

空氣污染對健康之影響及 自我防護措施

1

莊凱任
臺北醫學大學醫學系
2020.09.24

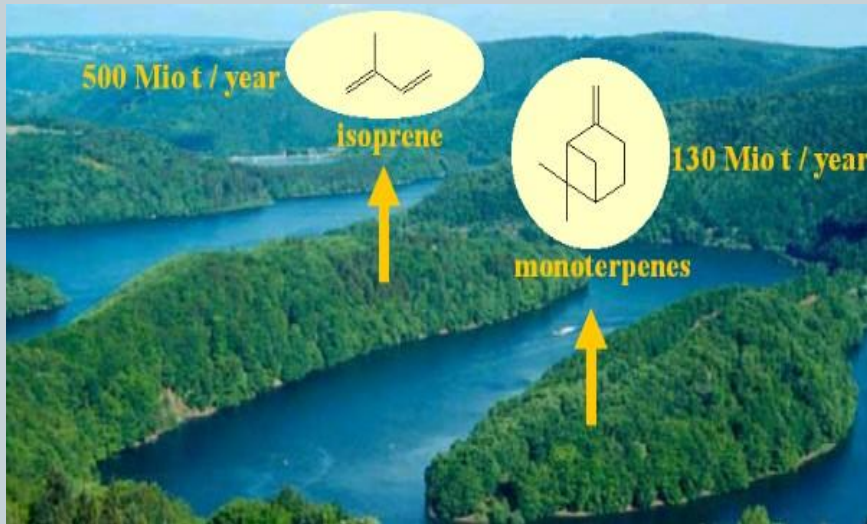
空氣污染與健康

2

空氣污染最早文獻記載

3

- Leonardo da Vinci wrote that blue haze formed from materials emitted into the atmosphere from trees in 1550.
- Natural photochemical smog resulting from hydrocarbons given off by living trees whose cause is still unknown.



The blueish color is assumed to come from fine biogenic particles.

Source: <http://www.atmosphere.mpg.de/>

空氣污染與健康之重要歷史事件

4

- December, 1930 Meuse Valley, Belgium fog caused 60 deaths and widespread respiratory morbidity.
- October, 1948 Donora, Pennsylvania smog episode, in which 1000's of people experienced adverse respiratory problems and 18 deaths occurred.
- London Fog of 1952 and 1962.

Great Smoke 1952

theguardian

Your search terms...

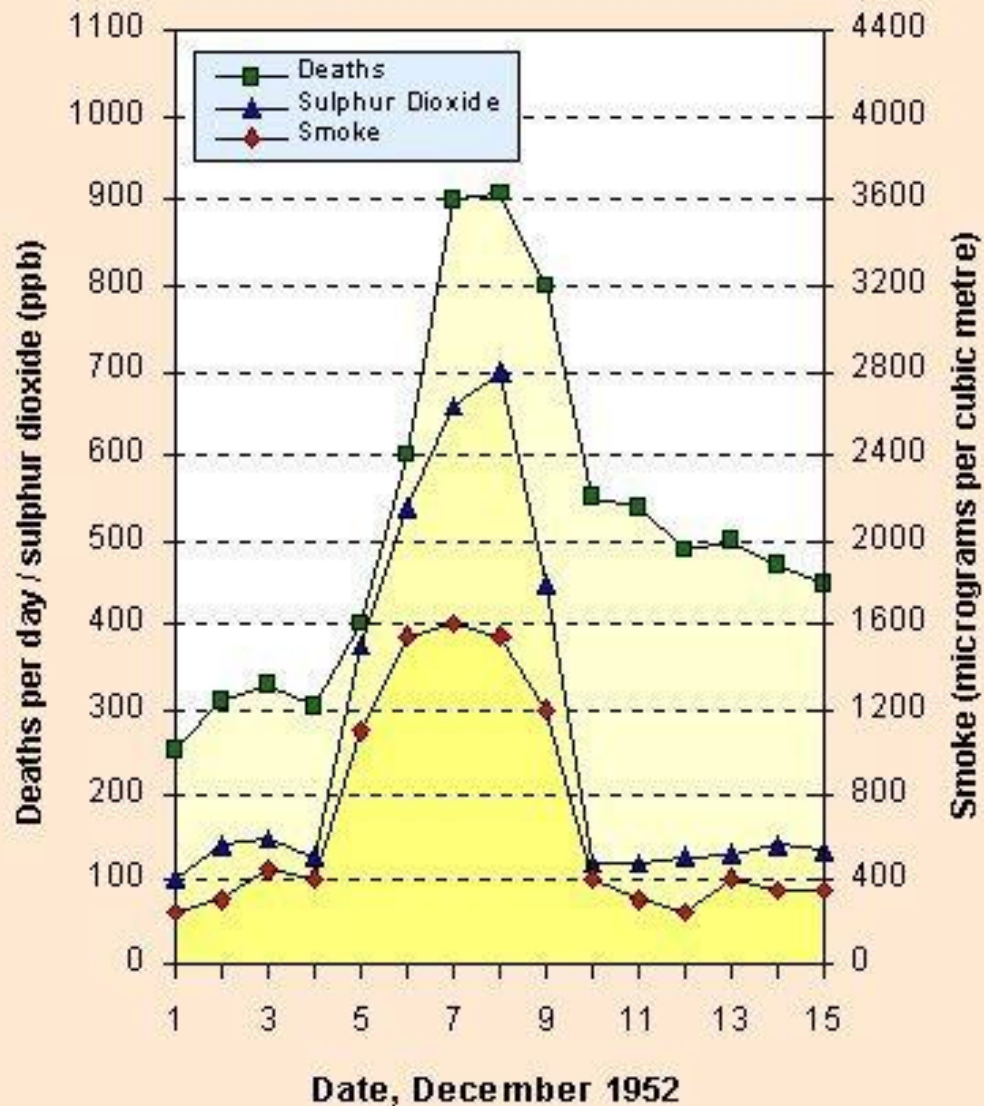
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60 years since the great smog of London - in pictures

On Friday 5 December 1952, a thick yellow smog brought the capital to a standstill for four days and is estimated to have killed more than 4,000 people. London's air may appear much cleaner today, but is still dangerously polluted. The coal pollution that caused the infamous 'pea soupers' has been replaced by invisible pollution – mainly from traffic fumes – resulting in 13,000 early deaths each year in the UK and 4,300 in London

guardian.co.uk, Wednesday 5 December 2012 06.00 GMT



**Deaths via:
pneumonia,
bronchitis,
tuberculosis,
heart failure**





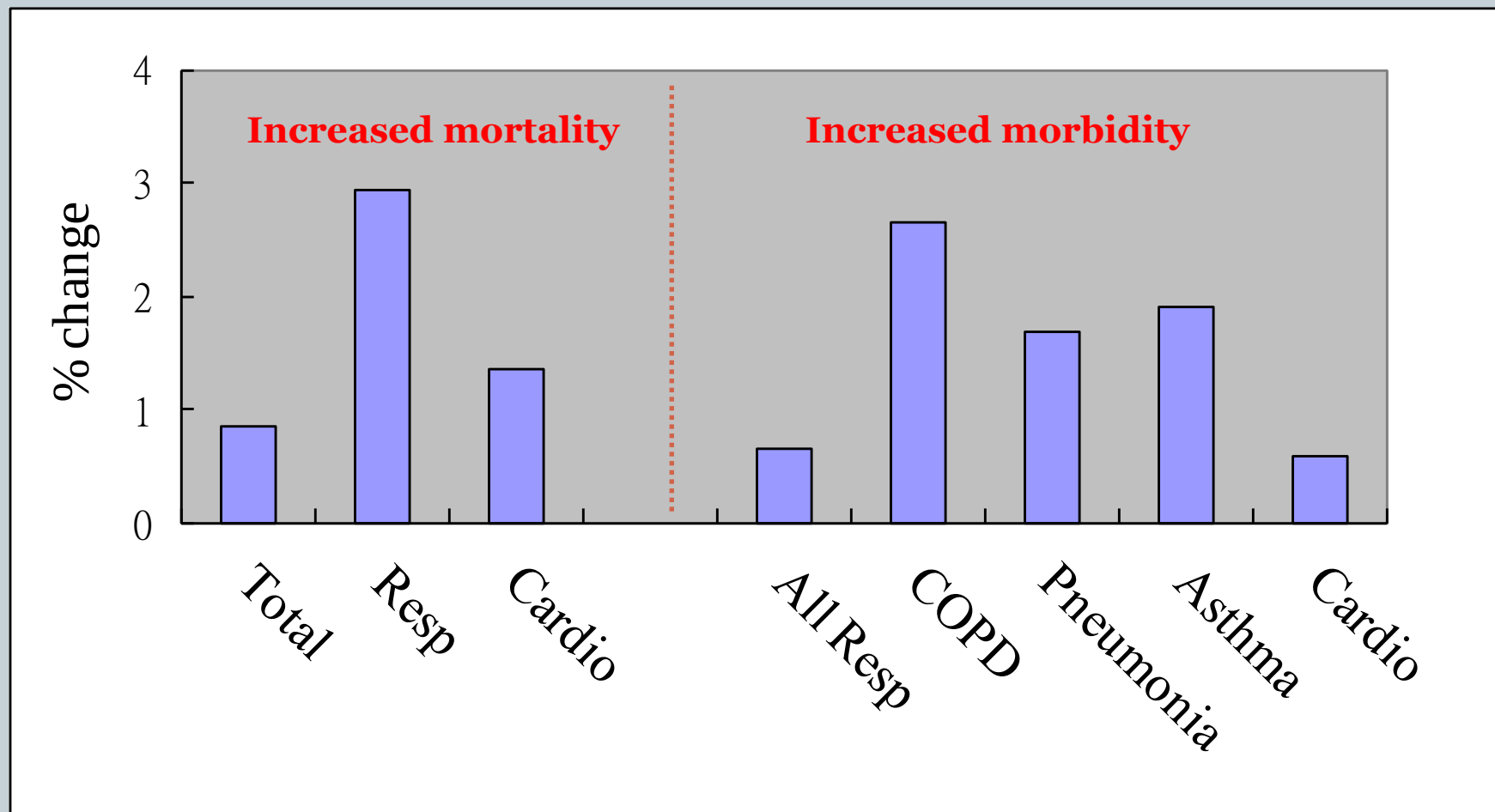


A large, rectangular public information sign with a wooden frame. The sign features a central illustration of a house with two chimneys. The left chimney is emitting thick, dark smoke, while the right chimney is emitting a thin, wispy line of smoke. Below the left chimney, the text reads "Burning smoky Fuel". Below the right chimney, the text reads "Burning smokeless Fuel". In the center of the house, the text reads "Be ready for the fog". Below this, there is a paragraph of smaller text: "GET A BAG OF COAL OR SMOKLESS FUEL NOW AND KEEP IT IN READY FOR THE FOG. GET THE BAG A FOG BURNING & SAVE OF THE FOG". At the bottom of the sign, there is a small illustration of a bag of coal labeled "14 LBS NETT". To the left of the bag, the text reads "FOR ALL THE NEIGHBORHOODS IN THE CITY". To the right of the bag, the text reads "A FOG BURNING GET IT, FOGUE IN ALL OF THE FOG BURNING AT ALL TIMES". At the very bottom of the sign, the text reads "FURNISHED BY WILSON BOGGS COUNCIL".

50年後...

空氣污染流行病學研究證據

11



Source: Pope III and Dockery, 1999.

空氣污染與健康致病機轉研究

12

AHA Scientific Statement

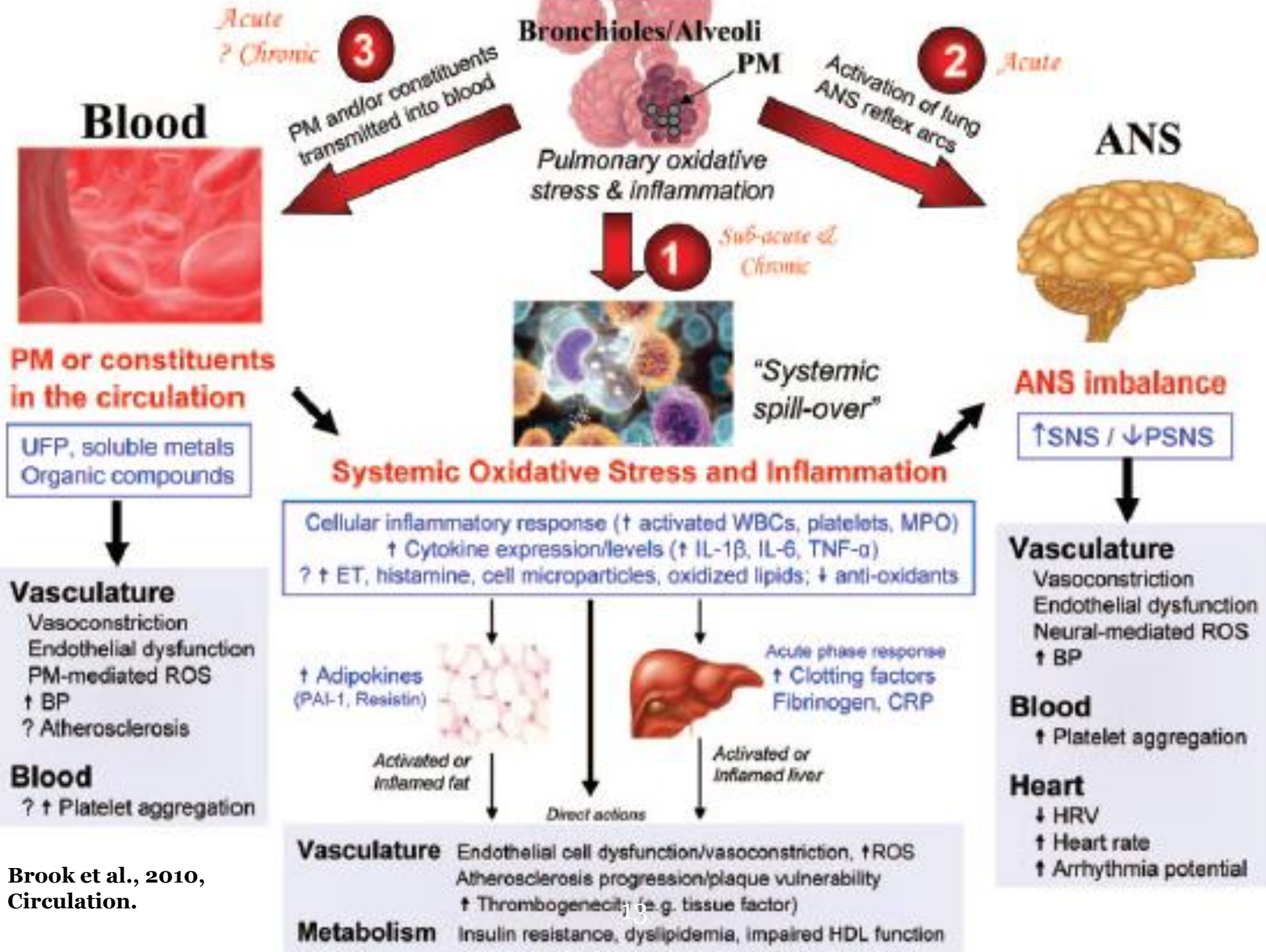
Air Pollution and Cardiovascular Disease

A Statement for Healthcare Professionals From the Expert Panel on Population and Prevention Science of the American Heart Association

Robert D. Brook, MD; Barry Franklin, PhD, Chair; Wayne Cascio, MD; Yuling Hong, MD, PhD; George Howard, PhD; Michael Lipsett, MD; Russell Luepker, MD; Murray Mittleman, MD, ScD; Jonathan Samet, MD; Sidney C. Smith, Jr, MD; Ira Tager, MD

Abstract—Air pollution is a heterogeneous, complex mixture of gases, liquids, and particulate matter. Epidemiological studies have demonstrated a consistent increased risk for cardiovascular events in relation to both short- and long-term exposure to present-day concentrations of ambient particulate matter. Several plausible mechanistic pathways have been described, including enhanced coagulation/thrombosis, a propensity for arrhythmias, acute arterial vasoconstriction, systemic inflammatory responses, and the chronic promotion of atherosclerosis. The purpose of this statement is to provide healthcare professionals and regulatory agencies with a comprehensive review of the literature on air pollution and cardiovascular disease. In addition, the implications of these findings in relation to public health and regulatory policies are addressed. Practical recommendations for healthcare providers and their patients are outlined. In the final section, suggestions for future research are made to address a number of remaining scientific questions. (*Circulation*. 2004;109:2655-2671.)

Key Words: AHA Scientific Statements ■ air pollution ■ cardiovascular diseases ■ respiration





蘋果日報

動新聞

蘋果LIVE

蘋果VR

爽報

星島

TOMONE

今日蘋果

即時新聞

動新聞

娛樂頻道

蘋果地產

火線話題

APPLE FASHION

蘋

林杰樑指導研究 登國際 空污害洗腎者死亡率 暴增7成6

字級： A- A A+

頭條要聞

空污濃 洗腎患死亡率增76%



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空污濃 洗腎患死亡率增76%

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2014年03月17日

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頭條要聞

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台率先發現 PM2.5增肝癌風險

從戶外回室內 應即洗手洗臉

2016年01月04日

傳送

讚 1.5 萬

G+ 42

健康焦點 醫藥新聞 飲食 美體 兩性 親子 中醫 百科 寵物 黃金貴族 購物 專欄



空污不只傷心肺！ 還會讓「睡眠呼吸障礙」更嚴重

時間：2016/12/30 12:44

氧化與發炎反應

臺灣空氣污染來源？

18



01: <http://groups.csail.mit.edu/medg/people/chris/taiwan-traffic.jpg>

02: http://joseph.elliott.name/travels/highlights/taiwan/catalog/01_taipei_traffic.html

03: www.skeller.ch/albums/Taiwan/traffic_taipei04.jpg



19:15:10



PTS EVENING NEWS

高雄 大林蒲

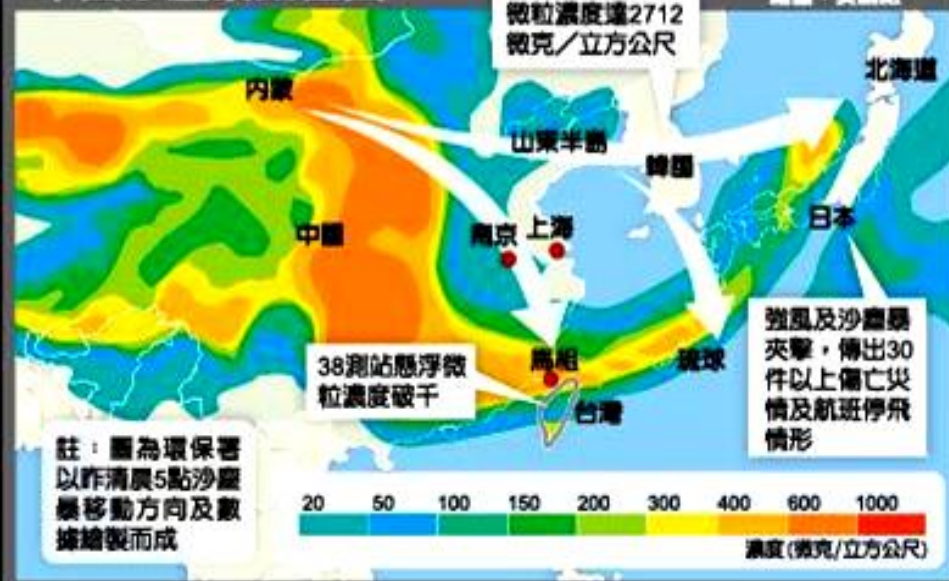
晚間新聞

臨海工業區空汙 常滯空中變蕈狀雲

中國沙塵暴路徑圖

3/20黑山島懸浮
微粒濃度達2712
微克/立方公尺

資料來源：環保署
繪圖：吳鳳組



今日空氣污染指標

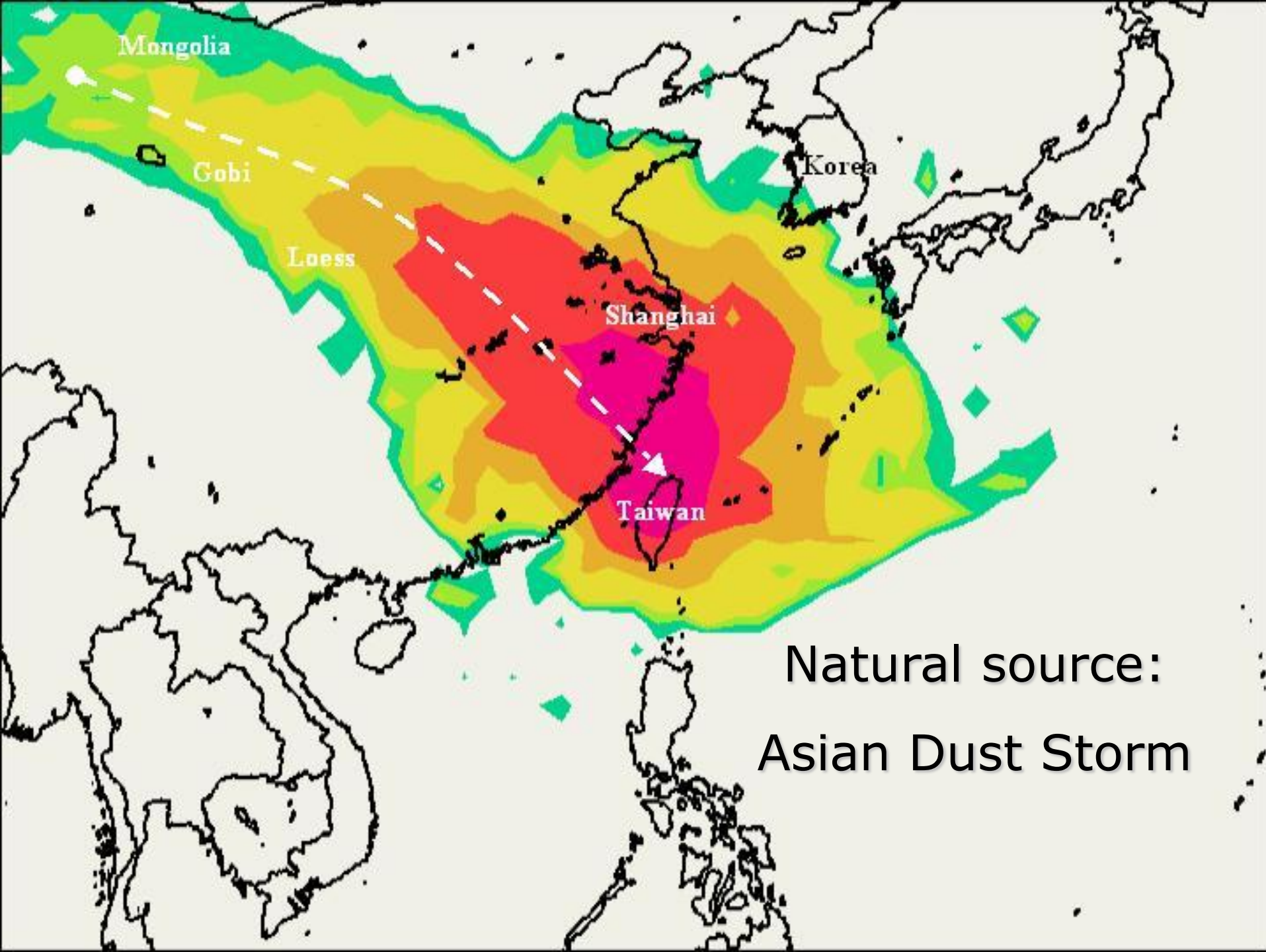
(懸浮微粒) 單位：毫克/立方公尺



資料來源：環保署

沙塵暴移動路徑





河川揚塵

●台灣本土沙塵暴

- 根據調查，中部地區的空气品質有日漸惡化趨勢，其中有**30%**是來自幾條大溪裸露的河床。
- 主要係每年**10月**至隔年**4月**間因東北季風吹拂，沿海裸露地之土砂因顆粒細小隨風飛揚所致。
- 砂塵之來源除河川裸露地外，亦有部分來自沿海灘地及臨近內陸土地。



民眾如何自我保護？

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我国首次单发霾预警 灰霾面积超100万平方公里

时政新闻 新京报[微博] 金煜 饶沛 2013-01-29 02:39 我要分享 ▾

2571



中国华北地区雾霾天气卫星照片

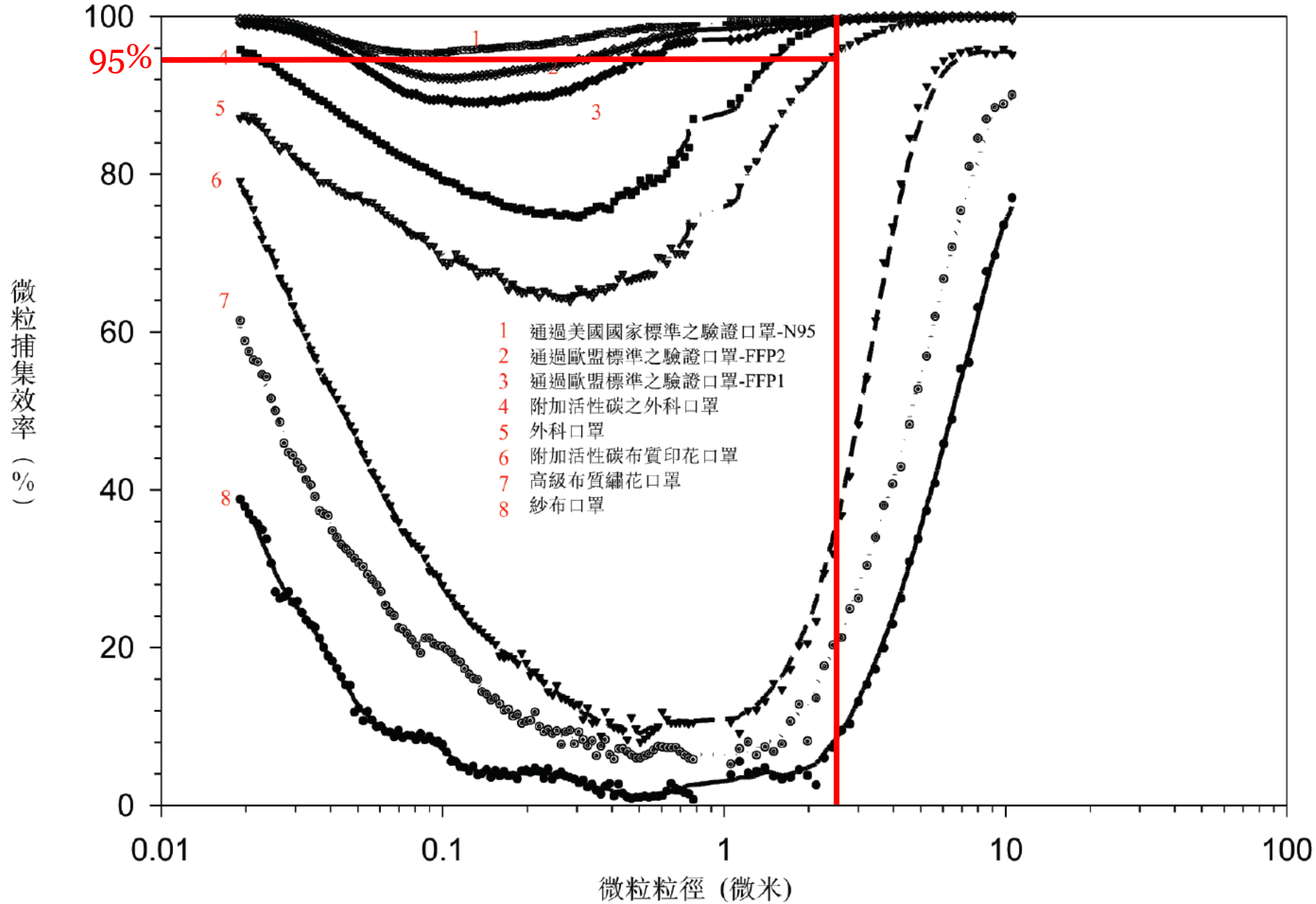


室外自我防護措施

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一、口罩

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不同口罩在風量每分鐘 85 升下對於粒狀有害物濾除效率比較圖

外科口罩



Environ Health Perspect. 2012 Mar;120(3):367-72. doi: 10.1289/ehp.1103898.

Reducing personal exposure to particulate air pollution improves cardiovascular health in patients with coronary heart disease.

Langrish JP¹, Li X, Wang S, Lee MM, Barnes GD, Miller MR, Cassee FR, Boon NA, Donaldson K, Li J, Li L, Mills NL, Newby DE, Jiang L.

Author information

Abstract

BACKGROUND: Air pollution exposure increases cardiovascular morbidity and mortality and is a major global public health concern.

OBJECTIVES: We investigated the benefits of reducing personal exposure to urban air pollution in patients with coronary heart disease.

METHODS: In an open randomized crossover trial, 98 patients with coronary heart disease walked on a predefined route in central Beijing, China, under different conditions: once while using a highly efficient face mask, and once while not using the mask. Symptoms, exercise, personal air pollution exposure, blood pressure, heart rate, and 12-lead electrocardiography were monitored throughout the 24-hr study period.

RESULTS: Ambient air pollutants were dominated by fine and ultrafine particulate matter (PM) that was present at high levels [74 $\mu\text{g}/\text{m}^3$ for PM(2.5) (PM with aerodynamic diameter $<2.5 \mu\text{m}$)]. Consistent with traffic-derived sources, this PM contained organic carbon and polycyclic aromatic hydrocarbons and was highly oxidizing, generating large amounts of free radicals. The face mask was well tolerated, and its use was associated with decreased self-reported symptoms and reduced maximal ST segment depression (-142 vs. -156 μV , $p = 0.046$) over the 24-hr period. When the face mask was used during the prescribed walk, mean arterial pressure was lower (93 ± 10 vs. 96 ± 10 mmHg, $p = 0.025$) and heart rate variability increased (high-frequency power: 54 vs. 40 msec², $p = 0.005$; high-frequency normalized power: 23.5 vs. 20.5 msec, $p = 0.001$; root mean square successive differences: 16.7 vs. 14.8 msec, $p = 0.007$). However, mask use did not appear to influence heart rate or energy expenditure.

CONCLUSIONS: Reducing personal exposure to air pollution using a highly efficient face mask appeared to reduce symptoms and improve a range of cardiovascular health measures in patients with coronary heart disease. Such interventions to reduce personal exposure to PM air pollution have the potential to reduce the incidence of cardiovascular events in this highly susceptible population.

countries where economic growth is dependent on road traffic and heavy industry (Simai et al. 2009). More practical solutions to reduce individual exposure and protect susceptible persons are urgently required. Therefore, we investigated the effects of a simple face mask intervention to reduce PM air pollution exposure on measures of cardiovascular health in patients with coronary heart disease.

Methods

Go to: ☒

Subjects. One hundred and two patients were recruited from the Fuwai Hospital, Beijing, China, in March 2009. All patients were nonsmokers and had a history of coronary heart disease. Exclusion criteria were a history of arrhythmia, severe coronary artery disease without revascularization, resting conduction abnormality, digoxin therapy, uncontrolled hypertension, renal or hepatic failure, or an acute coronary syndrome within the previous 3 months. Patients' medical histories were recorded from the case notes, and baseline anthropometric and biochemical measures were performed on recruitment. All subjects gave their written informed consent, and the study was reviewed and approved by the local research ethics committee.

Study design. Subjects attended the Fuwai Hospital or the ChaoYang Hospital in Beijing on two occasions, with at least a week between visits (median time between visits was 9 days), between March and May 2009. Each subject attended the same hospital on each visit. In a prospective randomized open blinded end point (PROBE) crossover study, subjects walked for 2 hr between 0900 hours and 1100 hours along prescribed city center routes [see Supplemental Material, Figure S1 (<http://dx.doi.org/10.1289/ehp.1102809>)] in Beijing, using a highly efficient face mask on one study visit but not the other (Dust Respirator 8812; 3M, St. Paul, MN, USA). This mask consists of a lightweight polypropylene filter, which is effective at removing airborne PM without affecting ambient gases. The mask has an expiration valve, complies with EN149:2001 FFP1 European Standard (British Standards Institute 2001), and has an assigned protection factor of 4 [i.e., it can be worn in atmospheres containing up to four times the workplace exposure limit (WEL) as defined by the U.K. Health and Safety Executive (2011). [The WEL for respirable carbon particles (carbon black), is 3.5 mg/m³ over an 8-hr time weighted average.] Mask use was randomly assigned to the first or second visit using balanced computer-generated randomization. In order to maximize the difference in PM air pollution exposure, subjects wore the mask for 24 hr before the mask study day, in addition to wearing it during the 24 hr study day, and were given instructions to wear the mask at all times while outdoors and as much as possible when indoors. Subjects' activities after the prescribed walk were not restricted, and they were instructed to continue their normal daily routines.

歐規EN149系列口罩



9310 FFP1拋棄式防塵口罩

- 創新三瓣式折疊口罩，方便攜帶。
- 材質柔軟，重量輕。
- 可調式鼻梁夾，減少霧氣產生與改善密合度。
- 獨立單一包裝適合收藏，安全衛生。
- 專利過濾材製造，採用先進靜電濾材。
- 鼻梁襯墊穿戴更舒適。



9914 FFP1活性碳拋棄式防塵口罩

- 專利矩型呼氣閥，降低呼氣空氣阻抗與改善悶熱問題。
- 活性碳吸附層吸附有機蒸氣。
- 可調式鼻梁夾，減少霧氣產生與改善密合度。
- 重量輕，穿戴舒適。
- 專利過濾材製造，採用先進靜電濾材。



8812 FFP1拋棄式防塵口罩

- 專利矩型呼氣閥，降低呼氣空氣阻抗與改善悶熱問題。
- 可調式鼻梁夾，減少霧氣產生與改善密合度。
- 重量輕，穿戴舒適。
- 專利過濾材製造，採用先進靜電濾材。



9320 FFP2拋棄式防塵口罩

- 創新三瓣式折疊口罩，方便攜帶。
- 材質柔軟，重量輕。
- 可調式鼻梁夾，減少霧氣產生與改善密合度。
- 獨立單一包裝適合收藏，安全衛生。
- 專利過濾材製造，採用先進靜電濾材。
- 鼻梁襯墊穿戴更舒適。



8810 FFP2拋棄式防塵口罩

- 可調式鼻梁夾，減少霧氣產生與改善密合度。
- 重量輕，穿戴舒適。
- 專利過濾材製造，採用先進靜電濾材。
- 鼻梁襯墊穿戴更舒適。



9332 FFP3拋棄式防塵口罩

- 創新三瓣式折疊口罩，方便攜帶。
- 材質柔軟，重量輕。
- 可調式鼻梁夾，減少霧氣產生與改善密合度。
- 獨立單一包裝適合收藏，安全衛生。
- 專利過濾材製造，採用先進靜電濾材。
- 專利矩型呼氣閥，降低呼氣空氣阻抗與改善悶熱問題。
- 鼻梁襯墊穿戴更舒適。



一（特別篇）、口罩與新冠肺炎？

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Short Communication

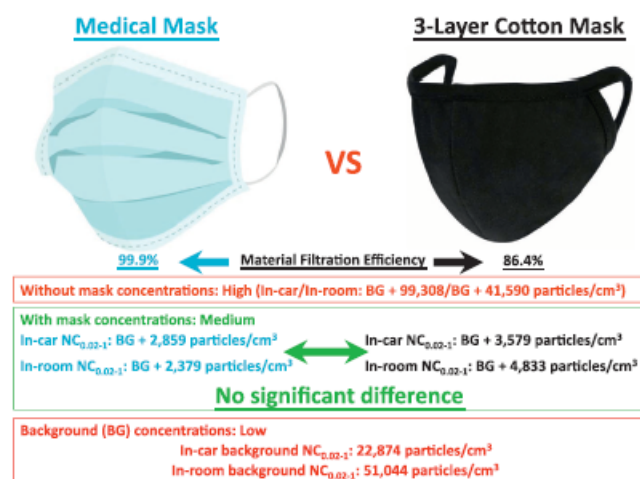
Medical mask versus cotton mask for preventing respiratory droplet transmission in micro environments

Kin-Fai Ho^a, Lian-Yu Lin^b, Shao-Ping Weng^c, Kai-Jen Chuang^{d,e,*}^a The Jockey Club School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong, China^b Department of Internal Medicine, Division of Cardiology, National Taiwan University Hospital, Taipei, Taiwan^c IHMED Fertility Center, Taipei, Taiwan^d School of Public Health, College of Public Health, Taipei Medical University, Taipei, Taiwan^e Department of Public Health, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

HIGHLIGHTS

- The COVID-19 outbreak has led to a medical mask shortage around the world.
- Cotton mask can reduce respiratory droplet transmission in a bedroom or a car.
- No significant difference between medical and cotton mask for droplet prevention.
- Cotton mask could be a potential substitute for medical mask.
- Cotton mask is washable and reusable.

GRAPHICAL ABSTRACT



Medical Mask



99.9%

VS

3-Layer Cotton Mask



86.4%

Material Filtration Efficiency

Without mask concentrations: High (In-car/In-room: BG + 99,308/BG + 41,590 particles/cm³)

With mask concentrations: Medium

In-car NC_{0.02-1}: BG + 2,859 particles/cm³

In-room NC_{0.02-1}: BG + 2,379 particles/cm³

In-car NC_{0.02-1}: BG + 3,579 particles/cm³

In-room NC_{0.02-1}: BG + 4,833 particles/cm³

No significant difference

Background (BG) concentrations: Low

In-car background NC_{0.02-1}: 22,874 particles/cm³

In-room background NC_{0.02-1}: 51,044 particles/cm³



Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals

<https://doi.org/10.1038/s41586-020-2271-3>

Received: 14 March 2020

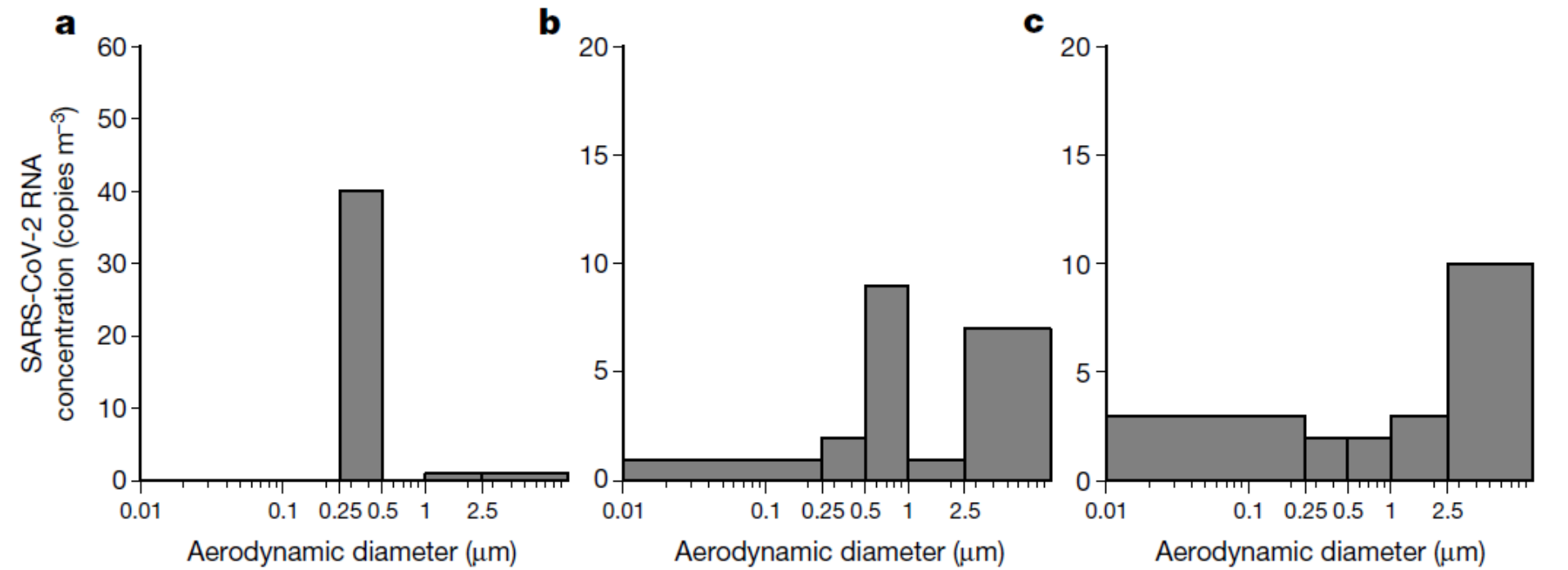
Accepted: 20 April 2020

Published online: 27 April 2020

 Check for updates

Yuan Liu^{1,6}, Zhi Ning^{2,6}, Yu Chen^{1,6}, Ming Guo^{1,6}, Yingle Liu¹, Nirmal Kumar Gali², Li Sun², Yusen Duan³, Jing Cai⁴, Dane Westerdahl², Xinjin Liu¹, Ke Xu¹, Kin-fai Ho⁵, Haidong Kan^{4,6}, Qingyan Fu^{2,6} & Ke Lan^{1,6}

The ongoing outbreak of coronavirus disease 2019 (COVID-19) has spread rapidly on a global scale. Although it is clear that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is transmitted through human respiratory droplets and direct contact, the potential for aerosol transmission is poorly understood^{1–3}. Here we investigated the aerodynamic nature of SARS-CoV-2 by measuring viral RNA in aerosols in different areas of two Wuhan hospitals during the outbreak of COVID-19 in February and March 2020. The concentration of SARS-CoV-2 RNA in aerosols that was detected in isolation wards and ventilated patient rooms was very low, but it was higher in the toilet areas used by the patients. Levels of airborne SARS-CoV-2 RNA in the most public areas was undetectable, except in two areas that were prone to crowding; this increase was possibly due to individuals infected with SARS-CoV-2 in the crowd. We found that some medical staff areas initially had high concentrations of viral RNA with aerosol size distributions that showed peaks in the submicrometre and/or supermicrometre regions; however, these levels were reduced to undetectable levels after implementation of rigorous sanitization procedures. Although we have not established the infectivity of the virus detected in these hospital areas, we propose that SARS-CoV-2 may have the potential to be transmitted through aerosols. Our results indicate that room ventilation, open space, sanitization of protective apparel, and proper use and disinfection of toilet areas can effectively limit the concentration of SARS-CoV-2 RNA in aerosols. Future work should explore the infectivity of aerosolized virus.



防護服裝去除室

防護服裝去除室

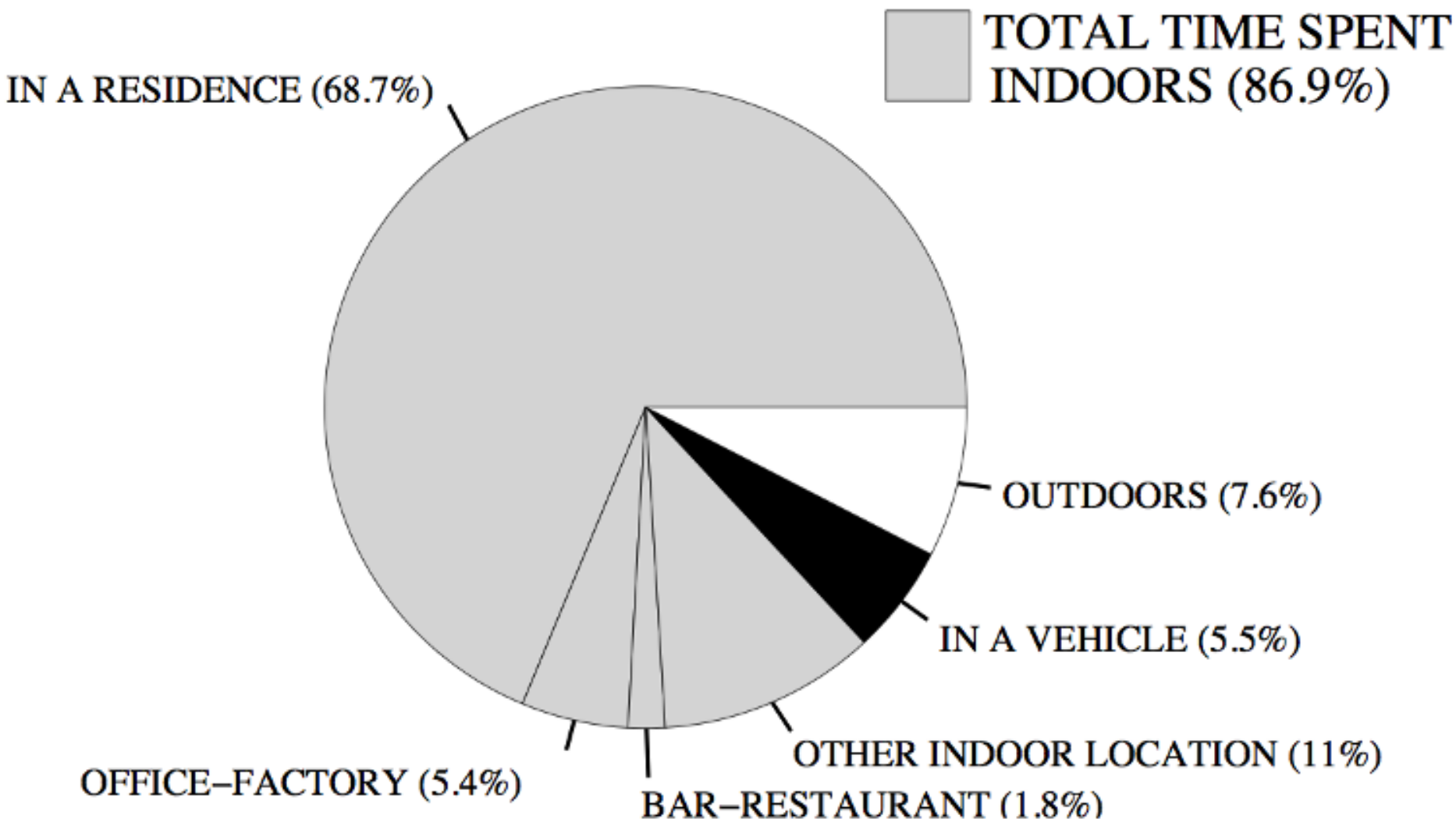
醫護辦公室

二、交通工具

41

NHAPS – Nation, Percentage Time Spent

Total n = 9,196





Contents lists available at ScienceDirect

International Journal of Hygiene and Environmental Health

journal homepage: www.elsevier.com/locate/ijheh

Effects of commuting mode on air pollution exposure and cardiovascular health among young adults in Taipei, Taiwan

Wen-Te Liu^{a,b}, Chih-Ming Ma^c, I.-Jung Liu^d, Bor-Cheng Han^e, Hsiao-Chi Chuang^{a,b}, Kai-Jen Chuang^{e,f,*}

^a Division of Pulmonary Medicine, Department of Internal Medicine, Shuang Ho Hospital, Taipei Medical University, Taipei, Taiwan

^b School of Respiratory Therapy, College of Medicine, Taipei Medical University, Taipei, Taiwan

^c Department of Cosmetic Application and Management, St. Mary's Junior College of Medicine, Nursing and Management, Yilan, Taiwan

^d Department of Nursing, Cardinal Tien College of Healthcare & Management, New Taipei City, Taiwan

^e School of Public Health, College of Public Health and Nutrition, Taipei Medical University, Taipei, Taiwan

^f Department of Public Health, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

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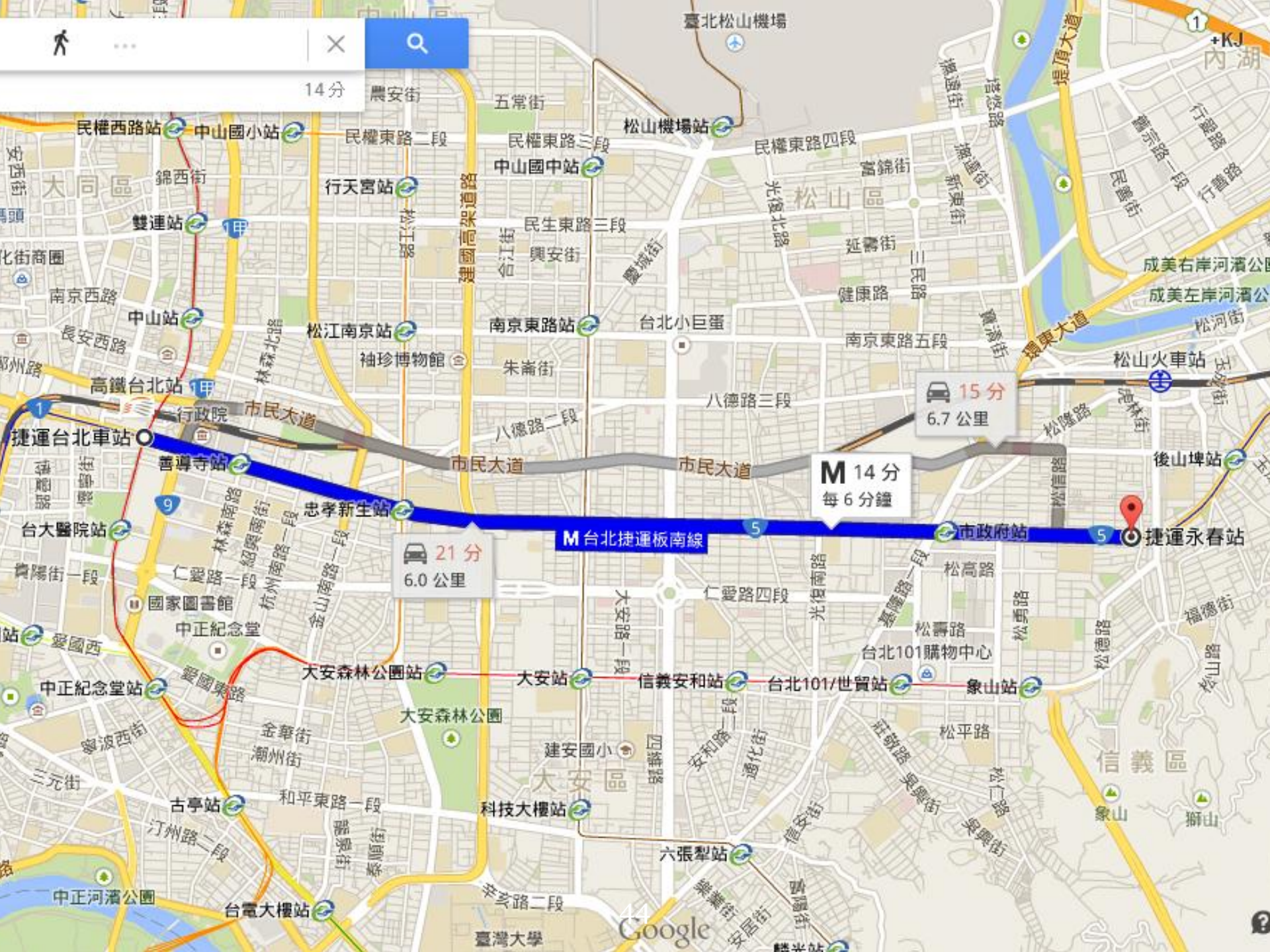
Traffic

Particulate matter

Subway

ABSTRACT

The association between traffic-related air pollution and adverse cardiovascular effects has been well documented; however, little is known about whether different commuting modes can modify the effects of air pollution on the cardiovascular system in human subjects in urban areas with heavy traffic. We recruited 120 young, healthy subjects in Taipei, Taiwan. Each participant was classified with different commuting modes according to his/her own commuting style. Three repeated measurements of heart rate variability (HRV) indices {standard deviation of NN intervals (SDNN) and the square root of the mean of the sum of the squares of differences between adjacent NN intervals (r-MSSD)}, particulate matter with an aerodynamic diameter $\leq 2.5 \mu\text{m}$ (PM_{2.5}), temperature, humidity and noise level were conducted for each subject during 1-h morning commutes (0900–1000 h) in four different commuting modes, including an electrically powered subway, a gas-powered bus, a gasoline-powered car, and walking. Linear mixed-



Air pollution exposure

	Subway	Bus	Car	Walking	ANOVA p-value
Sex, no					
Male	16	15	13	14	–
Female	14	15	17	16	
Age, year					
Mean $\pm$ SD	21.2 $\pm$ 0.8	21.3 $\pm$ 0.8	21.2 $\pm$ 0.7	21.4 $\pm$ 0.9	0.89
Range	19–24	19–24	19–24	19–24	
BMI, kg/m ²					
Mean $\pm$ SD	22.8 $\pm$ 1.8	23.0 $\pm$ 1.7	22.1 $\pm$ 1.8	22.9 $\pm$ 1.6	0.91
Range	18.9–24.1	19.1–24.7	18.8–23.5	19.4–23.1	
PM ₁₀ , $\mu\text{g}/\text{m}^3$					
Mean $\pm$ SD	31.5 $\pm$ 12.0	39.6 $\pm$ 15.8	34.3 $\pm$ 12.6	50.2 $\pm$ 21.2	<0.05
IQR	17.8	24.8	22.4	26.4	
Range	15.2–50.2	20.1–60.8	21.9–62.8	23.4–99.8	
No	1080	1045	1069	1080	
PM _{2.5} , $\mu\text{g}/\text{m}^3$					
Mean $\pm$ SD	22.3 $\pm$ 6.9	32.2 $\pm$ 12.4	29.2 $\pm$ 11.3	42.1 $\pm$ 18.2	<0.05
IQR	13.9	19.2	17.1	28.7	
Range	7.6–42.1	10.2–53.9	9.8–46.2	18.5–88.1	
No	1080	1023	1002	995	
TVOCs, ppb					
Mean $\pm$ SD	55.2 $\pm$ 18.2	77.5 $\pm$ 41.8	69.1 $\pm$ 36.8	100.5 $\pm$ 32.8	
IQR	23.2	42.9	37.4	72.1	
Range	21.0–78.6	31.0–139.8	26.0–110.2	52.5–210.2	
No	1080	992	1018	943	

HRV index

	Subway	Bus	Car	Walking	ANOVA <u>p-value</u>
Temperature, °C					
Mean ± SD	23.7 ± 1.3	23.9 ± 1.4	23.1 ± 1.1	22.3 ± 1.8	0.82
Range	20.3–24.2	19.8–25.5	19.6–24.3	18.2–23.1	
Relative humidity, %					
Mean ± SD	69.4 ± 1.7	72.0 ± 1.6	65.8 ± 0.9	69.1 ± 1.5	0.67
Range	61.1–70.8	64.0–77.5	58.2–71.4	60.1–83.0	
Noise, dBA					
Mean ± SD	66.0 ± 7.8	72.5 ± 11.3	63.1 ± 8.6	81.2 ± 12.5	<0.05
Range	58.4–81.9	63.5–97.2	51.1–84.3	76.2–110.7	
Log ₁₀ SDNN, msec					
Mean ± SD	1.91 ± 0.22	1.69 ± 0.18	1.79 ± 0.13	1.48 ± 0.29	<0.05
Range	0.95–2.43	0.81–2.10	1.10–1.75	0.65–1.98	
Log ₁₀ r-MSSD, msec					
Mean ± SD	1.61 ± 0.23	1.29 ± 0.29	1.44 ± 0.21	1.02 ± 0.18	<0.05
Range	0.53–2.17	0.61–1.88	0.51–2.13	0.43–1.87	

空氣污染傷心 走路影響比搭捷運高8倍

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國內研究，走路通勤者暴露到的細懸浮微粒是搭捷運2倍，增加罹患心血管疾病、猝死率。（中央社檔案照片）

（中央社記者龍珮亭台北2日電）國內研究，走路通勤者暴露到的細懸浮微粒（PM2.5）是搭捷運2倍；走路通勤對心臟自主神經不良影響比捷運高8.65倍，增加未來患心血管疾病、猝死率。

台北醫學大學醫學系公共衛生學科副教授莊凱任研究團隊最新發表一篇研究通勤交通工具對於年輕成年人空氣暴露及心血管疾病的影響，研究刊登在國際衛生與環境保護雜誌。

研究團隊收集測試者，並依平日通勤意願分類為走路、搭捷運、搭公車、自行開車，並在台北收

室內自我防護措施

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一、空氣清淨機

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Review Article

Health benefits of particle filtration

W. J. Fisk

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W. J. Fisk
Indoor Environment Group
Lawrence Berkeley National Laboratory
1 Cyclotron Rd. 90R3058
Berkeley
CA 94720, USA
Tel.: 510 486 5910
Fax: 510 486 6658



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Abstract

The evidence of health benefits of particle filtration in homes and commercial buildings is reviewed. Prior reviews of papers published before 2000 are summarized. The results of 16 more recent intervention studies are compiled and analyzed. Also, reviewed are four studies that modeled health benefits of using filtration to reduce indoor exposures to particles from outdoors. Prior reviews generally concluded that particle filtration is, at best, a source of small improvements in allergy and asthma health effects; however, many early studies had weak designs. A majority of recent intervention studies employed strong designs and more of these studies report statistically significant improvements in health symptoms or objective health outcomes, particularly for subjects with allergies or asthma. The percentage improvement in health outcomes is typically modest, for example, 7% to 25%. Delivery of filtered air to the breathing zone of sleeping allergic or asthmatic persons may be more consistently effective in improving health than room air filtration. Notable are two studies that report statistically significant improvements, with filtration, in markers that predict future adverse coronary events. From modeling, the largest potential benefits of indoor particle filtration may be reductions in morbidity and mortality from reducing indoor exposures to particles from outdoor air.

智慧 空氣清淨機 銷量增5成

可測PM2.5 空氣檢測儀也熱賣

2016年04月28日 傳送

f 讚 76

G+ 0

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空氣檢測儀有助隨時隨地注意家中空氣品質。

台灣近期飽受空污威脅，長期吸入細懸浮微粒，會增加心血管疾病及呼吸道疾病風險。防範空污侵襲儼然成為全民運動，根據樂天市場發現，3月空污關鍵字的搜尋量相較前個月成長3成，熱銷品項為空氣清淨機和空氣檢測儀，其中空氣檢測儀愈來愈受歡迎，單周衝上3C家電關鍵字的前5名，

PChome24h購物也指出，具有監測空氣品質功能的空氣清淨機備受消費者青睞，3月

相較去年2月開賣初期銷量成長超過5成。

報導／林明佳 攝影／施偉平 部分圖片／業者提供



空氣污染問題會危害呼吸道和肺部，還可能增加肺炎風險。

空氣污染問題愈趨嚴重，行政院環境保護署設立「空氣品質監測網」，可查詢各地空氣品質和懸浮微粒(particulate matter, PM)狀況，其中粒徑等於或小於2.5微米的細懸浮微粒，就簡稱為PM2.5，對健康危害更大，尤其受到矚目。樂天市場就發現，民眾現在不僅會注意到室外的空氣髒污，也會注意到室內的空氣品質，因此空氣檢測儀的銷量今

Long-term indoor air conditioner filtration and cardiovascular health: A randomized crossover intervention study



Hsiao-Chi Chuang^{a,b,c}, Kin-Fai Ho^{d,e,f}, Lian-Yu Lin^g, Ta-Yuan Chang^h, Gui-Bing Hongⁱ, Chi-Ming Ma^j, I-Jung Liu^k, Kai-Jen Chuang^{l,*}

^a School of Respiratory Therapy, College of Medicine, Taipei Medical University, Taipei, Taiwan

^b Division of Pulmonary Medicine, Department of Internal Medicine, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan

^c Department of Internal Medicine, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

^d The Jockey Club School of Public Health and Primary Care, The Chinese University of Hong Kong, Hong Kong, China

^e Key Laboratory of Aerosol Chemistry and Physics, SKLQG, Institute of Earth Environment, Chinese Academy of Sciences, Xian, 710075, China

^f Shenzhen Municipal Key Laboratory for Health Risk Analysis, Shenzhen Research Institute of the Chinese University of Hong Kong, Shenzhen, China

^g Division of Cardiology, Department of Internal Medicine, National Taiwan University Hospital, Taipei, Taiwan

^h Department of Occupational Safety and Health, College of Public Health, China Medical University, Taichung, Taiwan

ⁱ Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, Taipei, Taiwan

^j Department of Cosmetic Application and Management, Saint Mary's Junior College of Medicine, Nursing and Management, Yilan County, Taiwan

^k Department of Nursing, Cardinal Tien College of Healthcare & Management, New Taipei City, Taiwan

^l Department of Public Health, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

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二、抽油煙機？

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廚房油煙堵塞 不菸夫婦肺腺癌-[聯合報]

張嘉芳/聯合報

「肺癌也會傳染？」六十多歲的婦人，兩年前先生因肺腺癌病逝，兩人皆不吸菸，卻相繼罹癌，婦人一度以為肺癌會傳染。清理環境發現，廚房排油煙管阻塞恐是夫妻罹癌的原因之一。

「癌症不會傳染。」台灣癌症基金會執行長賴基銘說，癌症是基因疾病，主要是自體正常細胞基因變異，突變基因經過廿、卅年累積，轉換成癌症。這對六旬夫婦一輩子都不抽菸，但廚房油煙排不出去，家中瀰漫炒菜油煙，夫婦長期吸入環境煙塵，恐是相繼罹患肺腺癌的重要因素。

台大醫學院院長楊泮池表示，不抽菸也會罹患肺腺癌，主要與亞洲人的基因、家族史及環境汙染等因素有關，尤其女性肺腺癌患者有九成都不抽菸，男性肺腺癌患者約三至四成無抽菸病史。

楊泮池說，目前已知有十多個基因可能導致基因突變、罹患癌症，動物實驗證實會引起肺腺癌。進一步分析，肺腺癌有百分之五十五為上皮細胞受體突變，標靶藥物對於基因突變的肺癌治療效果不錯，且健保也有給付。

楊泮池建議，肺癌患者應做基因檢測，若有基因突變，使用標靶藥物配合化療，患者五年存活率可達百分之廿二，較世界水準的百分之十五高。

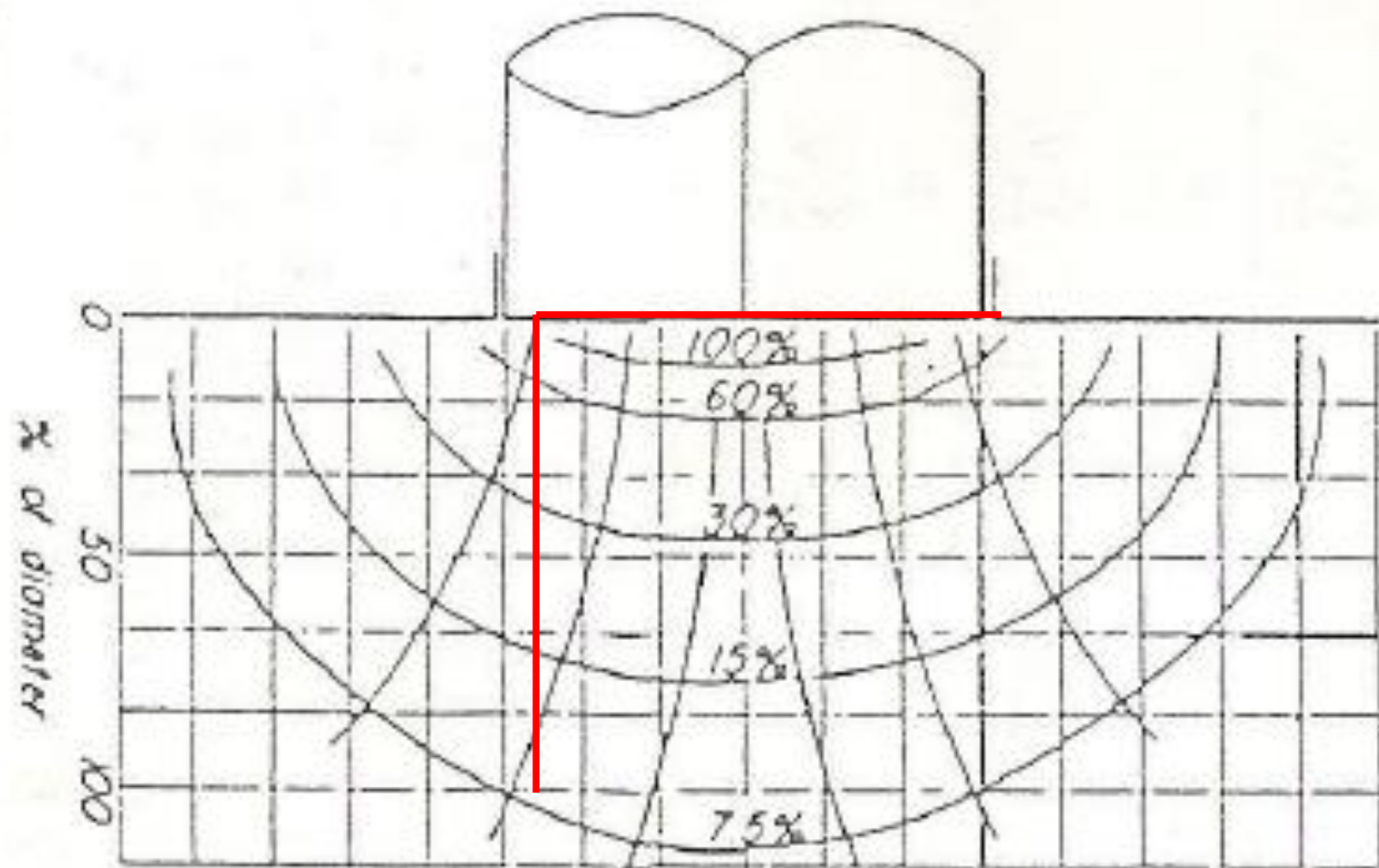
台北榮民總醫院胸腔腫瘤科主任蔡俊明說，低劑量電腦斷層掃描（C T）是肺癌篩檢有效工具；健康科學文教基金會董事長吳成文說，C T雖有輻射、費用高，但可減百分之廿肺癌死亡率。

有機溶劑中毒預防規則局部排氣裝置控制風速之規定(已刪除)

局部排氣裝置之性能

氣罩之型式		控制風速(公尺/每秒)
包圍型氣罩		0.4
外裝型氣罩	側邊吸引式	0.5
	下方吸引式	0.5
	上方吸引式	0.8
註一：本表中之控制風速係指開放全部設置之氣罩時之控制風速。		
註二：本表中之控制風速依氣罩型式，包圍型氣罩係指氣罩開口面任一點之最低速。外裝型氣罩係指氣罩吸引有機溶劑蒸氣之發散範圍內，距該氣罩開口面最遠距離之作業位置之風速。		

氣罩入口風速分布





蒲氏風力 級數表

9	烈風 Strong gale	20.8 - 24.4
10	暴風 Storm	24.5 - 28.4
11	狂風 Violent storm	28.5 - 32.6
12	颶風 Hurricane	32.7 - 36.9

級數	國際標準 (由WMO公布)					香港標準		風浪對照			陸地情形； 海面情形
	名稱	風速				名稱	風速 km/h	名稱	一般	最大	
		m/s	km/h	knot	mph				m		
0	無風 Calm	0 - 0.2	< 1	< 1	< 1	無風	< 2	—	—	—	靜，煙直上； 海面如鏡。
1	軟風 Light air	0.3 - 1.5	1 - 5	1 - 3	1 - 3	輕微	2 - 6	微波	0.1	0.1	炊煙可表示風向，風標不動； 海面有鱗狀波紋，波峰無泡沫。
2	輕風 Light breeze	1.6 - 3.3	6 - 11	4 - 6	4 - 7		7 - 12		0.2	0.3	風拂面，樹葉有聲，普通風標轉動； 微波明顯，波峰光滑未破裂。
3	微風 Gentle breeze	3.4 - 5.4	12 - 19	7 - 10	8 - 12	和緩	13 - 19	小波	0.6	1.0	樹葉及小枝搖動，旌旗招展； 小波，波峰開始破裂，泡沫如珠，波峰偶泛 白沫。
4	和風 Moderate breeze	5.5 - 7.9	20 - 28	11 - 16	13 - 18		20 - 30		1.0	1.5	塵沙飛揚，紙片飛舞，小樹幹搖動； 小波漸高，波峰白沫漸多。
5	清風 Fresh breeze	8.0 - 10.7	29 - 38	17 - 21	19 - 24	清勁	31 - 40	中浪	2.0	2.5	有葉之小樹搖擺，內陸水面有小波； 中浪漸高，波峰泛白沫，偶起浪花。
6	強風 Strong breeze	10.8 - 13.8	39 - 49	22 - 27	25 - 31	強風	41 - 51	大浪	3.0	4.0	大樹枝搖動，電線呼呼有聲，舉傘困難； 大浪形成，白沫範圍增大，漸起浪花。
7	疾風 Near gale	13.9 - 17.1	50 - 61	28 - 33	32 - 38		52 - 62		4.0	5.5	全樹搖動，迎風步行有阻力； 海面湧突，浪花白沫沿風成條吹起。
8	大風 Gale	17.2 - 20.7	62 - 74	34 - 40	39 - 46	烈風	63 - 75	巨浪	6.0	7.5	小枝吹折，逆風前進困難； 巨浪漸升，波峰破裂，浪花明顯成條沿風吹起。
9	烈風 Strong gale	20.8 - 24.4	75 - 88	41 - 47	47 - 54		76 - 87		7.0	10.0	煙突屋瓦等將被吹損； 猛浪驚濤，海面漸呈洶湧，浪花白沫增濃， 減低能見度。
10	暴風 Storm	24.5 - 28.4	89 - 102	48 - 55	55 - 63	暴風	88 - 103	猛浪	9.0	12.5	陸上不常見，見則拔樹倒屋或有其他損毀； 猛浪翻騰波峰高聳，浪花白沫堆集， 海面一片白浪，能見度減低。
11	狂風 Violent storm	28.5 - 32.6	103 - 117	56 - 63	64 - 72		104 - 117		11.5	16.0	陸上絕少，有則必有重大災害； 狂濤高可掩蔽中小海輪，海面全為白浪 掩蓋，能見度大減。
12	颶風 Hurricane	32.7 - 36.9	118 - 133	64 - 71	73 - 82	颶風 118 - 135	14.0		—	— 空中充滿浪花白沫，能見度惡劣。	



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媽媽！為了一家大小，請您炒菜『戴口罩』

◎ 職業醫學科暨實證醫學中心/鄭世隆主任

油煙是台灣女性的頭號殺手？

根據世界衛生組織的統計，最近二十年來全世界的癌症死亡率正快速上升，其中以肺癌的死亡率增加最快。肺癌除了跟抽菸及二手菸有關，還與廚房油煙、遺傳基因、空氣污染等有關，醫生呼籲四十歲後應定期做胸部X光檢查。

肺癌的可怕應重視

在台灣地區，自1999年起，肺癌已經躍升成為所有癌症死亡率的第一位。在男性中，抽菸是導致肺癌的最主要成因，90%的肺癌是因抽菸而引起的。在女性中，80%的肺癌卻是跟抽菸並無相關。不抽菸，卻長期吸入“二手菸”的人也同樣會遭受傷害。外界環境致肺癌因素，如空氣污染，吸入石棉、鎘、砷、放射性氬氣等，也都可能導致肺癌。

呼籲媽媽們炒菜時應帶口罩，避免油煙吸入

台灣公共衛生學界的專家針對「女人不抽菸居然肺癌是頭號致死癌症」的謎題進行解謎，研究發現炒菜油煙侵入肺部可能是主要原因。這與中國人炒菜的習慣有關，覺得「火愈猛，青菜愈青」。高雄醫學大學公共衛生學系教授林慶銘估計，台灣婦女的肺癌約50%歸因於油煙，30%歸因於菸害（不管是否抽菸或二

N95?

FFP1?

FFP2?

活性炭？

外科口罩？

		N-系列	R-系列	P-系列
過濾效率	95%	N95	R95	P95
	99%	N99	R99	P99
	99.7%	N100	R100	P100
阻隔顆粒之性質		無法抵擋油質 (Not resistant to Oil)	可防護油性氣膠 (Resistant to Oil)	可防一般粉塵及油霧滴 (Oil Proof)
使用時限		通常無使用時限	時限為8小時	通常無使用時限

三、室內植物？

63

Top 10 Houseplant Air Cleaners

Based on an assessment¹⁷ of 50 houseplants by four criteria: 1) removal of chemical vapors, 2) ease of growth and maintenance, 3) resistance to insect infestation, and 4) transpiration rates. Wolverton says studies suggest houseplants are most effective in removing VOCs in energy-efficient, nonventilated buildings; in highly ventilated buildings, the rapid exchange of inside and outside air makes the benefits of houseplants mostly limited to their psychologic and aesthetic values.

1. Areca palm (*Chrysalidocarpus lutescens*)
2. Lady palm (*Rhapis excelsa*)
3. Bamboo palm (*Chamaedorea erumpens*)
4. Rubber plant (*Ficus elastica*)
5. Dracaena (*Dracaena decremensis* 'Janet Craig')
6. English ivy (*Hedera helix*)
7. Dwarf date palm (*Phoenix roebelenii*)
8. Ficus (*Ficus macleilandii* 'Alii')
9. Boston fern (*Nephrolepis exaltata* 'Bostoniensis')
10. Peace lily (*Spathiphyllum wallisii*)

Wolverton BC. How to Grow Fresh Air: 50 House Plants that Purify Your Home or Office. New York, NY:Penguin Books. 1997.

Claudio L. Planting healthier indoor air. Environ Health Perspect. 2011 Oct;119(10):A426-7.

10種室內空氣淨化植物

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1. 散尾葵/黃椰子/檳榔樹
2. 觀音棕竹
3. 袖珍椰子
4. 印度橡樹
5. 龍血樹
6. 常春藤
7. 江邊刺葵
8. 瘤枝榕
9. 波士頓蕨
10. 白鶴芋



KAMAL MEATTLE
大約十七年前，我開始對德里的空氣過敏。

“The Living Room Plant”

Areca Palm

(Chrysalidocarpus lutescens)



“The Bedroom Plant”

Mother-in-law's Tongue

(Sansevieria trifasciata)



虎尾蘭和黃金葛。

“The Specialist Plant”

Money Plant

(Epipremnum aureum)





文獻顯示楊樹及銀杏吸收污染物能力亦佳，但楊樹較為特別，一方面能吸收不少空氣中的污染物，另一方面在夏天又會釋放有機化合物。戴指，部份植物在氣溫和暖時，會釋放有機化合物如異戊二烯

（Isoprene），若與汽車釋放的一氧化氮結合及陽光照射，便會產生臭氧，不但抵銷植物吸收臭氧的功能，反而會導致臭氧增加，增加了空氣中的污染物。

立院周邊交管看這邊(8272)

杏等，吸收污染物能力較強，但部份植物卻會釋放有機化合物，與汽車排放的一氧化氮結合便會產生臭

即時

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高溫逾35度 樹下乘涼會傷身？



2016-06-29

〔記者吳亮儀／台北報導〕天氣太熱，不少民眾會躲到樹下乘涼，但樹木揮發有機物異戊二烯會和空氣污染物結合產生二次污染。生物科主任顏宗海特別提醒住在都市裡的民眾注意，避免在樹下乘涼，民眾天熱時最好別在樹下乘涼。



芬多精結合空污形成臭氧

長庚毒物實驗室團隊在「俠醫」林杰樑臉書貼文，指出根據研究，樹木在攝氏卅五度高溫下，會釋出比平常多十倍的芬多精，一旦空氣中有一氧化氮和二氧化氮等空氣污染物時，芬多精和樹木釋出的揮發有機物異戊二烯結合後，會形成臭氧。



興大教授駁俠醫臉書說法

王升陽說，這個誤解是在一九八〇年代，美國杜克大學研究團隊發現高溫下樹梢有集結氣體，研究發現就是異戊二烯，但它會往上飄，不會沉積在樹下，若大量異戊二烯集結，反而會破壞臭氧層。

臭氧層離地面高度卅公里，王升陽說，若持續高溫讓植物持續釋放大量異戊二烯，科學理論上的確可能破壞臭氧，但只要下個雨或降溫就沒事了。王升陽也說，異戊二烯很輕、會往上飄，除非在封閉空間內且異戊二烯和空污氣體濃度高，否則不會對人體有傷害，更何況在開放空間的公園內，去公園樹下乘涼一點問題都沒有。



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journal homepage: www.elsevier.com/locate/envint



Indoor ozone levels, houseplants and peak expiratory flow rates among healthy adults in Taipei, Taiwan



Li-Te Chang^a, Gui-Bing Hong^b, Shao-Ping Weng^c, Hsiao-Chi Chuang^{d,e,f}, Ta-Yuan Chang^g, Chien-Wei Liu^h, Wan-Yu Chuangⁱ, Kai-Jen Chuang^{e,i,*}

^a Department of Environmental Engineering and Science, Feng Chia University, Taichung, Taiwan

^b Department of Chemical Engineering and Biotechnology, National Taipei University of Technology, Taipei, Taiwan

^c IHMED Fertility Center, Taipei, Taiwan

^d School of Respiratory Therapy, College of Medicine, Taipei Medical University, Taipei, Taiwan

^e Division of Pulmonary Medicine, Department of Internal Medicine, Shuang Ho Hospital, Taipei Medical University, New Taipei City, Taiwan

^f Department of Internal Medicine, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

^g Department of Occupational Safety and Health, College of Public Health, China Medical University, Taichung, Taiwan

^h Department of Information Management, St. Mary's Junior College of Medicine, Nursing and Management, Yilan, Taiwan

ⁱ Department of Public Health, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan

期刊領域：環境科學 (ENVIRONMENTAL SCIENCES)

期刊排名：2.9% (7/242)

影響因子：7.297

2014/1/1 – 2014/12/31於大臺北地區：

72

30個家庭擺放室內植物
15男15女家管

平均36.3歲

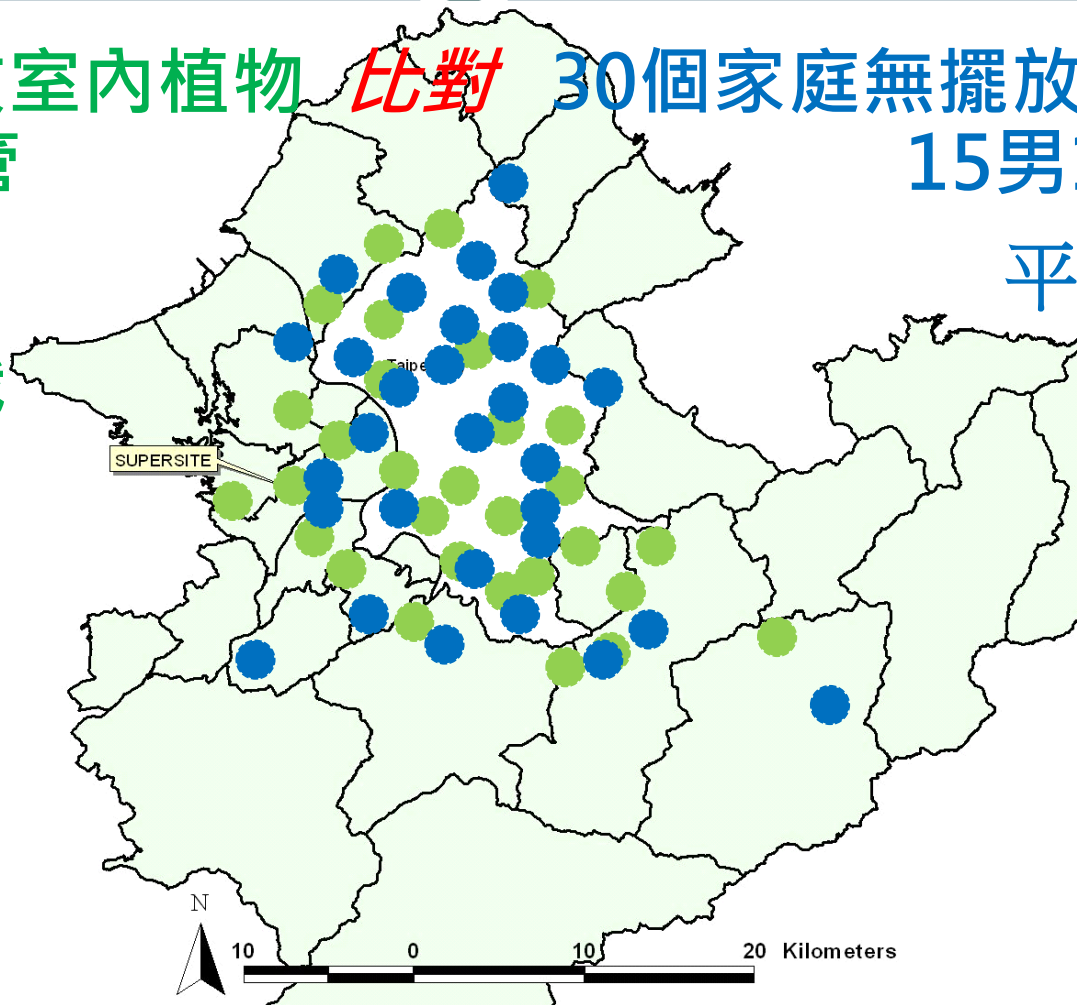
平均12盆植栽

比對

30個家庭無擺放室內植物
15男15女家管

平均36.4歲

0盆栽



每人每個月進行一次 室內空氣品質檢測與肺功能檢查

73

測量PM_{2.5}



測量尖峰吐氣流速



測量異戊二烯 (芬多精)



測量臭氧



2014/1/1 – 2014/12/31於大臺北地區：

74

30個家庭擺放室內植物
PM_{2.5}: 11.8 微克/立方公尺

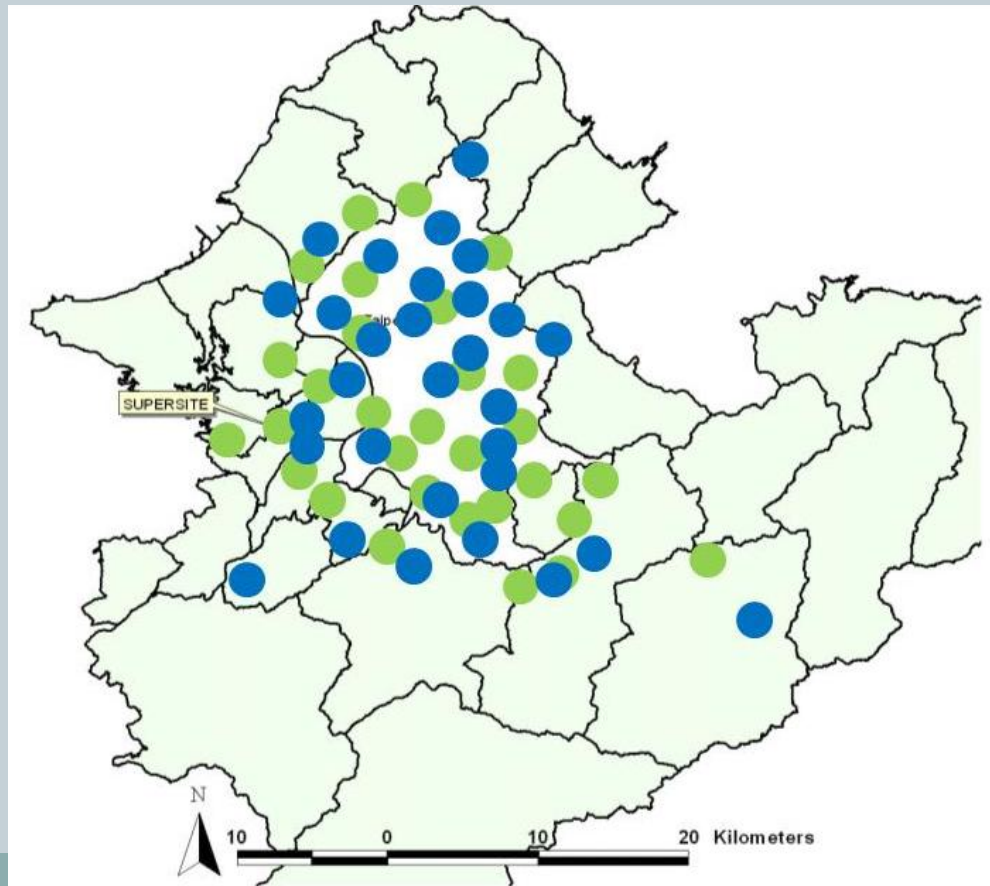
比對

30個家庭無擺放室內植物
PM_{2.5}: 15.2 微克/立方公尺

明顯降低22.4%

環境保護署室外空
氣品質年平均標準
15 微克/立方公尺

環境保護署室內空
氣品質日平均標準
35 微克/立方公尺



2014/1/1 – 2014/12/31於大臺北地區：

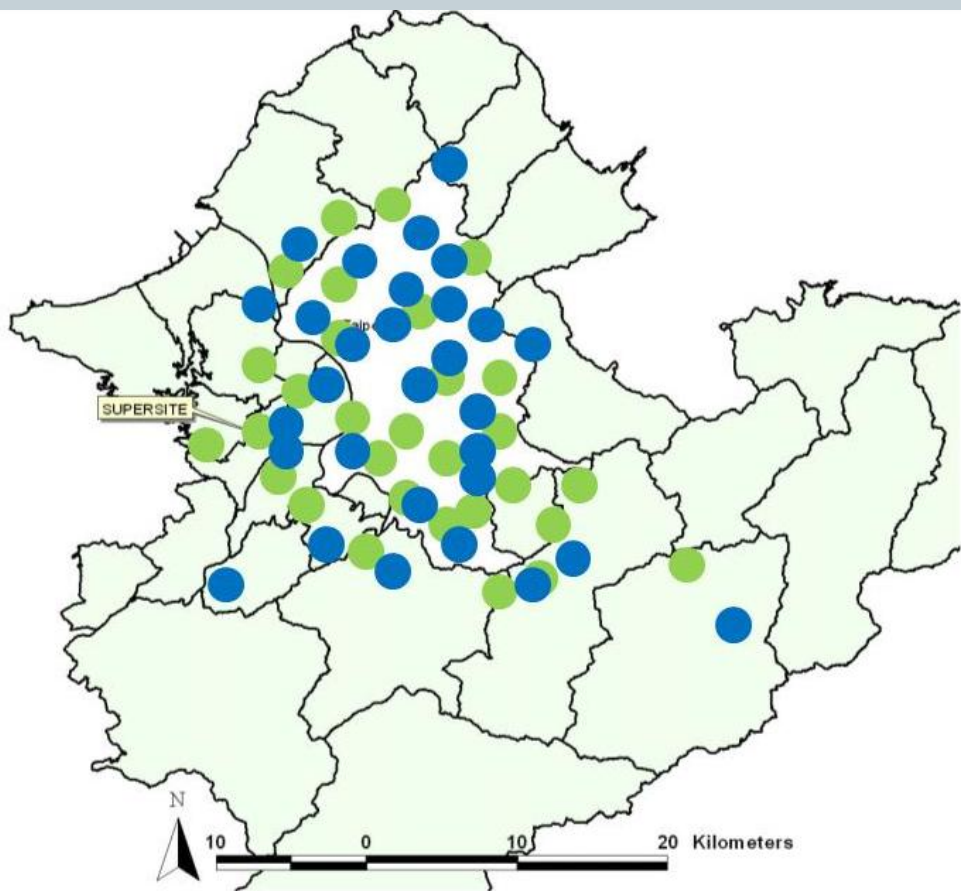
75

30個家庭擺放室內植物
尖峰吐氣流速不受影響

比對

30個家庭無擺放室內植物
尖峰吐氣流速降低2.01%

上述統計模型已校正
年齡、性別、溫濕度
身體質量指數等因子



夏季室內臭氧濃度值得注意！

30個家庭擺放室內植物

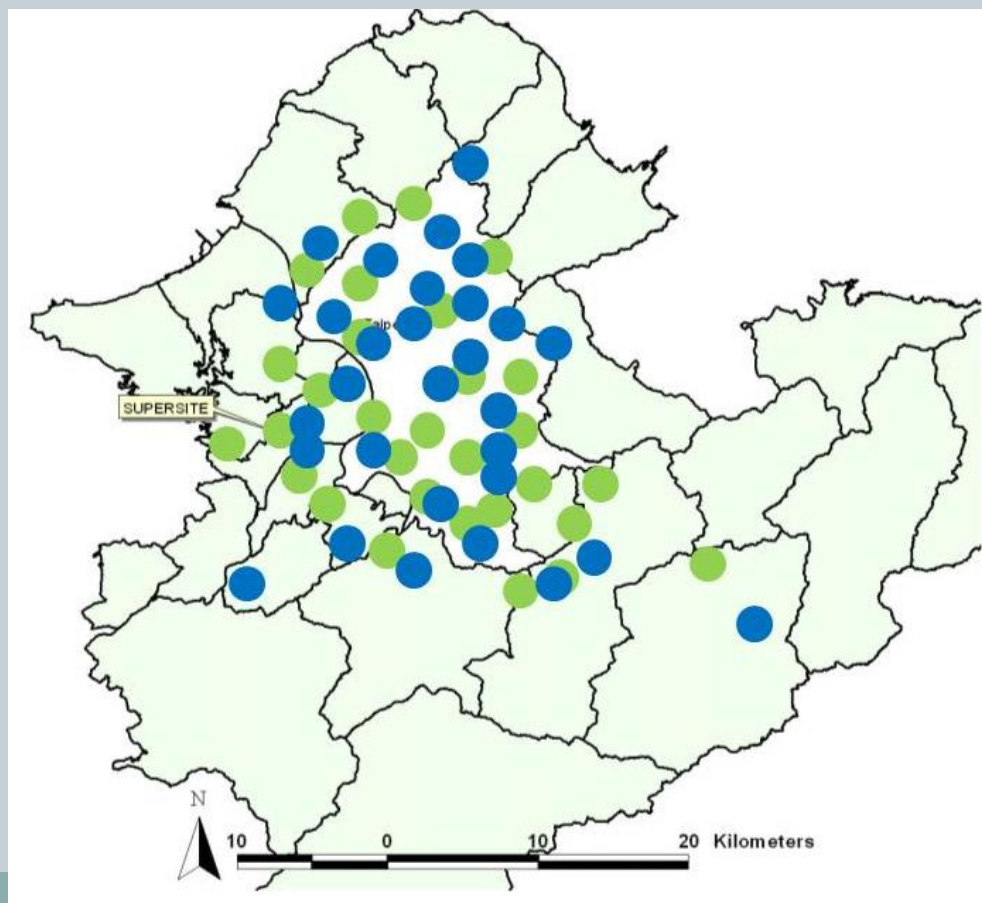


30個家庭無擺放室內植物

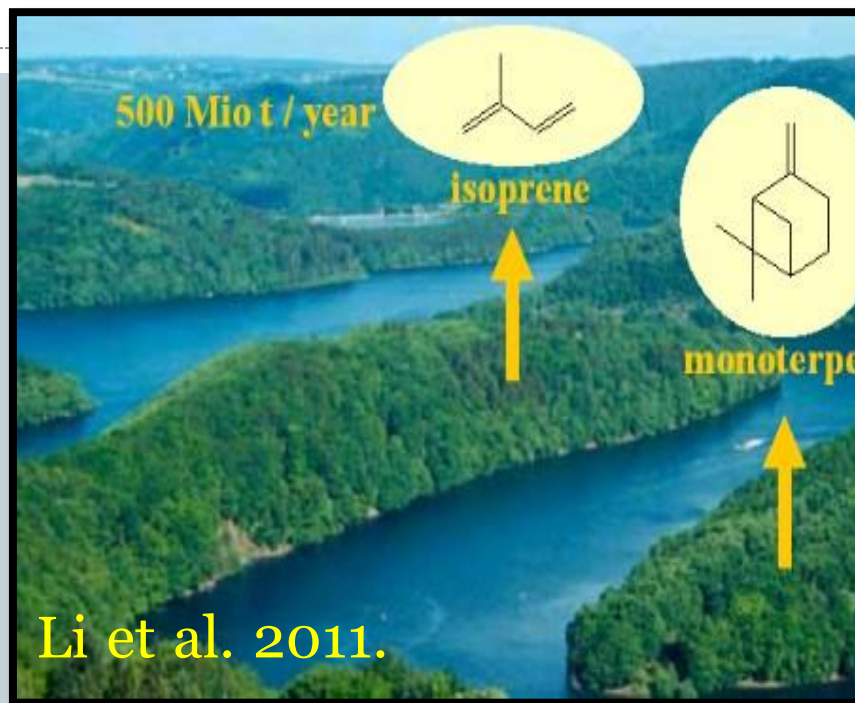
臭氧: 59.7ppb

臭氧: 36.2ppb

環境保護署室內外
空氣品質臭氧8小
時平均標準60ppb



氣溫介於30至40度間芬多精大量產生形成臭氧



解決之道：控制室內溫度低於30度

77

自由時報
Liberty Times Net

即時 報紙 焦點 政治 社會 地方 生活 言論 國際 財經 體育

首頁 > 生活

高溫逾35度 樹下乘涼會傷身?

2016-06-29

〔記者吳亮儀／台北報導〕天氣太熱，不少民眾會到樹下乘涼，但長庚毒物科團隊提醒，樹木揮發有機物異戊二烯會和空氣污染物結合產生臭氧，吸入可能更傷身體。林口長庚毒物科主任顏宗海特別提醒住在都市裡的民眾注意，因為都市空氣污染嚴重，像車輛和工業廢氣等，民眾天熱時最好別在樹下乘涼。

芬多精結合空污形成臭氧

長庚毒物實驗室團隊在「俠醫」林杰樑臉書貼文，指出根據研究，樹木在攝氏卅五度高溫下，會釋出比平常多十倍的芬多精，一旦空氣中有一氧化氮和二氧化氮等空氣污染物時，芬多精和樹木釋出的揮發有機物異戊二烯結合後，會形成臭氧。

自由體育 自由娛樂 自由評論網 style 3C科技

ポイント10倍 送料無料

Bricks

INCENSE MOST x2 送料無料

JUSDAO MADE IN JAPAN 送料無料 設備設置サービス無料

送料無料

Twitter f 讚 分享 35

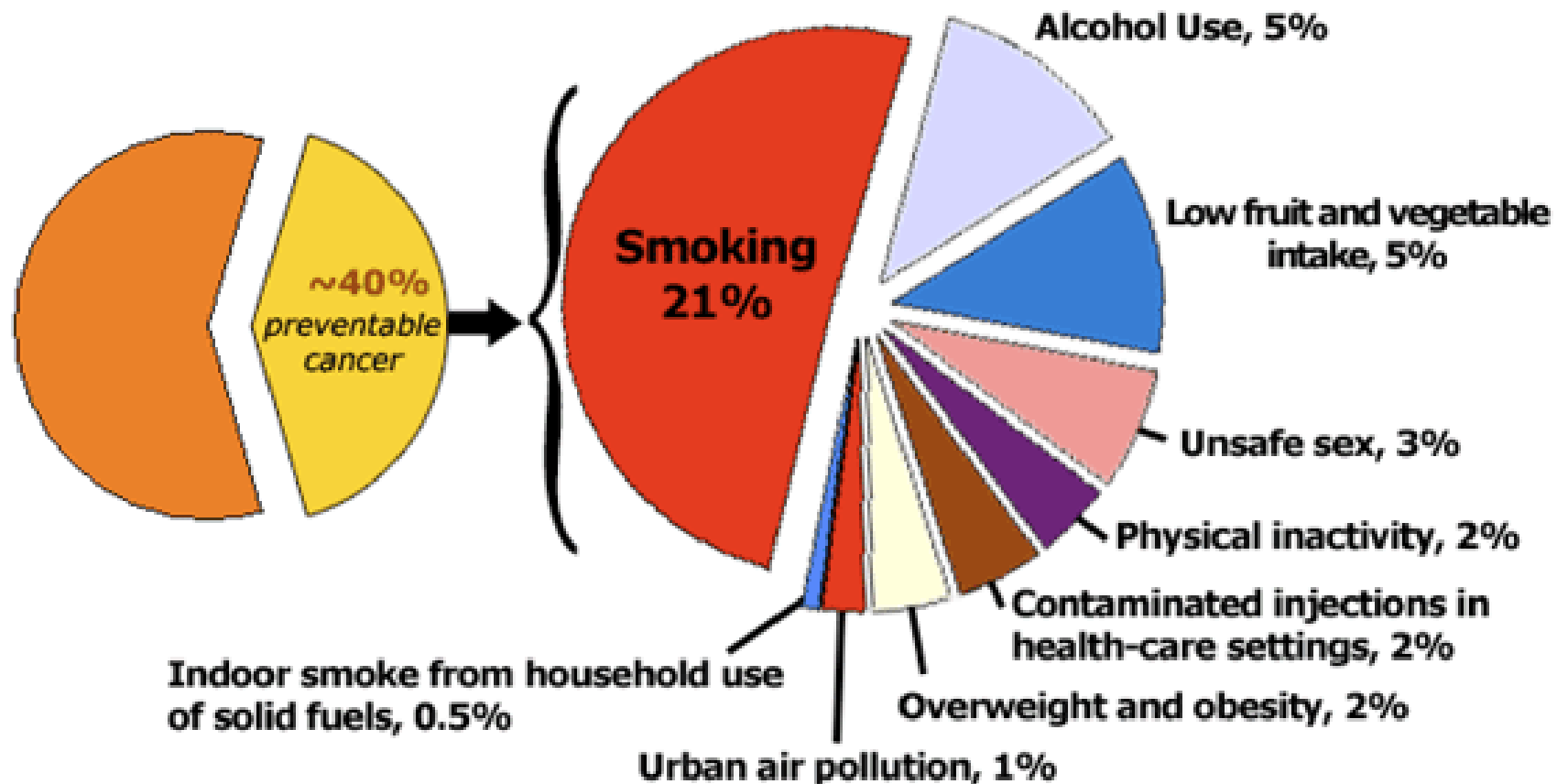
空氣污染對健康之影響？

78

癌症危險因子

79

- 飲食：35%
- 吸煙：30%
- 生殖：7%
- 職業：4%
- 飲酒：3%
- 地理：3%
- 污染：2%
- 醫療與藥物：1%
- 食品添加物：< 1%
- 工業產品：< 1%
- 感染：？



Danaei G, Vander Hoorn S, Lopez AD, Murray CJ, Ezzati M. Causes of cancer in the world: comparative risk assessment of nine behavioural and environmental risk factors *The Lancet*, 2005, 366:1784-1793

http://www.oxygenforlife.co.za/whyuse_cellfood.asp

飲食、運動與空氣污染？

81

1.維生素C：維生素C是地球上最重要的抗氧化物之一，能幫助組織生長與修復的能力，早為世人所熟知。而今研究還發現了一個需要多吃柳橙和檸檬的理由，維生素C能保護我們免受汽車廢氣和發電廠等空氣污染的負面影響。

▶[看更多：奇異果維生素C高，吃了皮膚水噹噹](#)

2.大蒜：常吃生大蒜，肺癌風險有望降低近半，研究發現，生吃大蒜在某種程度上可以保護肺部，甚至可以降低近一半患肺癌的可能性。

▶[看更多：吃蒜頭增強免疫力，防癌一級棒！](#)

3.胡蘿蔔素：多吃含有胡蘿蔔素的食物，有助於身體「排毒」。

▶[看更多：胡蘿蔔維生素A最豐富，護眼睛好犀利](#)

4.綠茶：平時多喝綠茶，充分利用茶多酚和礦物質，增強抗氧化功效，也能有效提升人體對抗霧霾，對抗空氣污染的能力。

▶[看更多：「熱感冒」，薄荷綠茶可預防](#)

《日常生活7個因應對策》

空氣污染對人體是明顯的外在壓力來源，作用於呼吸道及肺部組織，暴露在污染的空氣中會對健康造成負面影響，尤其對運動員的表現也會造成損害。然而，居住在都市環境中，想要徹底的與



好食材TV



5.要**避免吸入過多PM2.5細懸浮微粒**，除了要戒菸、更要避免二手菸、烹煮食物時記得開抽油煙機、減少寺廟拜拜時，燒香及燒紙錢的煙霧。

6.從室外進入屋內，要**確實執行個人衛生防護的動作**，例如洗手、洗臉、清潔鼻腔。

此外，又應該從哪些食物，得到有益於肺部的營養素呢？

1.**多吃蘋果**：英國聖喬治醫院附屬醫學院的研究人員發表在「胸腔醫學」期刊的研究報告指出，每星期吃五顆以上蘋果的男性，與不吃蘋果的男性相比較，愛吃蘋果的男性平均肺容積多出138毫升，顯示出肺部功能更為健康。

2.**多吃富含β-胡蘿蔔素及玉米黃質（cryptoxanthin）**等抗氧化物的食物，包括紅蘿蔔、紫色高麗菜、茄子、玉米、南瓜、木瓜等，都能夠保護肺部，預防肺癌。

3.**十字花科蔬菜(花椰菜)**可以預防肺癌並改善呼吸道相關疾病的症狀。因為十字花科蔬菜內含有β-胡蘿蔔素、類黃酮等抗氧化物質，還有豐富維生素C等，可有效預防肺部疾病。

4.2011年美國臨床營養學期刊(American Journal of Clinical Nutrition)的研究指出，**常吃豆類食品(豆腐、豆漿)**的女性比不常吃的女性可以減少23%罹患肺癌的風險，而不吸菸的民眾若常吃豆類食品會比不常吃的人更可以減少38%罹患肺癌的風險。

最後，潘老師預祝大家都能做到上述的六個良好生活習慣，多吃四類抗空污飲食，健健康康活到天年。

這4類食物，會加重空汙傷害

文 / Fooding台灣好食材編輯·圖片來源 / 王正毅、楊慧玉、《香草廚房花園》

👍 讚 293

❤ 1

👁 1597

面對空氣汙染，可以多吃些大蒜、綠茶，以及柑橘、檸檬等維生素C高的食物，提升保護力。
不過也要知道吃了哪些食物可能加重空汙傷害喔！



這4類食物少吃，可降低空汙傷害。



熱門文章



夏天就是要吃瓜！必學
麵瓜 5 料理



綠竹筍來報時-《飲食是
最美好的教養》



這4類食物少吃，可降低空汙傷害。

《這4類食物少吃，可降低空汙傷害》

佳禾診所羅明宇醫師表示，要降低空汙傷害，應少吃以下食物：

- 1.少喝飲料及少吃垃圾食物，不但可減少製造產品帶來的汙染，也能減少對人體健康的危害。
- 2.減少烹調食用油，因為烹調產生的油煙，是食用油或食物在高溫條件下，發生一系列變化後而形成的。
- 3.少吃燒烤食物，減少食物燒烤過程中產生的PM2.5，避免食物進入人體，對人體健康造成傷害。

► 看更多：蘸醬減鈉，健康吃燒烤！

- 4.少吃辛辣刺激的食物，因為人體抵禦顆粒物和污染物的第一道關卡是我們的鼻腔、氣管黏膜。



綠竹筍來報時-《
最美好的教養》

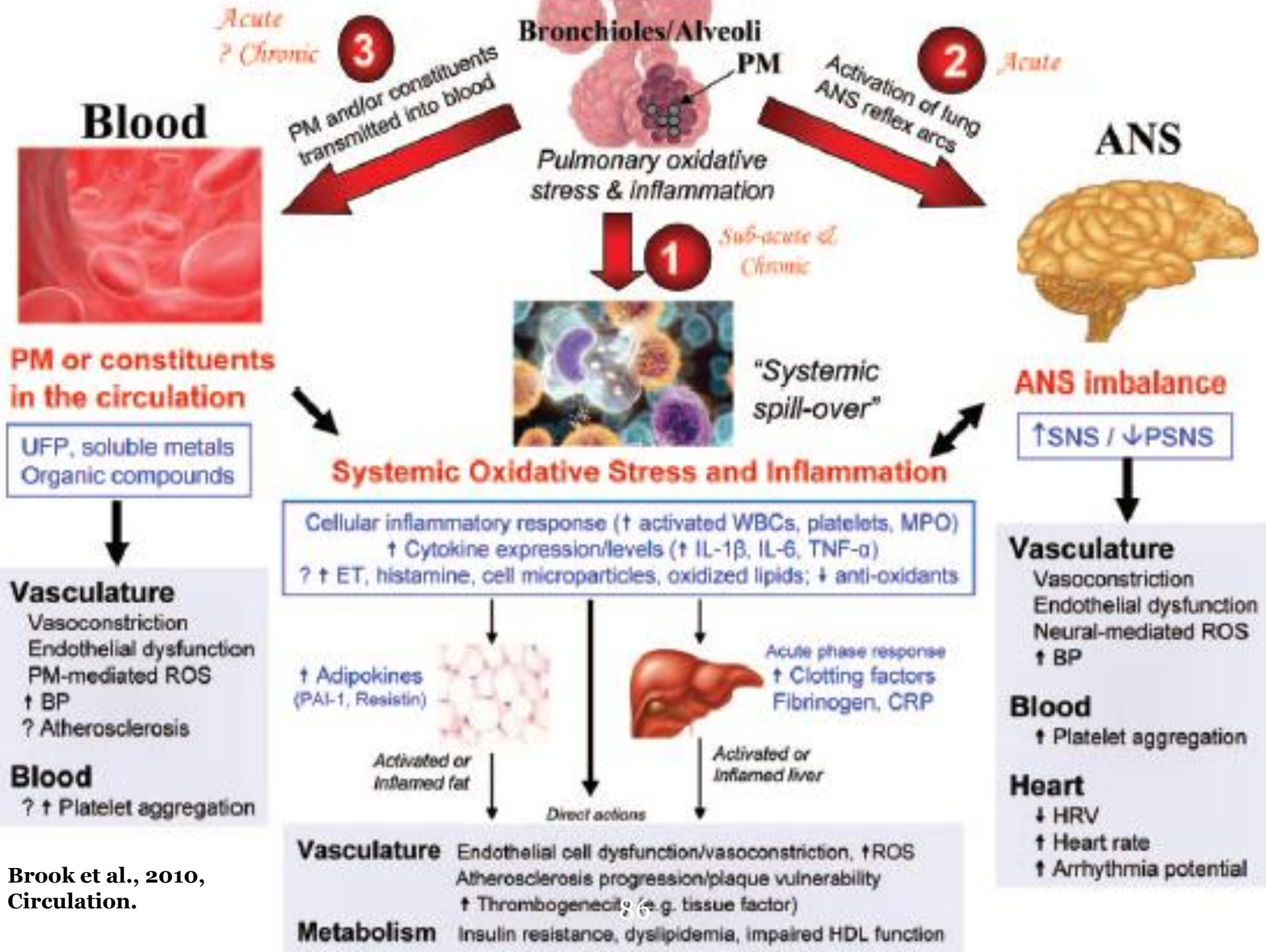


善用GI值選食物，
血糖好簡單

熱門食譜



【油蔥金針菇】就
仔這一味！



氧化與發炎反應

空氣污染時運動利大於弊

Cheung / 2015-04-02

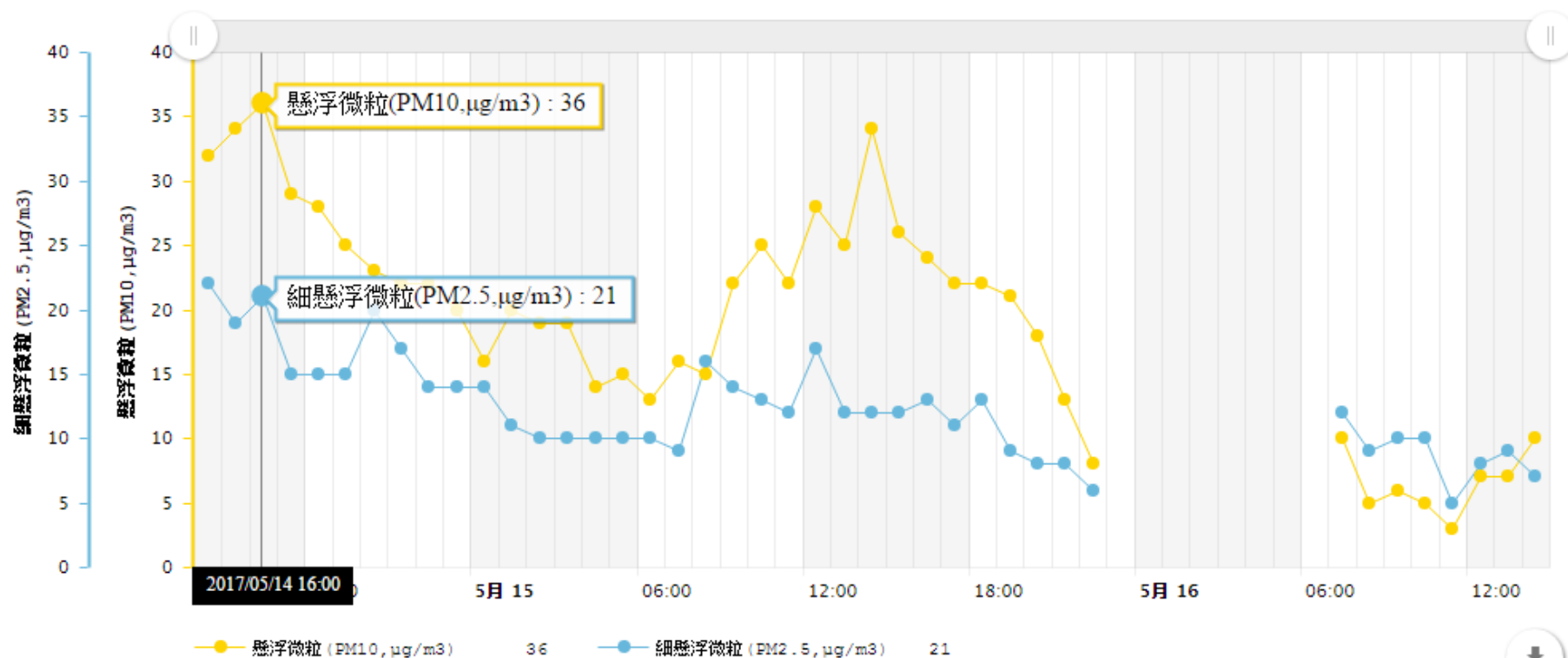
話說，現在空氣質量這麼不景氣，到底還能不能運動了？空氣污染和不運動，哪個對身體危害更大？最近，丹麥哥本哈根大學的一項新研究發現，對於過早死亡的風險而言，運動的有利影響比空氣污染的消極影響對人們的健康更重要。換句話說，運動的好處超過空氣污染的害處。



據美國每日科學網站3月30日報導，研究證明，儘管空氣污染對健康有不利影響，但在城市裡，不應將空氣污染視為運動的障礙。哥本哈根大學流行病學與篩查中心副教授佐拉娜·約萬諾維奇·安德森說：“即使對於生活在哥本哈根污染最嚴重區域的人們來說，跑一跑，走一走，或者騎車上班，都比呆著不動更有利健康。”這一研究結果發表在美國《環境狀況觀察》月

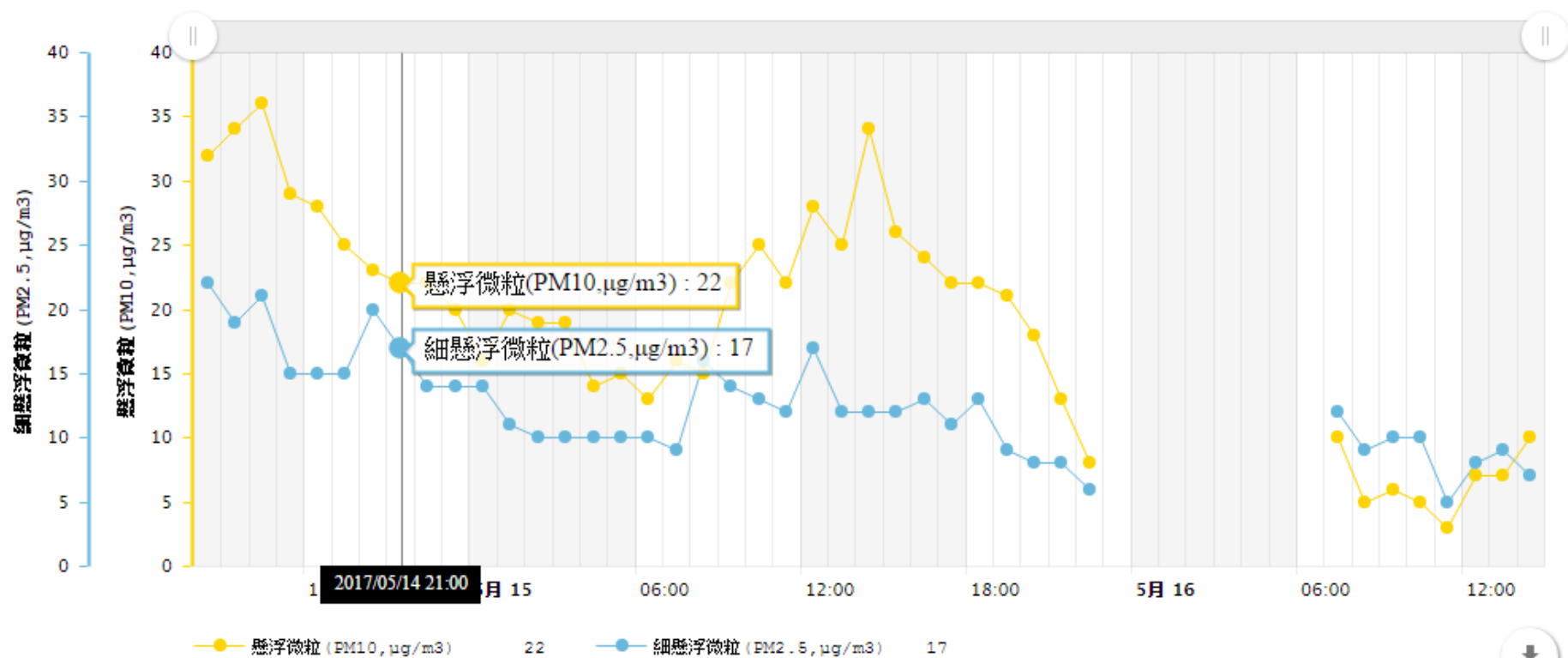
古亭

2017/05/14 14:00~2017/05/16 14:00



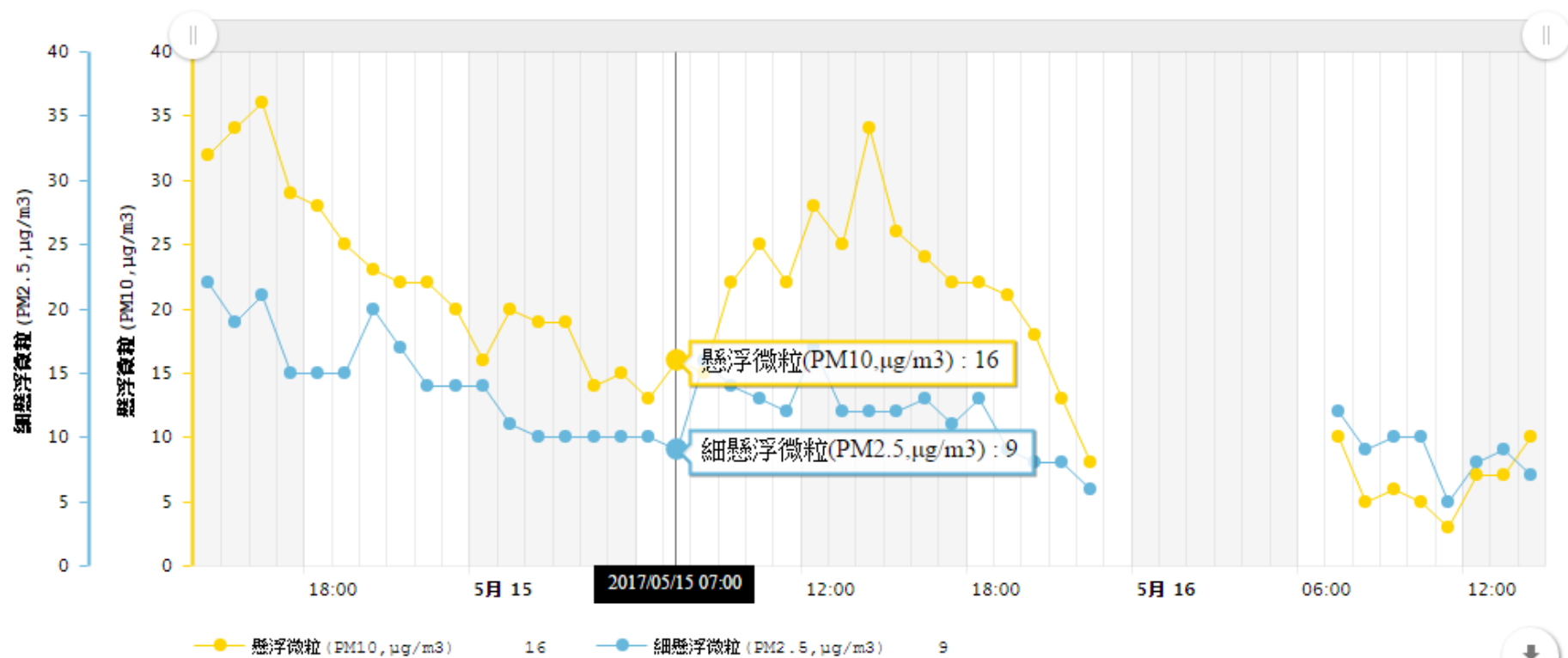
古亭

2017/05/14 14:00~2017/05/16 14:00



古亭

2017/05/14 14:00~2017/05/16 14:00



天冷愛上健身房？研究：空氣不通恐有損健康



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讚 11

分享

2014-12-10 16:28

〔即時新聞／綜合報導〕寒冷的冬天許多人會「轉移陣地」到健身房運動，最新研究發現，健身房空氣不流通，可能導致人體吸入有害物質。

據英國《電訊報》（The Telegraph）報導，一項由葡萄牙的里斯本大學（University of Lisbon）與荷蘭的代爾夫特科技大學（Delft University of Technology）共同發表研究指出，即使在寒冬，戶外運動比起在健身房恐怕還是更好選擇。



最新研究發現，健身房空氣不流通，可能導致人體吸入有害物質。（圖擷取自英國《電訊報》）

研究指出，不論是重訓室、健身房還是有氧舞蹈教室，空間空氣中都充滿高濃度的人造汙染物，且在白天人潮多的尖峰時段，健身中心的空調系統也因運轉不夠快速，無法保持空氣清淨，人長時間待在這些場所就會受到影響。

健身房的樣本空氣中發現含有一氧化碳以及有機揮發性化合物（VOCs），VOCs包括由地毯、清潔劑與健身器械釋放出的甲醛等。

里斯本大學研究員卡拉拉莫斯（Carla Ramos）表示，主要原因是空氣低流通率，拉莫斯和她的團隊測試了里斯本11間健身中心的空氣品質，發現產和世界各地的大城市非常類

結論

93

- 均衡飲食與運動
- 穿戴適合自己的口罩
- 裝設適合自己的空氣清淨設備
- 避免高溫烹調（大於攝氏100度）
- 避免使用揮發性有機化學物質（清潔劑、室內芳香劑）

Thank you for your attention