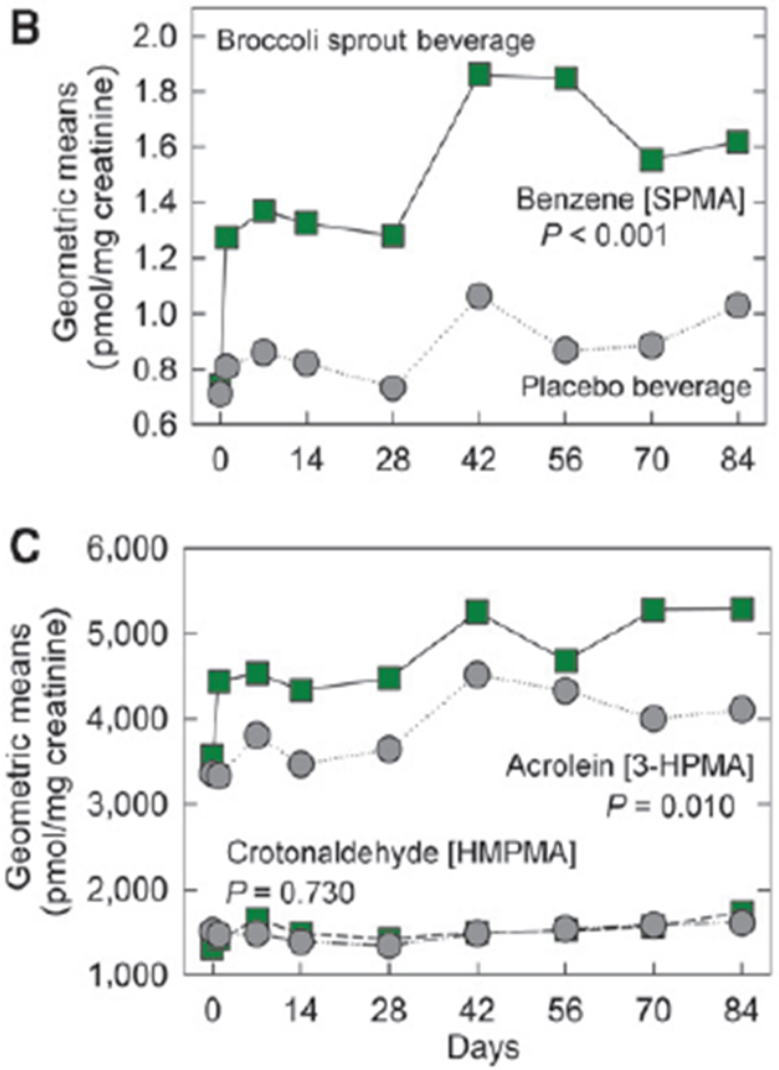
Rapid and Sustainable Detoxication of Airborne Pollutants by Broccoli Sprout Beverage: Results of a Randomized Clinical Trial in China

Patricia A. Egner[1], Jian-Guo Chen[6], Adam T. Zarth[4], Derek K. Ng[2], Jin-Bing Wang[6], Kevin H. Kensler[1], Lisa P. Jacobson[2], Alvaro Muñoz[2], Jamie L. Johnson[1], John D. Groopman[1], Jed W. Fahey[3], Paul Talalay[3], Jian Zhu[6], Tao-Yang Chen[6], Geng-Sun Qian[6], Steven G. Carmella[4], Stephen S. Hecht[4], and Thomas W. Kensler[1,3,5]

SPMA、3-HPMA、HMPMA

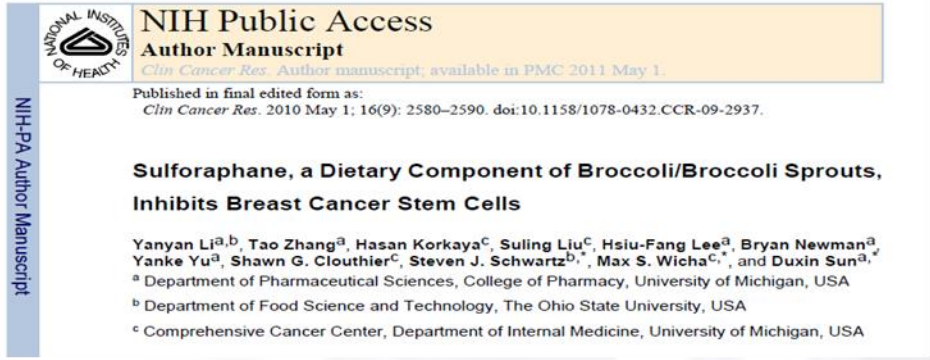
為空氣污染產物(苯酚類)

為使用蘿蔔硫素組



- 蘿蔔硫素能協助人體藉由尿液排出汙染物。

硫代葡萄糖苷對抗乳癌功效


NIH Public Access
Author Manuscript
Clin Cancer Res. Author manuscript; available in PMC 2011 May 1.

Published in final edited form as:
Clin Cancer Res. 2010 May 1; 16(9): 2580–2590. doi:10.1158/1078-0432.CCR-09-2937.

Sulforaphane, a Dietary Component of Broccoli/Broccoli Sprouts, Inhibits Breast Cancer Stem Cells

Yanyan Li[a,b], Tao Zhang[a], Hasan Korkaya[c], Suling Liu[c], Hsiu-Fang Lee[a], Bryan Newman[a], Yanke Yu[a], Shawn G. Clouthier[c], Steven J. Schwartz[b,*], Max S. Wicha[c,*], and Duxin Sun[a,*]

[a] Department of Pharmaceutical Sciences, College of Pharmacy, University of Michigan, USA
[b] Department of Food Science and Technology, The Ohio State University, USA
[c] Comprehensive Cancer Center, Department of Internal Medicine, University of Michigan, USA

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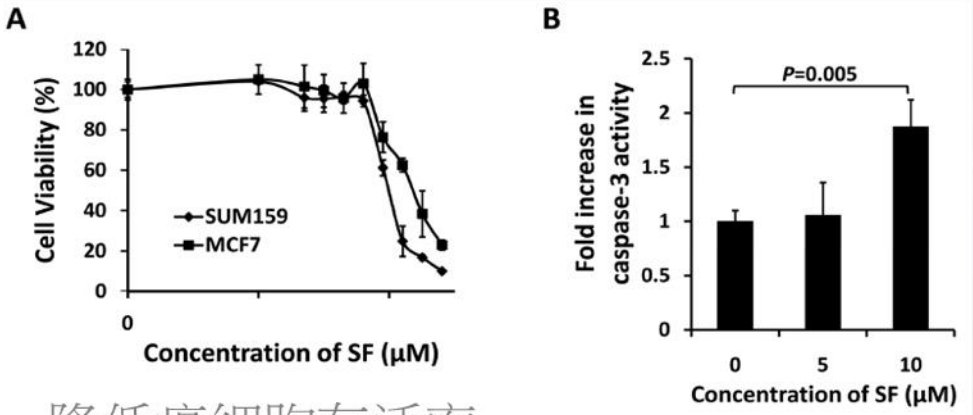
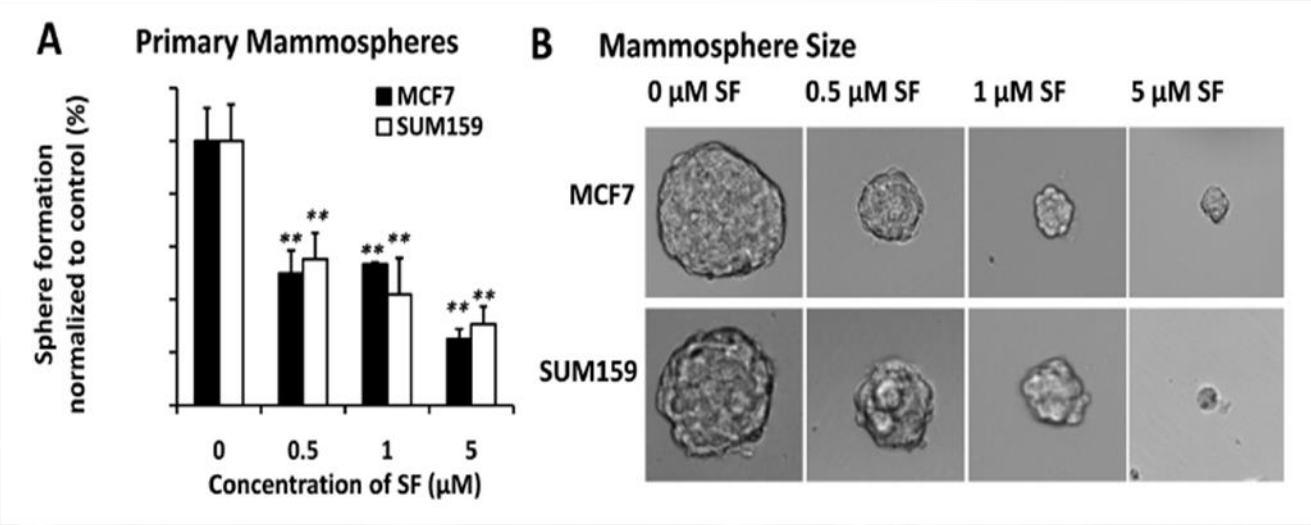


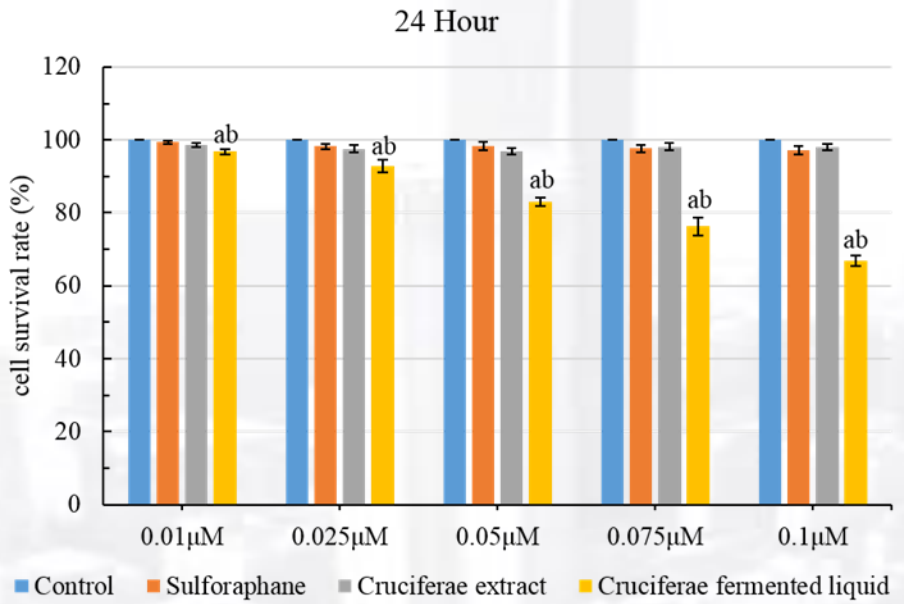
降低癌細胞存活率　促進癌細胞凋亡作用



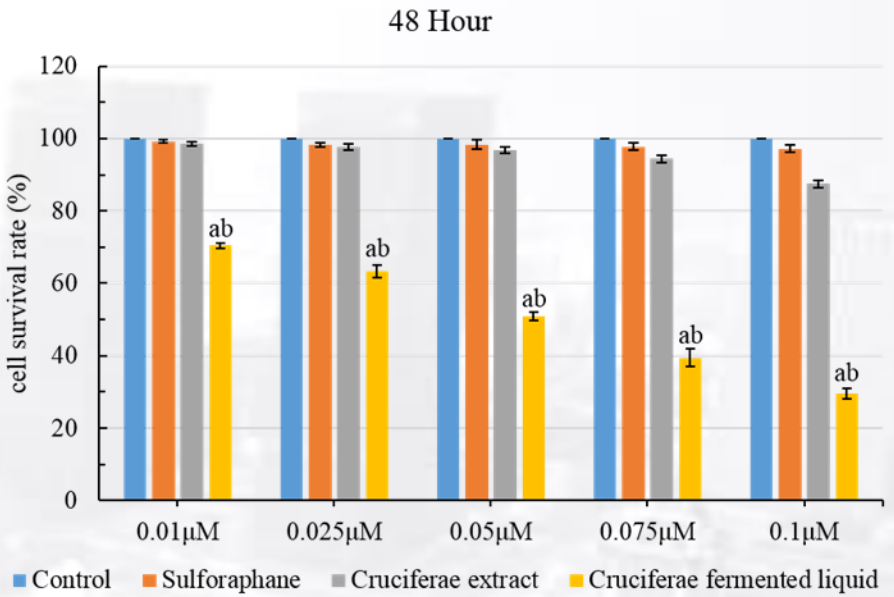
縮小腫瘤細胞大小

- 蘿蔔硫素對乳癌細胞具有毒殺作用。
- 蘿蔔硫素對乳癌腫瘤具有抑制效果，預防腫瘤擴散。

硫苷化合物抑制結腸癌細胞



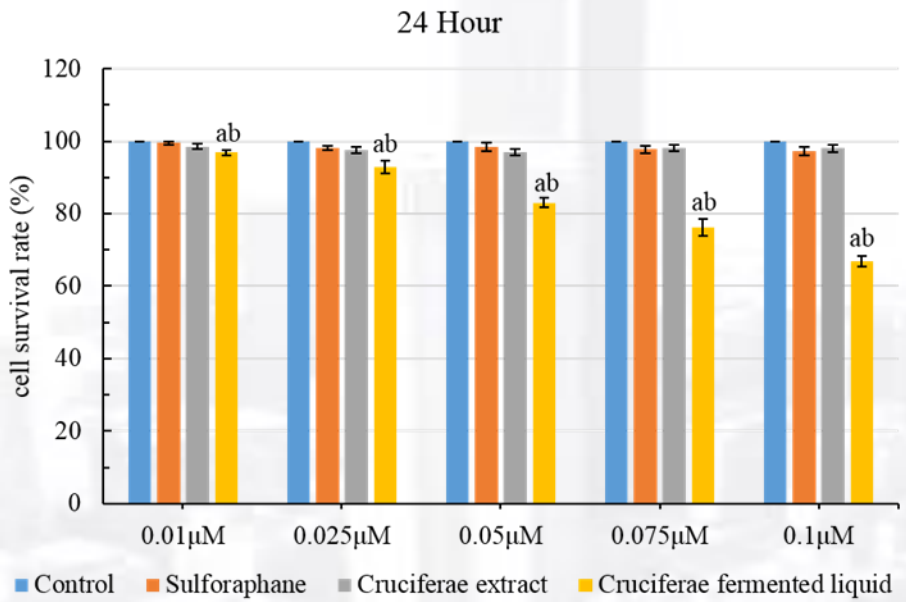
Valuse are expressed as mean±SD, a, p<0.05 indicates a significant difference compared with Sulforaphane；b, p<0.05 indicates a significant difference compared with Ceuciferae extract.



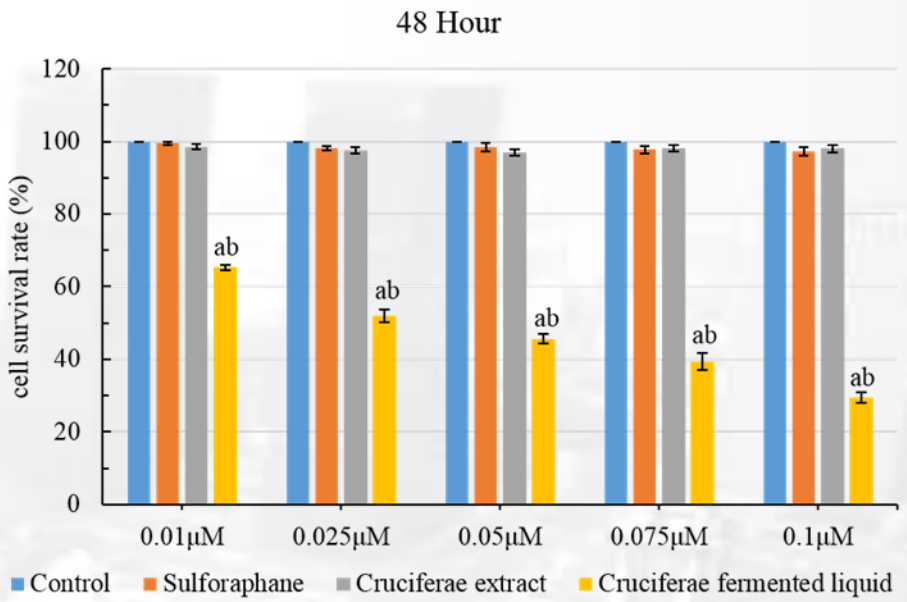
Valuse are expressed as mean±SD, a, p<0.05 indicates a significant difference compared with Sulforaphane；b, p<0.05 indicates a significant difference compared with Ceuciferae extract.

IC_{50}轉換人體用量:
硫代葡萄糖苷=3.1mg/70kg/day
醱酵液使用量=0.01ml

硫苷化合物抑制肝癌細胞



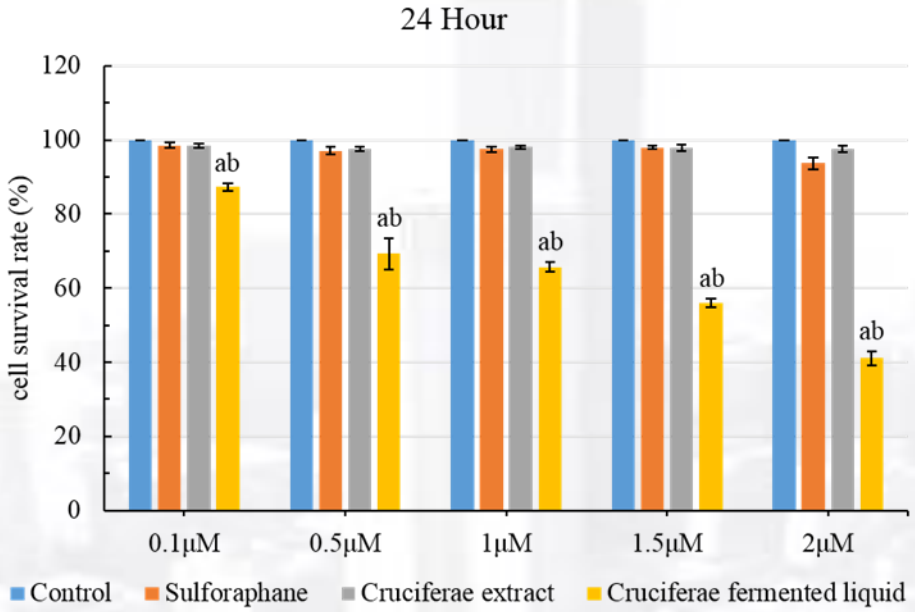
Valuse are expressed as mean±SD, a, p<0.05 indicates a significant difference compared with Sulforaphane；b, p<0.05 indicates a significant difference compared with Ceuciferae extract.



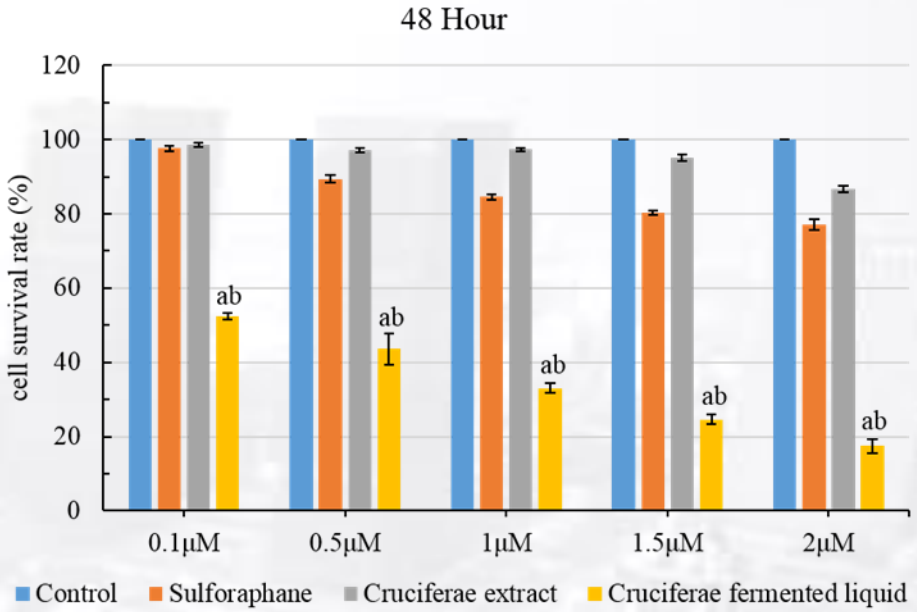
Valuse are expressed as mean±SD, a, p<0.05 indicates a significant difference compared with Sulforaphane；b, p<0.05 indicates a significant difference compared with Ceuciferae extract.

IC_{50}轉換人體用量:
硫代葡萄糖苷=2.42mg/70kg/day
醱酵液使用量=0.008ml

硫苷化合物抑制乳癌細胞



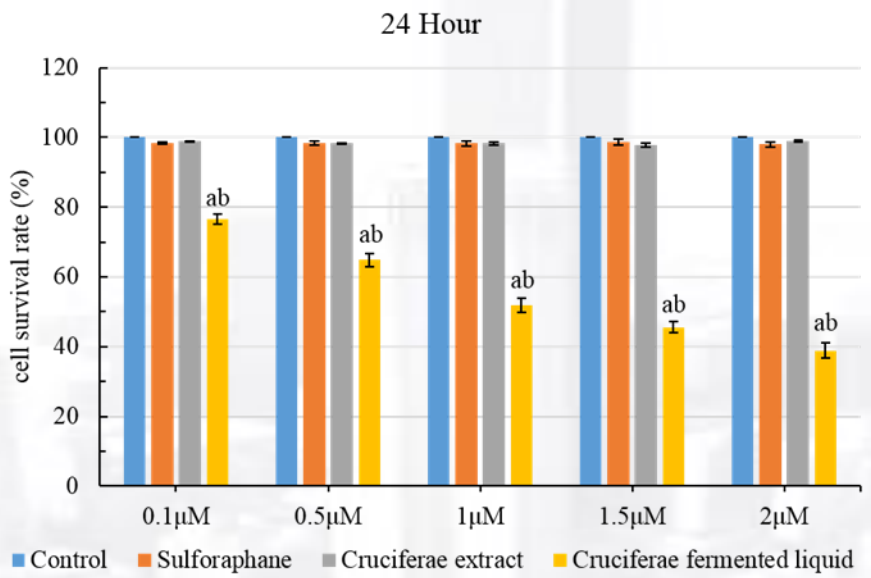
Valuse are expressed as mean±SD, a, p<0.05 indicates a significant difference compared with Sulforaphane；b, p<0.05 indicates a significant difference compared with Ceuciferae extract.



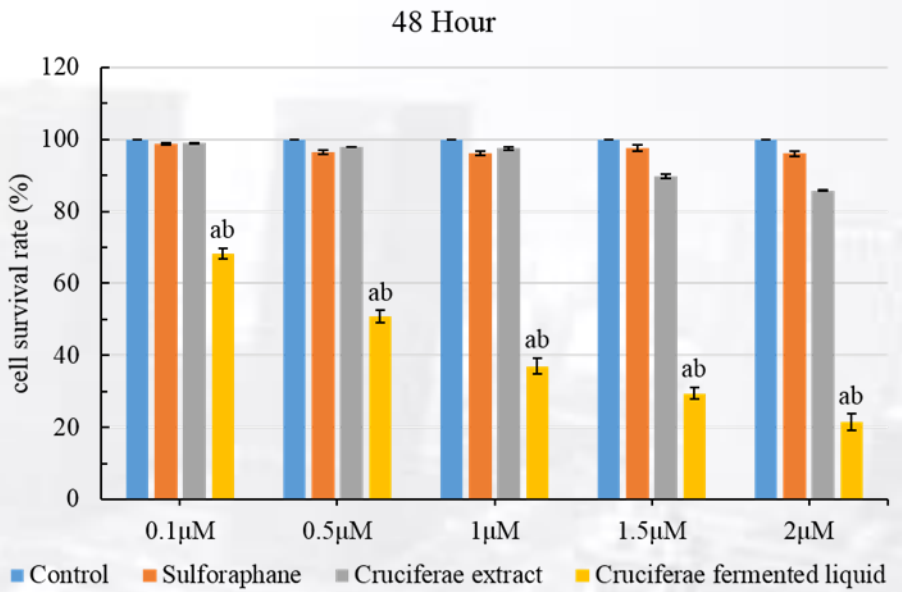
Valuse are expressed as mean±SD, a, p<0.05 indicates a significant difference compared with Sulforaphane；b, p<0.05 indicates a significant difference compared with Ceuciferae extract.

IC_{50}轉換人體用量:
硫代葡萄糖苷=12.4mg/70kg/day
醱酵液使用量=0.04ml
蘿蔔硫素=302.7mg/70kg/day

硫苷化合物抑制肺腺癌細胞



Valuse are expressed as mean±SD, a, $p<0.05$ indicates a significant difference compared with Sulforaphane；b, $p<0.05$ indicates a significant difference compared with Ceuciferae extract.



Valuse are expressed as mean±SD, a, $p<0.05$ indicates a significant difference compared with Sulforaphane；b, $p<0.05$ indicates a significant difference compared with Ceuciferae extract.

IC_{50}轉換人體用量:
硫代葡萄糖苷=38.8mg/70kg/day
醱酵液使用量=0.127ml
蘿蔔硫素=0.413ml/70kg/day

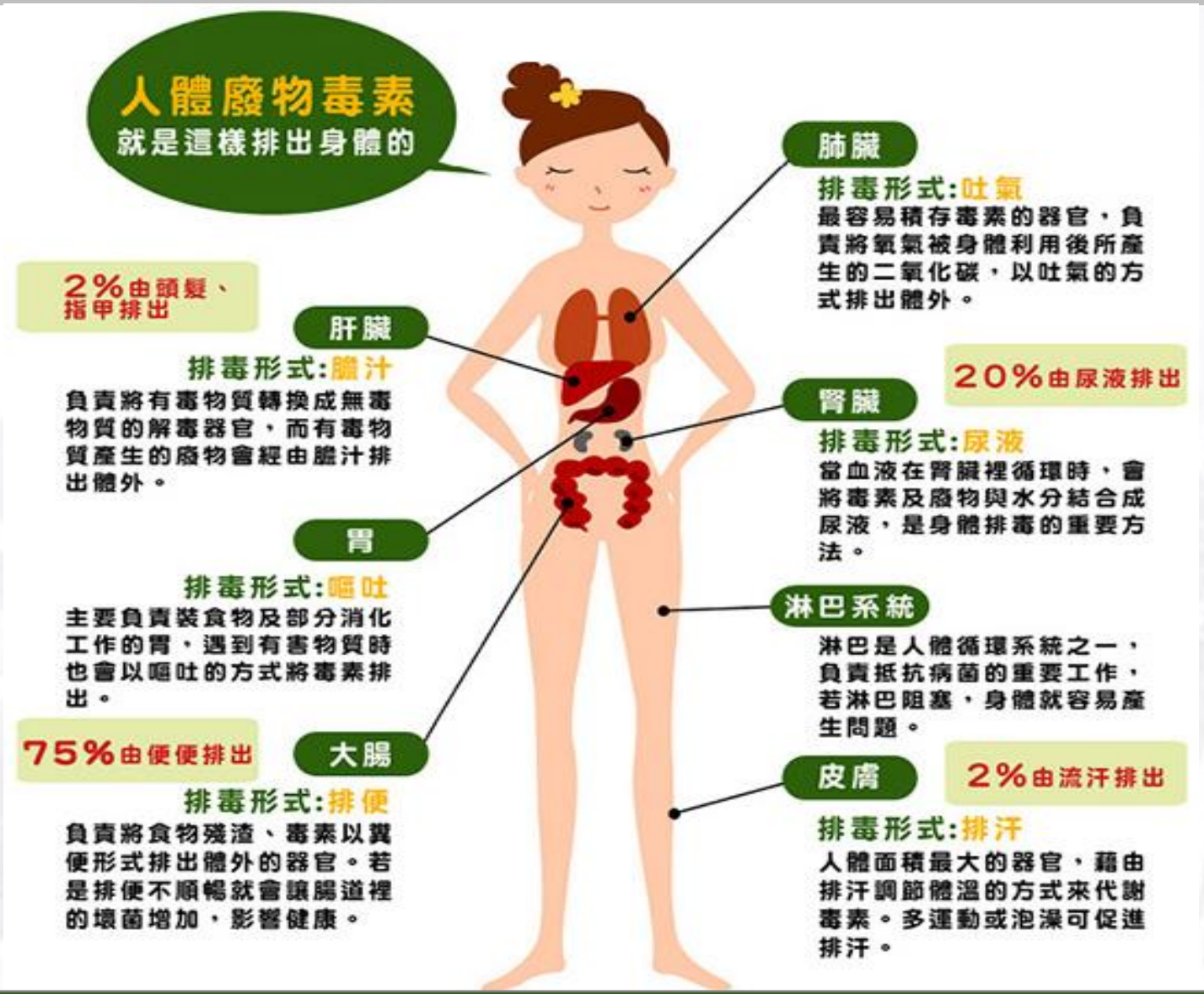
PART

2

排毒的重要性

環境中還有哪些毒素?

毒素
來源
體內
代謝物
情緒
壓力
環境
汙染
日用品
化學毒
化妝品
化學毒
藥物
藥毒
食品
添加物

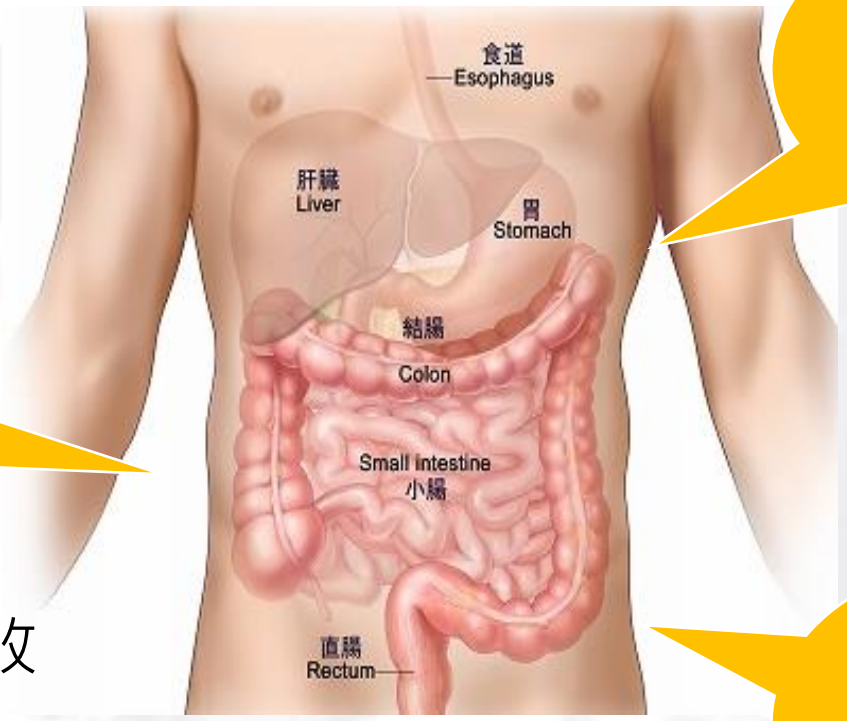

人體廢物毒素
就是這樣排出身體的
肺臟
排毒形式:吐氣
最容易積存毒素的器官，負責將氧氣被身體利用後所產生的二氧化碳，以吐氣的方式排出體外。
2%由頭髮、指甲排出
肝臟
排毒形式:膽汁
負責將有毒物質轉換成無毒物質的解毒器官，而有毒物質產生的廢物會經由膽汁排出體外。
20%由尿液排出
腎臟
排毒形式:尿液
當血液在腎臟裡循環時，會將毒素及廢物與水分結合成尿液，是身體排毒的重要方法。
胃
排毒形式:嘔吐
主要負責裝食物及部分消化工作的胃，遇到有害物質時也會以嘔吐的方式將毒素排出。
淋巴系統
淋巴是人體循環系統之一，負責抵抗病菌的重要工作，若淋巴阻塞，身體就容易產生問題。
75%由便便排出
大腸
排毒形式:排便
負責將食物殘渣、毒素以糞便形式排出體外的器官。若是排便不順暢就會讓腸道裡的壞菌增加，影響健康。
皮膚
2%由流汗排出
排毒形式:排汗
人體面積最大的器官，藉由排汗調節體溫的方式來代謝毒素。多運動或泡澡可促進排汗。

最大的
免疫器官

70% 免疫力來自腸道

最大的
加油站

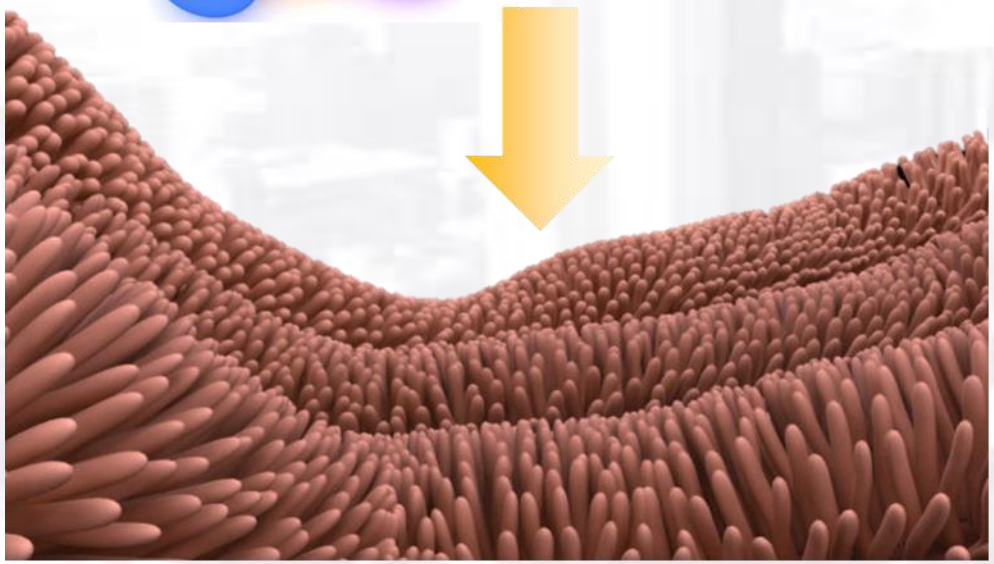
99% 營養需要腸道吸收



最大的
排汙廠

75% 毒素靠腸道排出

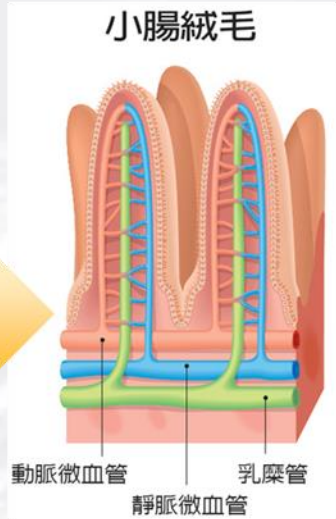
最大加油站



表面積260平方公尺，超過半個籃球場面積

圖示說明

- 腸道佈滿絨毛，表面積約為260平方公尺，面積超過半個籃球場。
- 腸道絨毛作用為營養吸收。
- 表面積大代表接觸的病原、過敏原、有害物質多。
- 絨毛內佈滿血管，協助養份運輸全身。

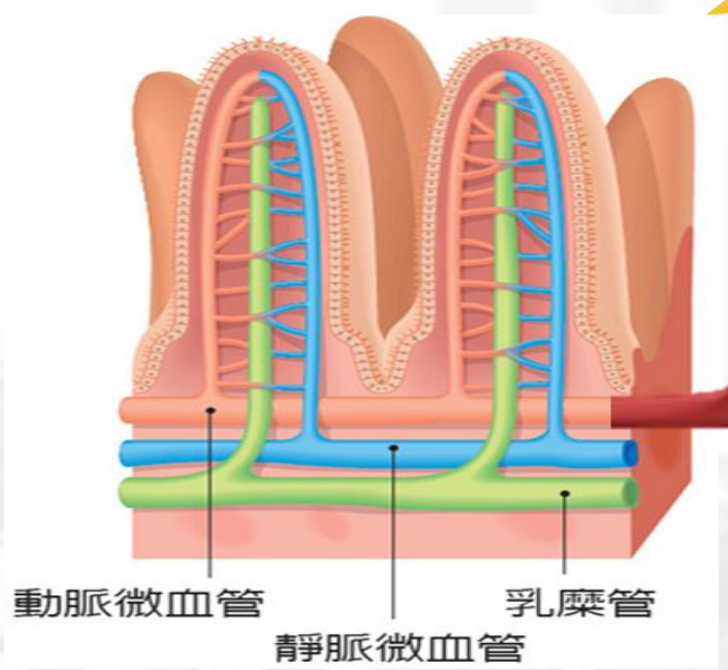


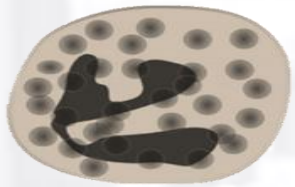
最大免疫器官

提升免疫

圖示說明

- 腸道絨毛微血管內含有多種免疫細胞。
- 吸收營養源提升免疫細胞，增加免疫力。
- 經由血液運輸清除體內病原、過敏原、有害外來物。

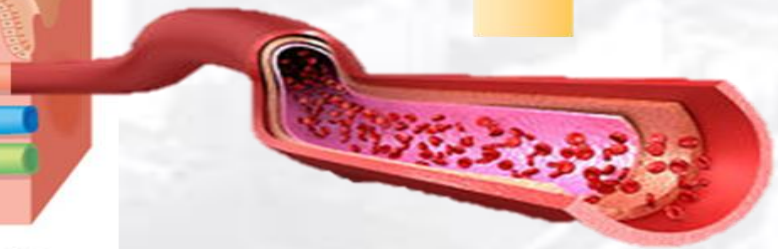




巨噬細胞

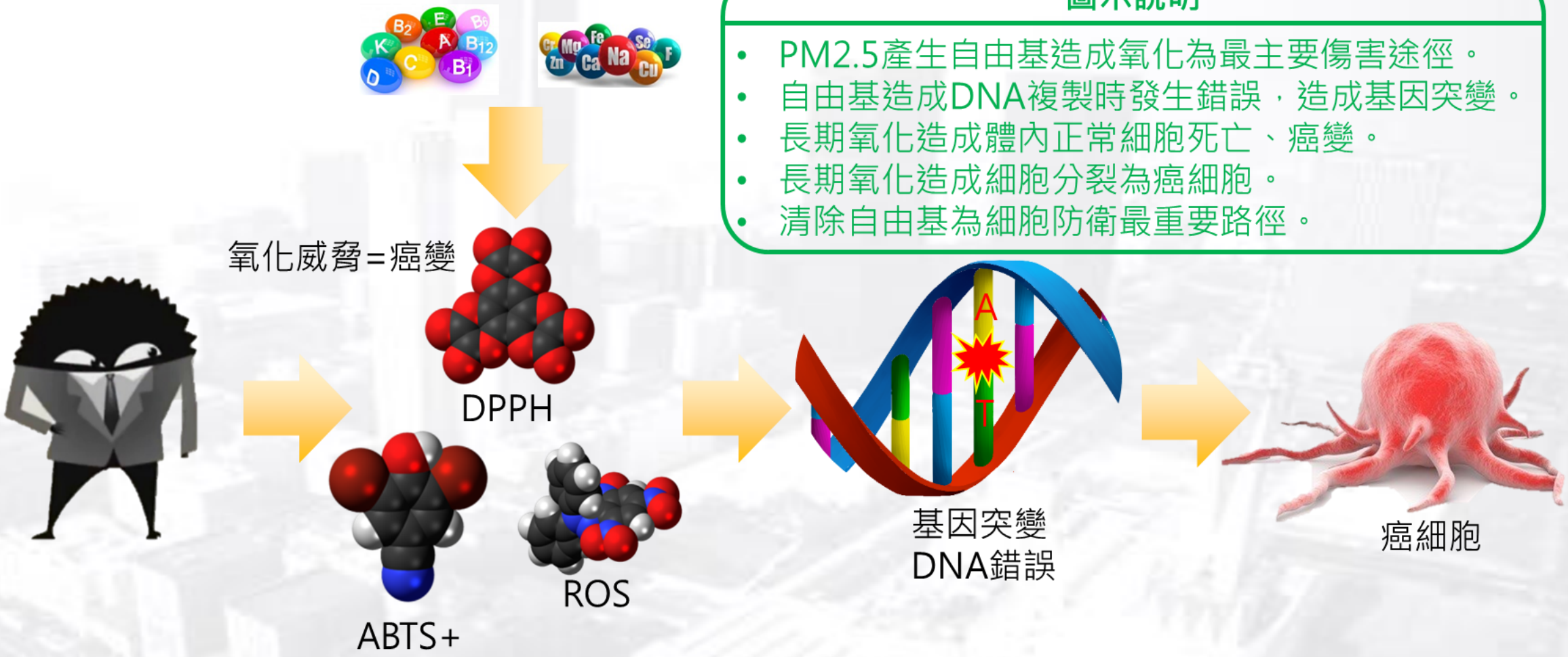
嗜中性白血球

胞吞作用



70%免疫細胞存在腸道

最大排毒廠



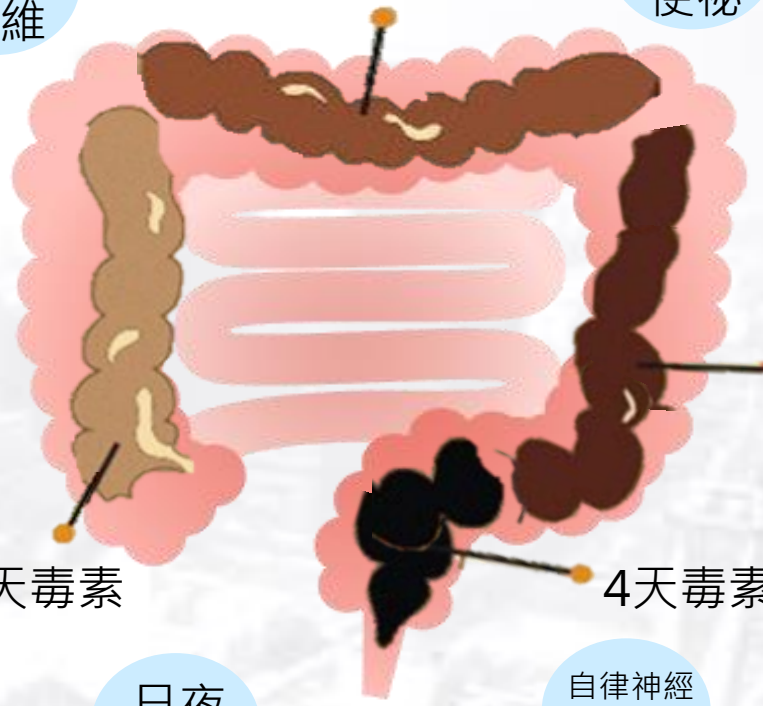
圖示說明

- PM2.5產生自由基造成氧化為最主要傷害途徑。
- 自由基造成DNA複製時發生錯誤，造成基因突變。
- 長期氧化造成體內正常細胞死亡、癌變。
- 長期氧化造成細胞分裂為癌細胞。
- 清除自由基為細胞防衛最重要路徑。

宿便的形成

知識小百科

- 小腸平均6公尺
- 大腸平均1.5公尺
- 直腸平均0.3公尺
- 腸子的長度約身高的3-4倍



食量小
外食族
缺乏纖維
慣性便祕
作息不良
偏食
蠕動慢
長期減重
夜貓族
容易緊張
壓力大
營養不良
日夜顛倒
自律神經失調
體質虛弱
銀髮族

毒素沉积
沉積腦部
記憶力下降
腦血栓
腦癌
沉積肺臟
肺炎
肺纖維化
肺癌
沉積心臟
心肌梗塞
冠心病
心律不整
沉積胰臟
糖尿病
肥胖
胰腺癌
沉積肝臟
脂肪肝
肝硬化
肝癌
沉積腎臟
腎炎
腎結石
尿毒症
沉積腸胃
胃潰瘍
便祕
腸癌
沉積生殖系統
子宮頸癌
卵巢癌
攝護腺癌
沉積神經
反應遲緩
暴躁易怒
失眠
沉積血管
高血壓
高血脂
動脈硬化
沉積肌肉
肌肉痠痛
沉積骨骼
痛風
退化性關節炎
骨質疏鬆

PART

3

健康體態維持

蔬果攝取↓

蛋白質↑

熱量↑

維生素↓

植化素↓

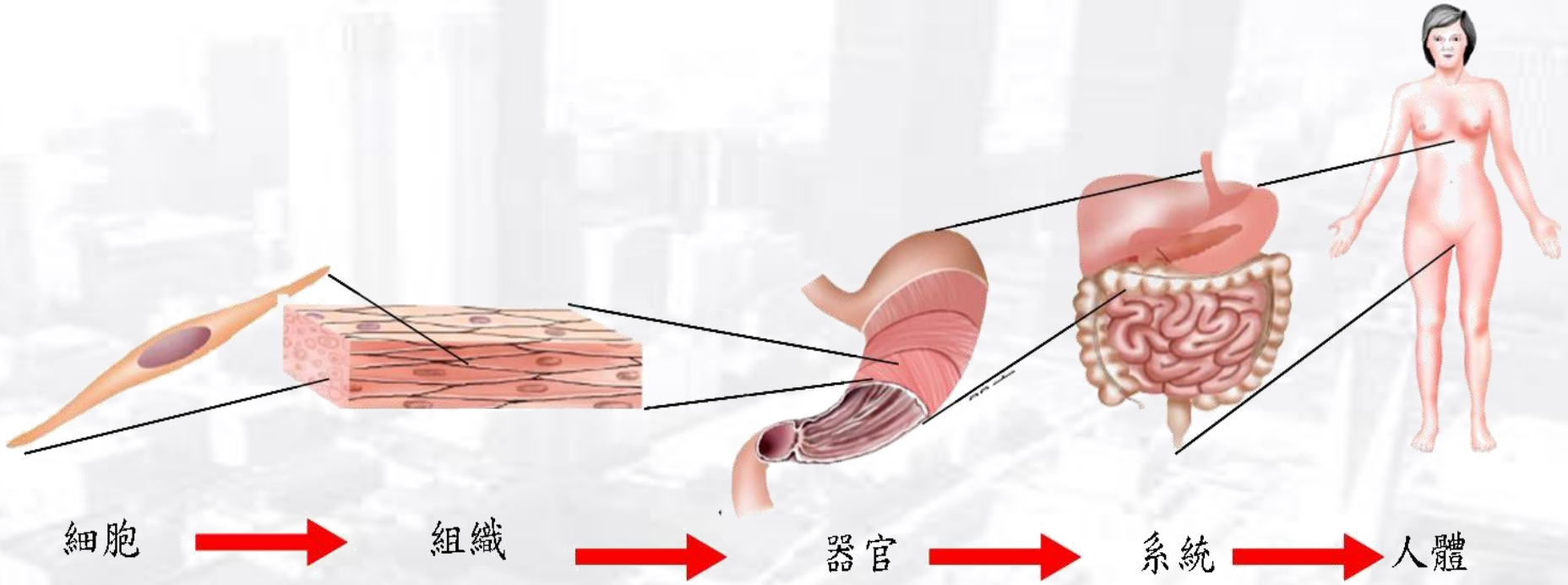
精緻澱粉↑

礦物質↓

脂質↑

膳食纖維↓

營養分子長期缺失，會造成細胞出現代謝障礙，進而引發疾病的發生。



人體結構層次圖

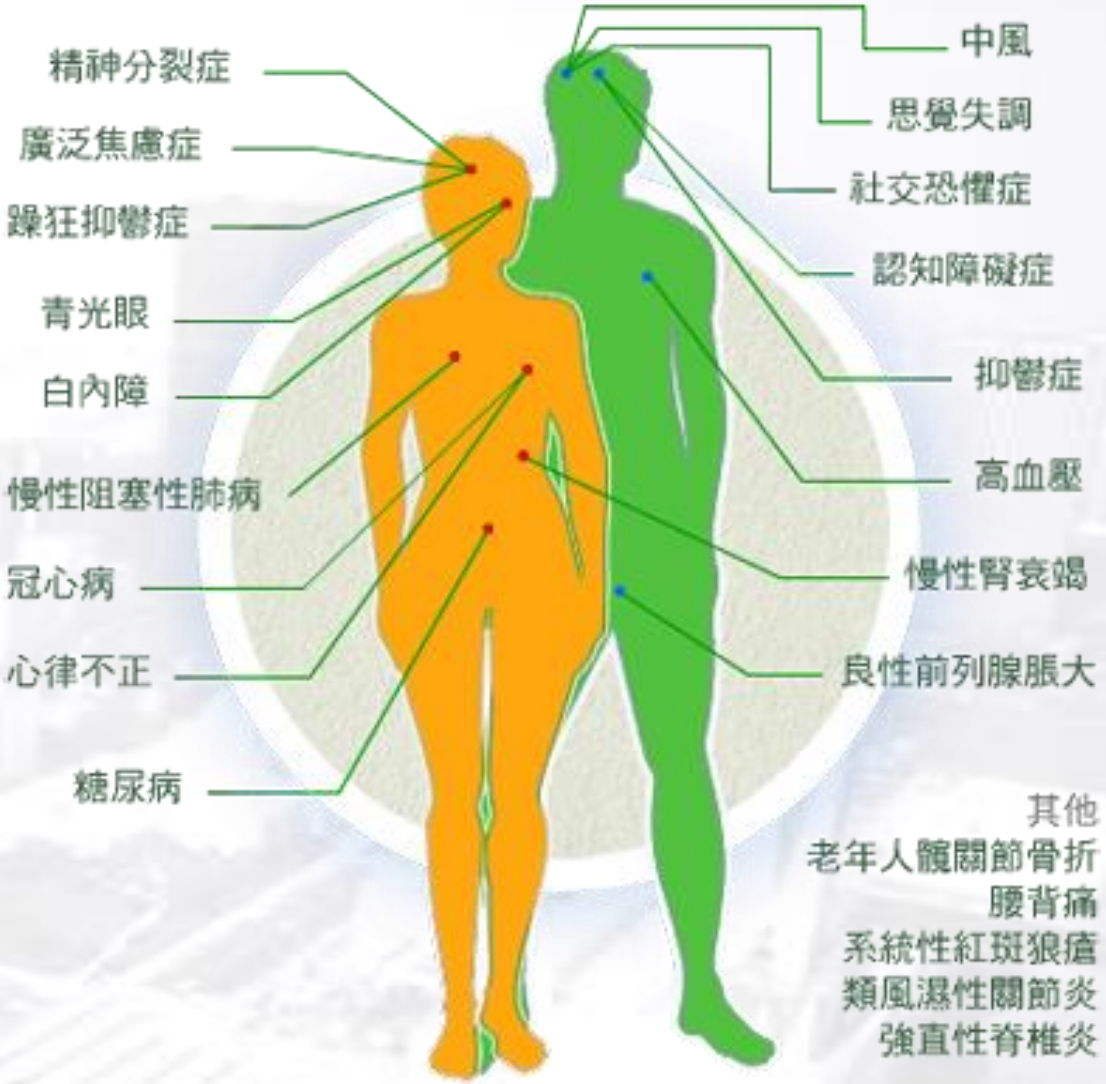
營養不均衡

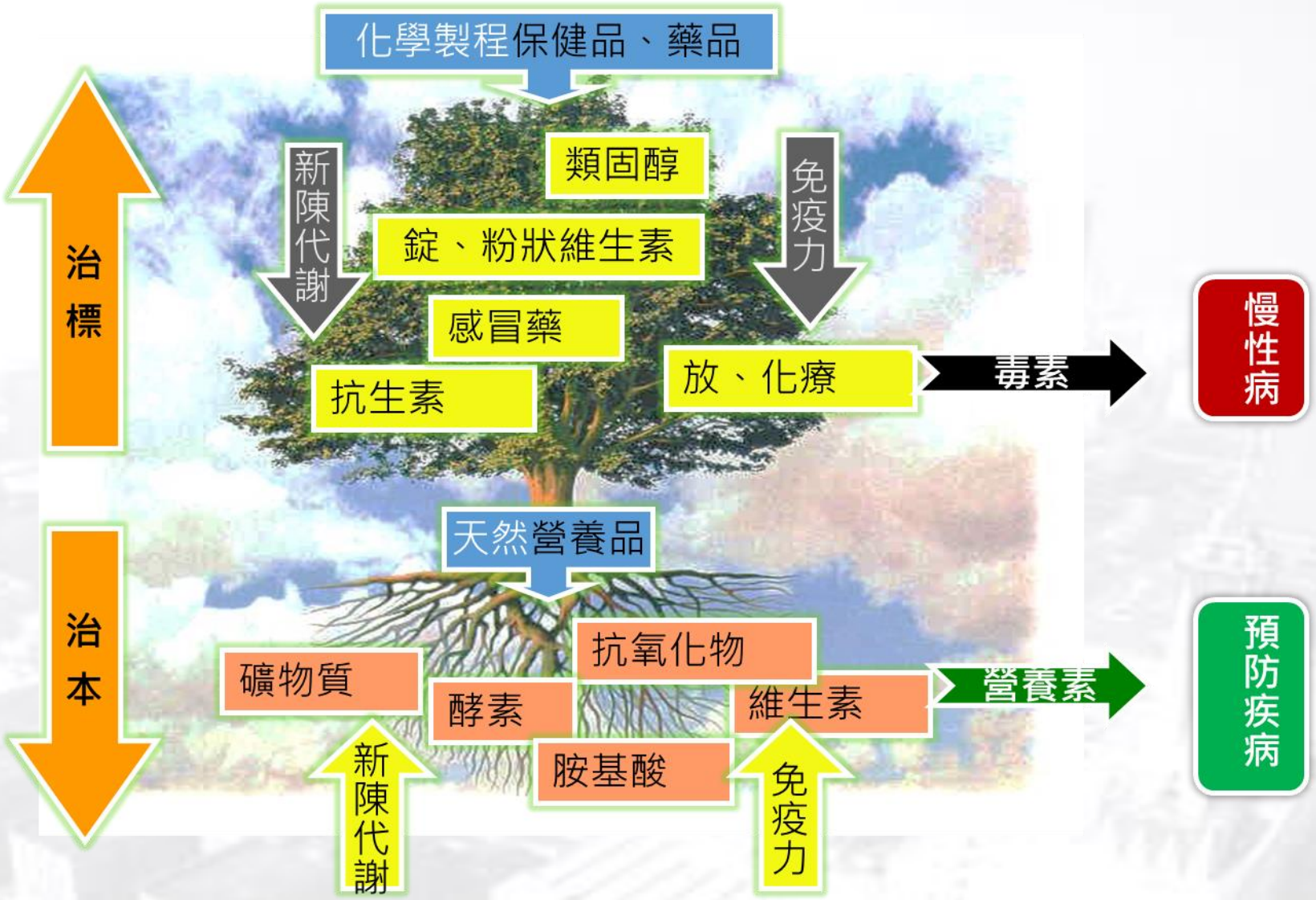
↓

失去身體自癒能力

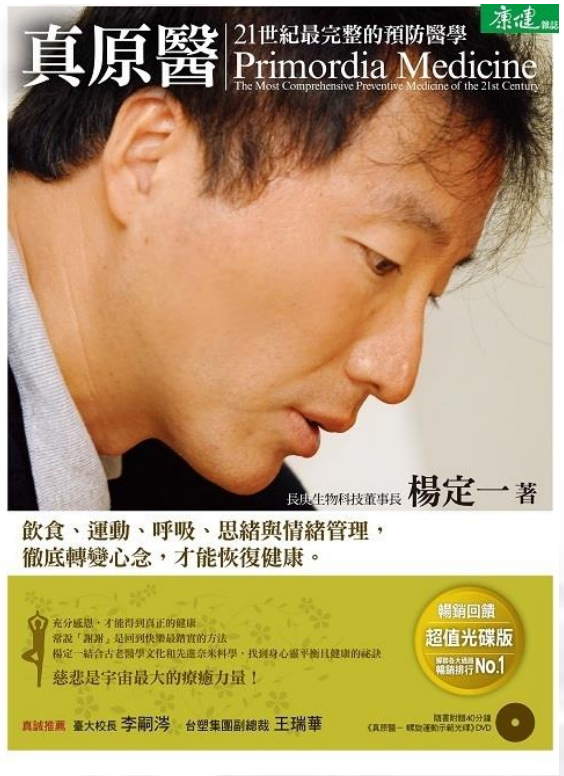
↓

慢性疾病、癌症 找上門




化學製程保健品、藥品
治標
新陳代謝
類固醇
錠、粉狀維生素
感冒藥
抗生素
免疫力
放、化療
毒素
慢性病
天然營養品
治本
礦物質
酵素
抗氧化物
維生素
胺基酸
營養素
預防疾病
新陳代謝
免疫力

養生之道-身心靈平衡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徹底轉變心念，才能恢復健康。
充分感恩，才能得到真正的健康
常說「謝謝」是回到快樂最踏實的方法
楊定一結合古老醫學文化和先進奈米科學，找到身心靈平衡且健康的秘訣
慈悲是宇宙最大的療癒力量！
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flexible
serenity
leisure
harmony
yoga
beauty
joy
happy
meditate
recreation
discipline
concentration
therapy
beautiful
fitness
body
care
spirit
feminine
energy
exercise
relaxation
strenght
mental
focus
calm
gym
wellness
rest

養生之道-運動

養生之道-睡眠

養生之道-有機生活

養生之道-彩虹蔬果

養生之道-生機飲食

天然保養法-蔬果醱酵液

- 完整**百種彩虹蔬果**營養價值、有助先清後補
- 提升**抗氧化營養素**含量，有助抵抗氧化毒物(自由基)
- 豐富的**有機酸、膳食纖維**幫助腸胃道保健
- 糖、甜度不高，**糖尿病患者可安心使用**

PART

4

實驗分享

獨家功效-產品專利

高酵代謝專利 第M405268號 ENZYME

SOD含量為他牌三倍

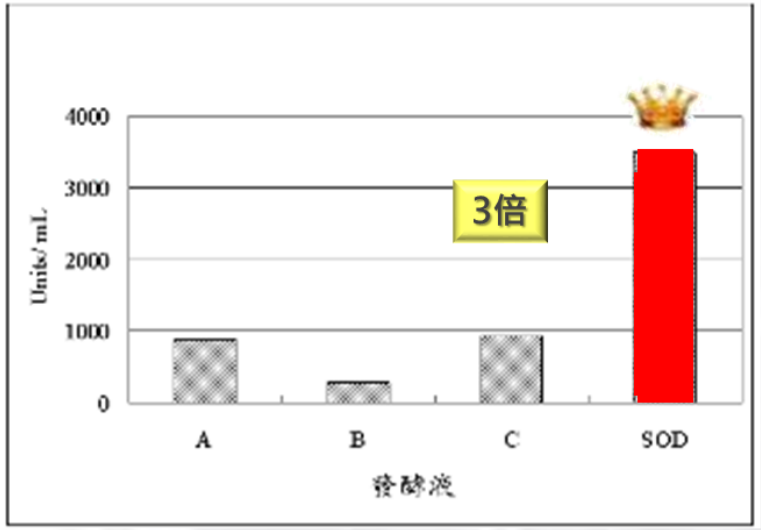
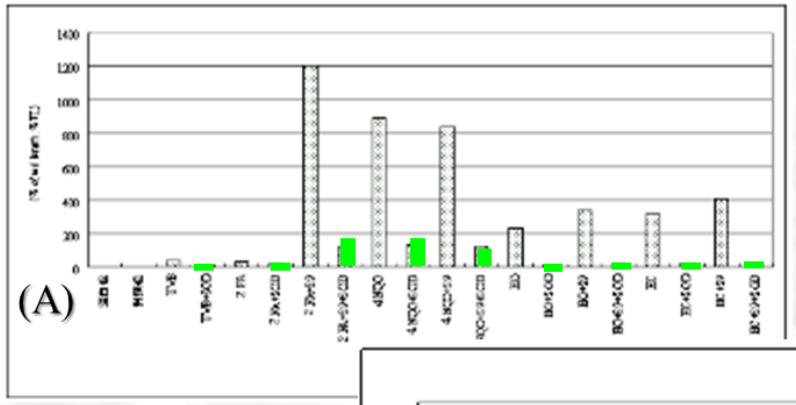


Figure 1. SOD活性.

幫助清除自由基，分解毒素

降低細胞基因傷害&抗致突變



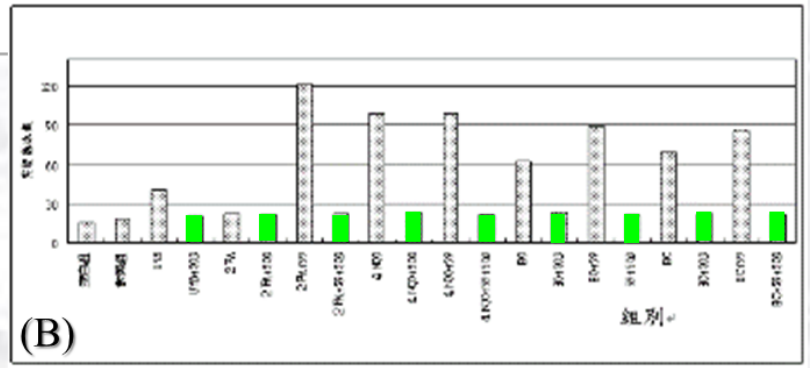
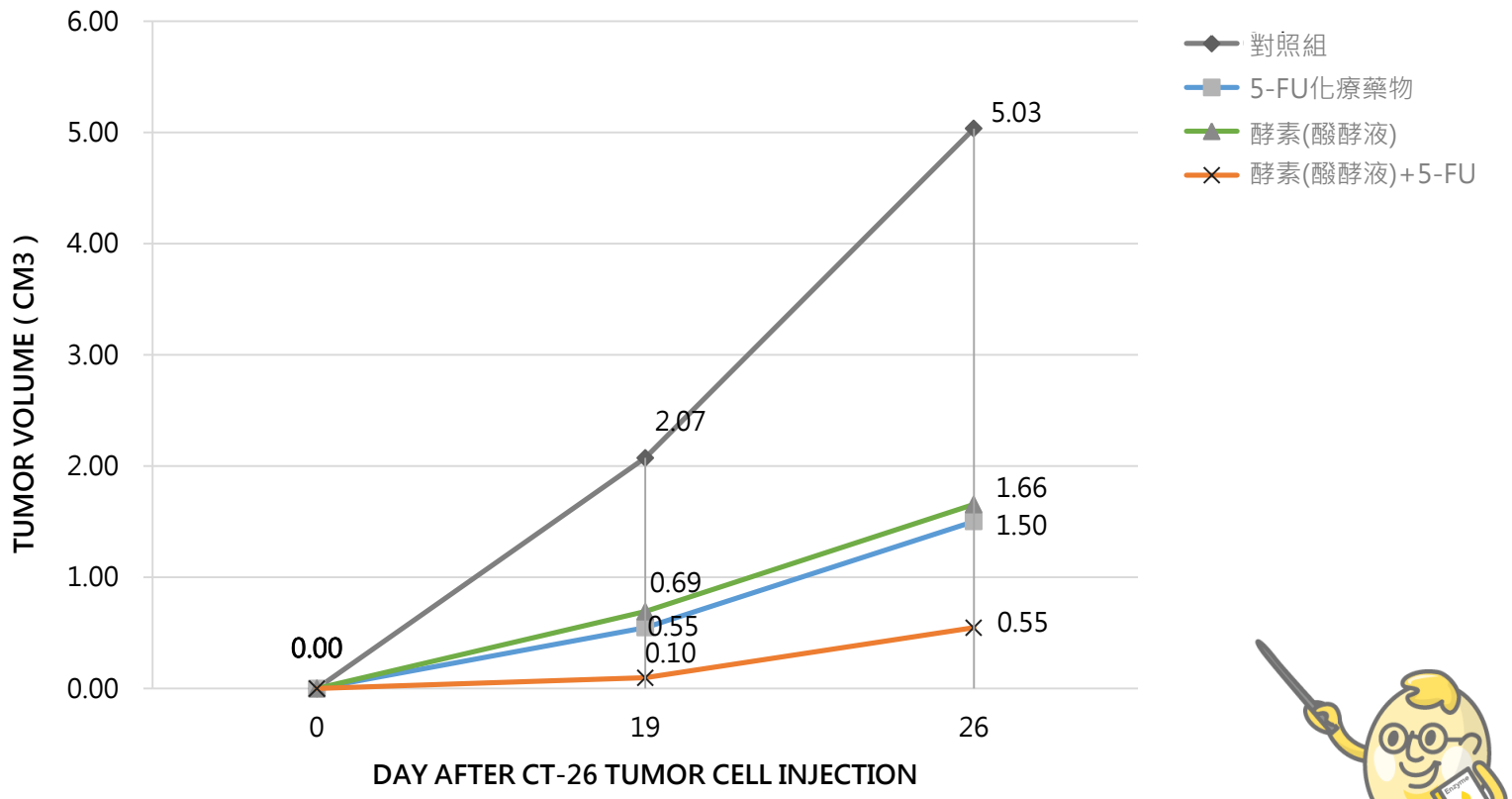
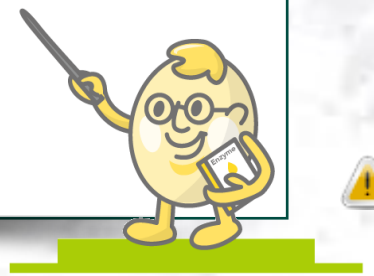


Figure 2.
(A) 細胞基因傷害測試
(B) 抗致突變測試

酵素(醱酵液)對大腸癌功效性試驗



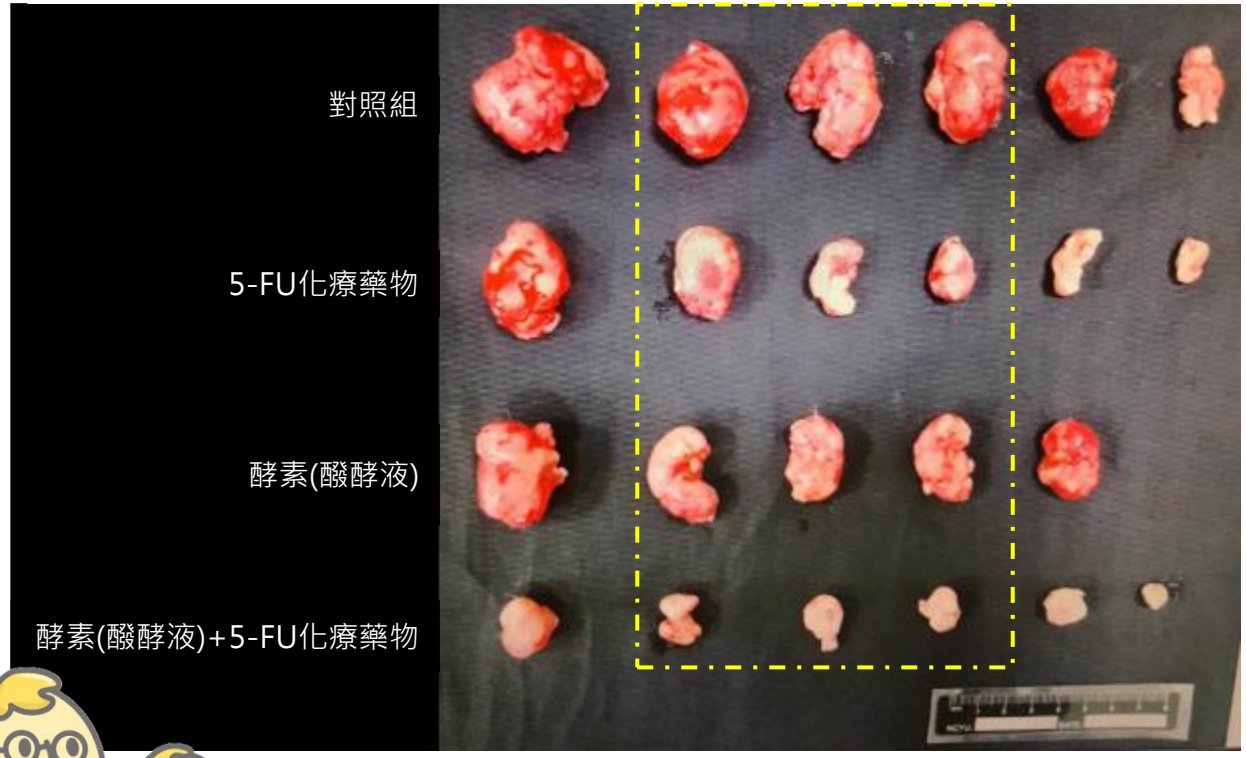


- 單純施予酵素(醱酵液)，其腫瘤大小比對照組明顯小許多，且僅比5-FU化療藥物組別略大一些，**酵素(醱酵液)優勢為天然保健品，無化學成份，不會產生副作用。**

- 酵素(醱酵液)+5-FU化療藥物抑制腫瘤大小的成效最為顯著，相較單純施予5-FU化療藥物組小。顯見**酵素(醱酵液)具有輔助5-FU化療藥物之效果**。

溫馨提醒：下頁將出現腫瘤照，略微血腥，敬請見諒

酵素(醱酵液)對大腸癌功效性試驗

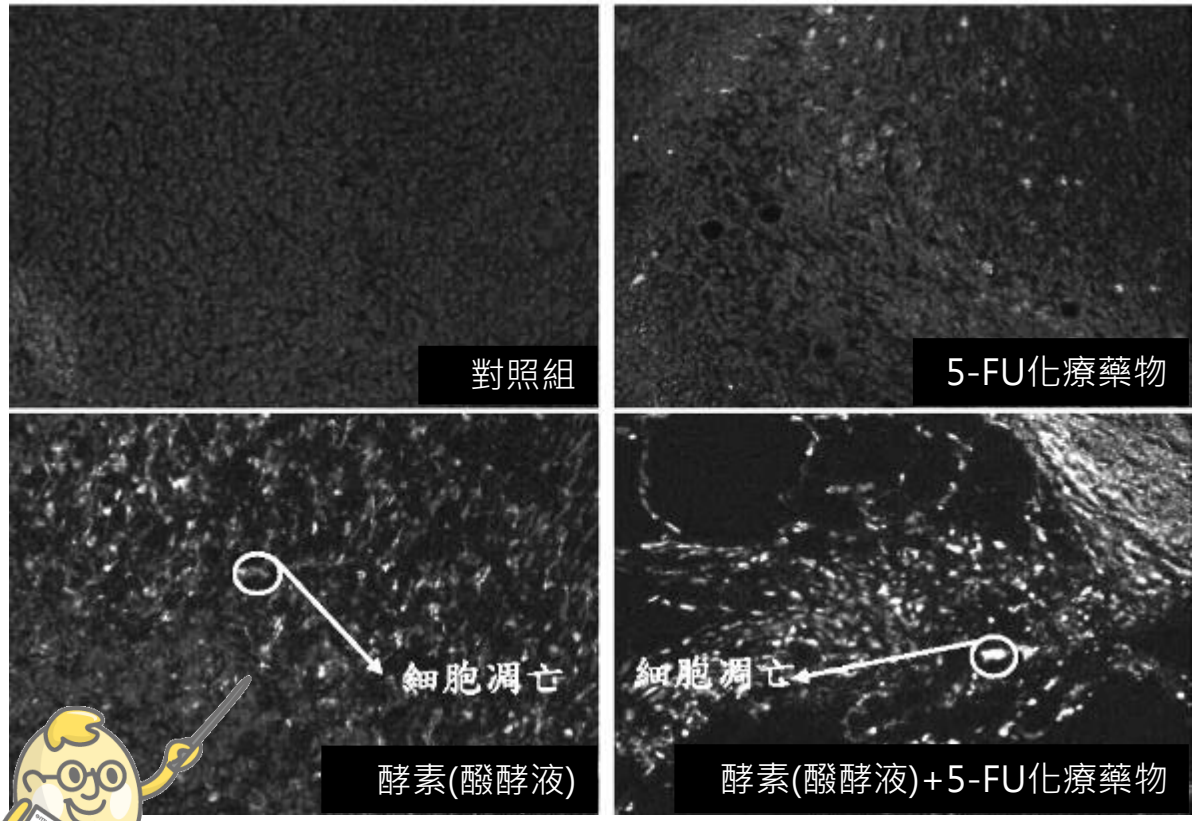


- **對照組：**
  被誘發癌症的小鼠，注射食鹽水，腫瘤持續擴大。
- **5-FU化療藥物組：**
  使用5-FU化療藥物，達到抑制腫瘤的效果。
- **酵素(醱酵液)組：**
  使用醱酵液，達到抑制腫瘤效果與化療藥物接近。
- **酵素(醱酵液)+5FU-化療藥物組：**
  使用酵素(醱酵液)與5-FU化療藥物，抑制腫瘤效果最好。

有效

抑制大腸癌

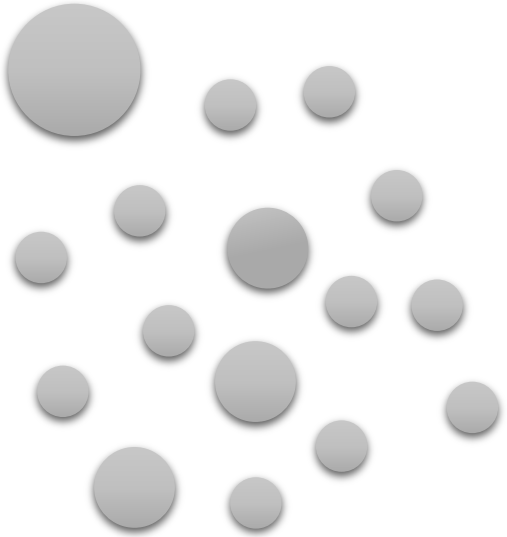
酵素(醱酵液)對大腸癌功效性試驗



凋亡(死亡)的癌細胞會被螢光染色發出光源，
光源越明顯表示癌細胞死亡的程度越高。

- **對照組：**
  此組的圖片是漆黑的且無明顯光點，顯示癌細胞未凋亡。
- **5-FU化療藥物組：**
  不及酵素(醱酵液)的光點明顯，因化療藥物除了抑制癌細胞生長使其凋亡，也造成正常細胞的傷害。
- **酵素(醱酵液)組：**
  光點明顯，凋亡的癌細胞很多，能有效殺死癌細胞，卻不傷害正常的細胞。
- **酵素(醱酵液)+5-FU化療藥物組：**
  光點最為明顯且數量多，表示酵素(醱酵液)除了能殺死癌細胞之外，也能輔助化療藥物殺死更多癌細胞，同時不傷害正常細胞，具有標靶性。

疾病根源



清 除毒素

調 整體質

補 滋細胞

每日一1杯更健康

THANK YOU

感謝您的聆聽

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