

Air Pollution and Elite Athletes

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14 - 1 - 2009**

What is air pollution?

Human introduction of pollutants:-

harmful to

people other creatures

& environments

Air Pollution

- Outdoor
- Indoor



Common Outdoor Pollutants (1)

- Respirable suspended particulates
可吸入懸浮粒子
- Nitrogen dioxide
二氧化氮
- Sulphur dioxide
二氧化硫

Common outdoor Pollutants (2)

- Photochemical oxidants (ozone)
光化學氧化劑 (臭氧)
- Carbon monoxide
一氧化碳
- Volatile organic compounds
揮發性有機化合物
- Lead 鉛

People at Risk (1)

- Asthma
- C O A D
- Coronary Heart Disease



People at Risk (2)



- Pregnancy
- Young
- Old

People at Risk (3)

- Vigorous exercisers
- + or - exercise induced asthma
- respiratory rate and depth
- pollutants absorption

Respirable Suspended Particulates (RSP)

- Tiny solid & liquid particle
- PM 10 & 2.5 micrometres
- Organic & inorganic
- Sulphate nitrates ammonia
carbon mineral dust water



Respirable Suspended Particulates (RSP)

- ↓ visibility
- Dust smoke soot
- Fossil fuels burning wood
- Agriculture
- Construction



Respirable Suspended Particulate < 10 micron

- PM-10
- Pass through URT → lungs
- Nose & throat irritation
- Bronchitis
- Lung damage
- Mutagenic



Nitrogen Dioxide (NO₂)

A red sports car is the central focus of the image, with a woman in a purple dress leaning against its hood. The background shows a modern interior with a large framed picture on the wall and a white cabinet.

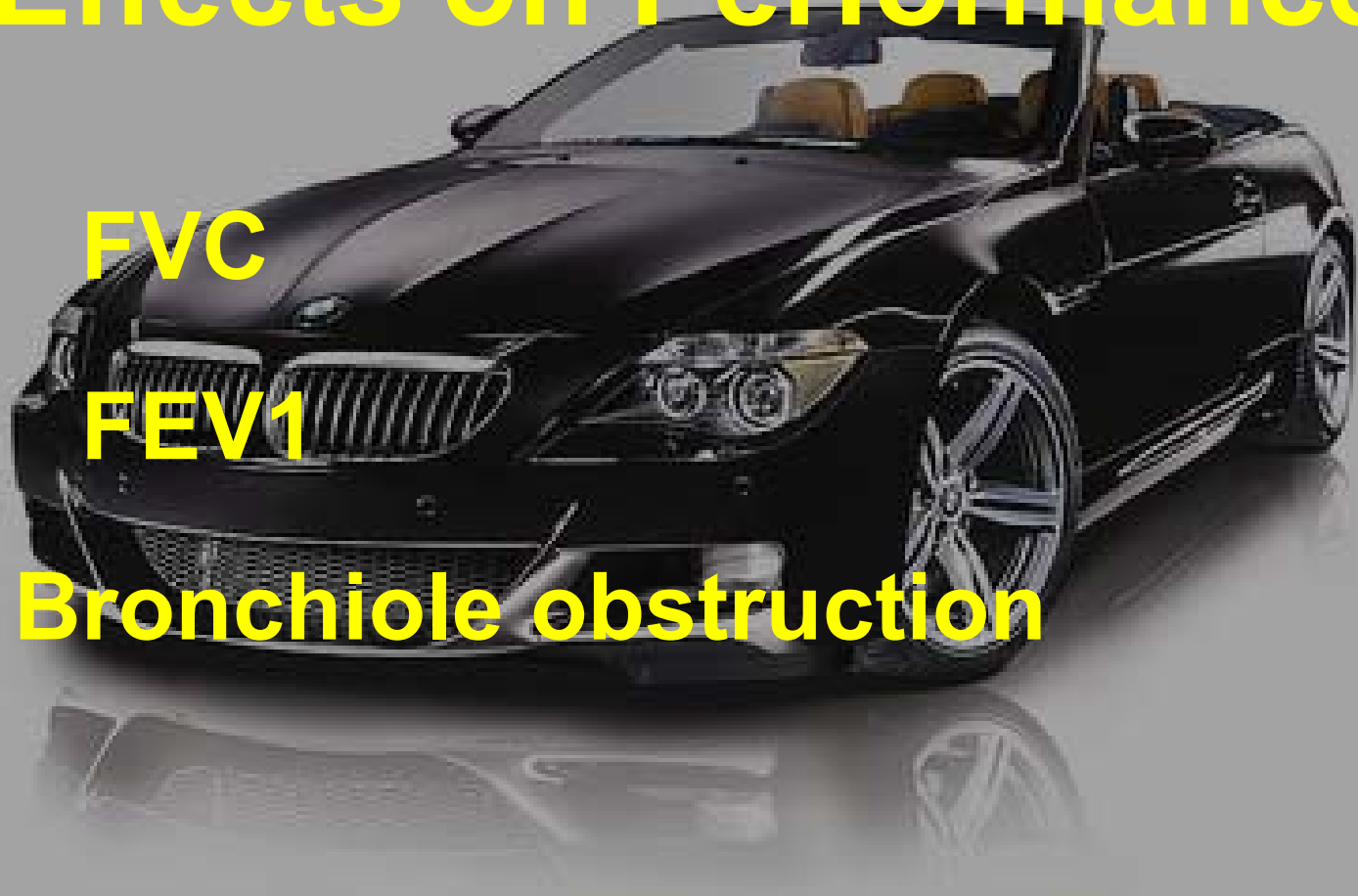
- Acid rain
- Burning of petrol, natural gas, coal
- Cars, ships, industrial plants
- Stoves, water heater
- + Other chemicals = P Matter
- + Sunlight + VOC = ozone

Nitrogen Dioxide (NO₂)

- Eye irritation
- Respiratory tract inflammation
- Cough, shortness of breath
- Lung damage

Effects on Performance

- FVC
- FEV1
- Bronchiole obstruction



Sulphur Dioxide (SO₂)

- Acid rain
- Burning of petrol, natural gas, coal, wood & charcoal
- Electrical plant 89%

Sulphur Dioxide (SO₂)

- Nasal symptoms
- Bronchoconstriction

Asthmatic – 0.25 ppm

Nonasthmatic – 2 ppm

Ozone (O₃)

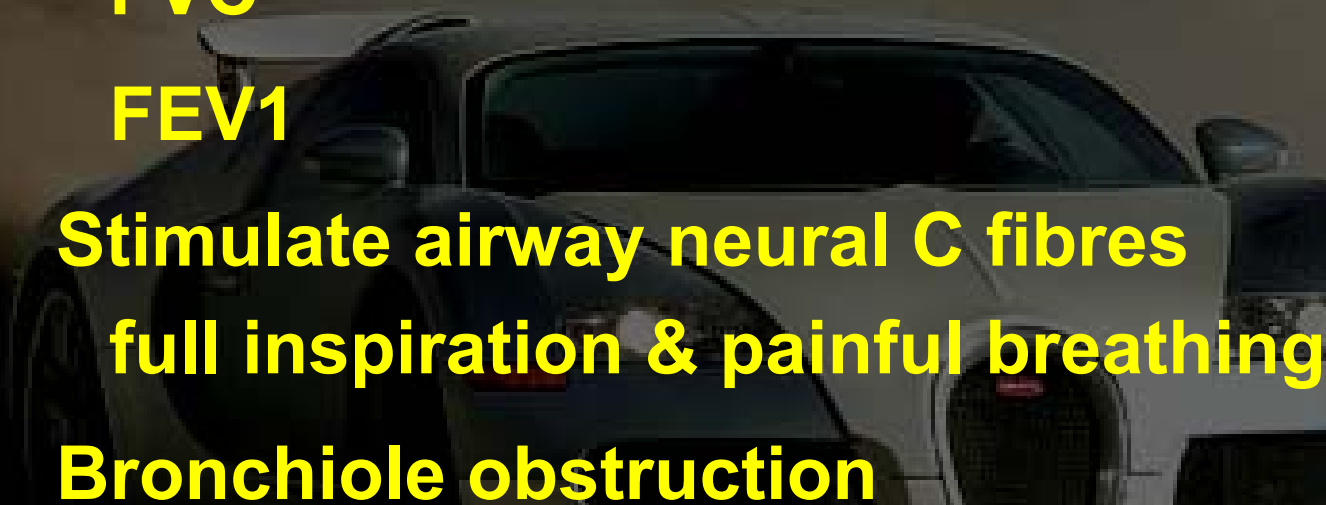
- Sunlight + motor car emission + VOC
- Stratosphere (10-60 km) UV light
- Ground level smog
- Damage health

Ozone (O₃)

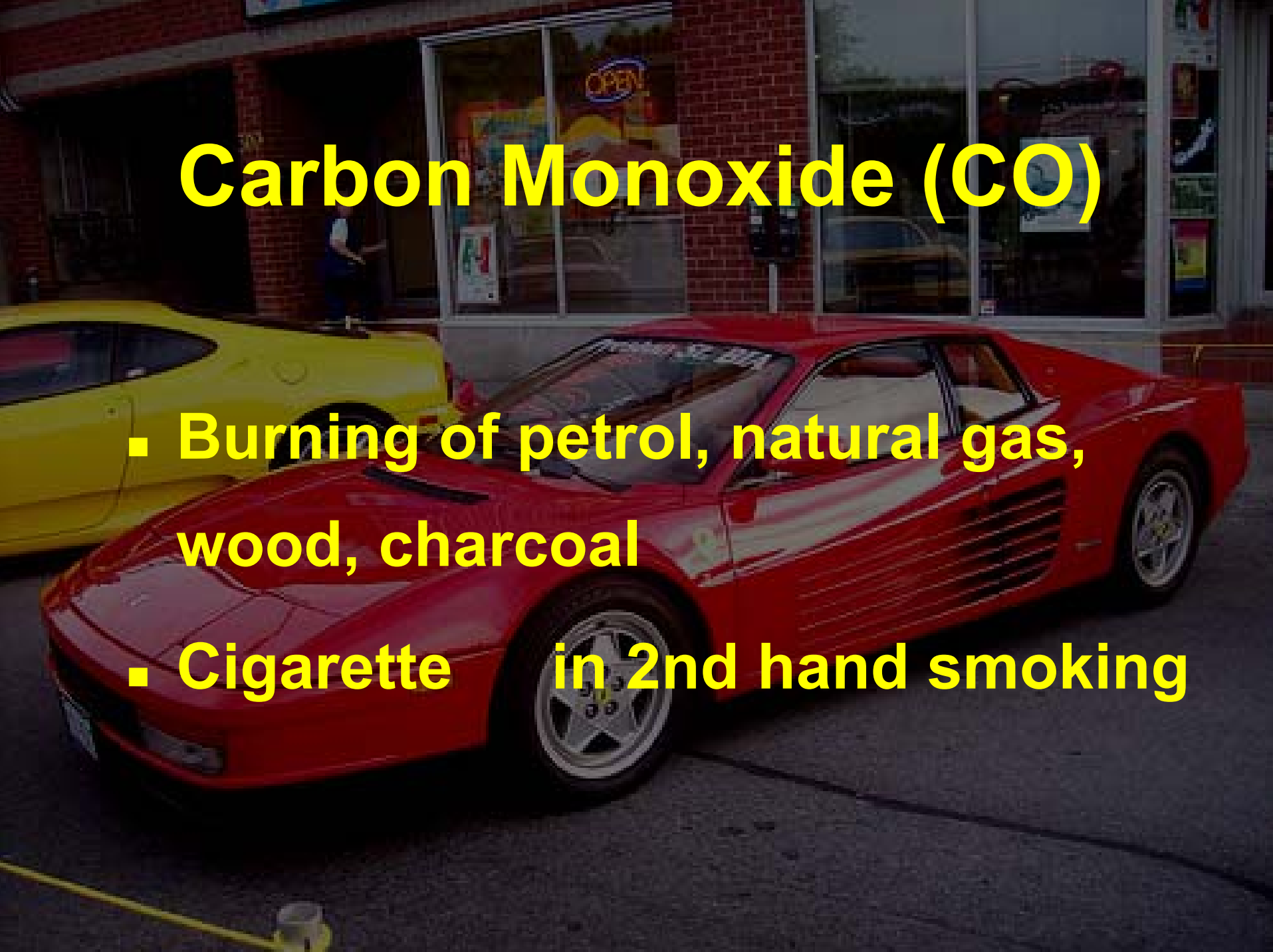
- Eye irritation
- Chest pain & dyspnoea
- Bronchitis
- Lung damage



Effects on Performance

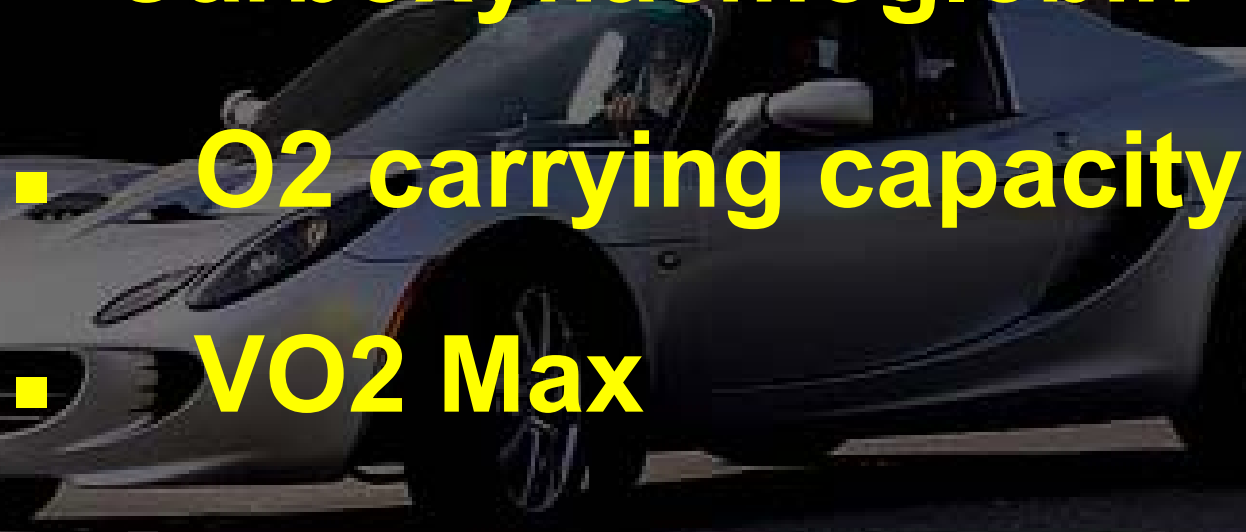
- FVC
 - FEV1
 - Stimulate airway neural C fibres
full inspiration & painful breathing
 - Bronchiole obstruction
- 

Carbon Monoxide (CO)



- Burning of petrol, natural gas, wood, charcoal
- Cigarette in 2nd hand smoking

Effects on Performance

- Carboxyhaemoglobin
 - O₂ carrying capacity
 - VO₂ Max
 - Endurance
- 
- A silver Lotus Evija electric sports car is parked on a street at night. The car is a two-seater convertible with a sleek, aerodynamic design. The background shows a dark building with some lights and a street sign.

Joggers & Cyclists in Heavy Traffic

- COHb 4 – 6 %
- Vision & coordination
- Headache & dizziness
- Nausea & vomiting

Volatile Organic Compounds (VOC)

- Smog
- Petrol, coal, natural gas
- Solvent, paint, glues



Volatile Organic Compounds (VOC)

A street scene with a blue car parked on the left, a person on a bicycle in the foreground, and a colorful mural on the right. The background shows a brick building.

- Eye irritation
- Respiratory tract damage
- Others

Volatile Organic Compounds (VOC)

- **Controlled by law**
- **1 Apr 07 hair spray**
- **Others 1 Jan 08**
- **\$ 200,000 6 mon imprison**

Lead

- Respirable suspended particulate
- From motor car exhausts
- Old paint
- Metal refinery



Lead

- Poison essential enzymes
- RBC kidneys
- Neural tissues



Air Pollution

can kill

- 1984 Bhopal India
- 8000 died 600000 sick
- 1952 London Great Smog
- 4000 died in 6 D
- 8000 in following months



Air Pollution

WHO 2002

2.4 M deaths / yr worldwide

0.65 M in China

Air Pollution

HONG KONG

Attributable deaths 2000 / yr

Hospital admission

64000 bed-days

Most polluted cities 2004

1) Cairo	169	PM
2) Delhi	150	mcg
3) Calcutta	128	/CM
4) Tianjin	125	
5) Chongqing	123	
9) Shenyang	101	

Air Pollution Index 1987

Potential health effects (0 - 500)

5 components

RSP SO₂ NO₂ CO O₃

< 100 = no immediate health effect

51 – 100 = chronic health effect

> 100 = acute health effect

Air Pollution Index (API)

5 bands

■ 0 – 25

Low

低

■ 26 – 50

Medium

中

■ 51 – 100

High

偏高

■ 101 – 200

V high

甚高

■ 201 – 500

Severe

嚴重

Medical Advice

	low 低	Medium 中	high 偏高	v high 甚高	severe 嚴重
API	0 - 25	26 - 50	51 - 100	101 - 200	201 - 500
healthy	nil	nil	If prolonged	Some discomfort	widespread symptoms
diseased	nil	nil	+ or -	++	++++

2005 WHO Air Quality Guidelines

- Particulate matter
- Ozone
- Nitrogen dioxide
- Sulphur dioxide

Particulate Matter

PM₁₀

- 20 mcg / cu m annual mean
- 50 mcg / cu m 24 hrs mean
- 180 mcg / cu m 24 hrs mean

Ozone

100 mcg / cu m 8 hrs mean

240 mcg / cu m / hr

Nitrogen Dioxide

- 40 micg / cu m annual mean
- 80 micg / cu m
- 200 micg / cu m 1 hr mean
- 300 micg / cu m

Sulphur Dioxide

- 20 micg / cu m 24 hrs mean
- 350 micg / cu m
- 500 micg / cu m 10 min mean



SCMP Wed Feb 14 2007

Bad air forces elite couple to quit HK

Former international triathletes Gary and Gia

Mandy are to abandon their home in HK

because of hazardous levels of pollution.....

.....my recovery rate takes longer.....I actually

suffer for days after competing in local events

South China Morning Post

清華早報

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Run at your peril, warns health expert

Competing in HK Marathon 'not a good idea', says Hedley

ATHLETICS

Matthew Scott and Richard Caatke

A leading medical expert yesterday issued a bleak warning ahead of Sunday's Standard Chartered Hong Kong Marathon: run the race and you'll risk your health.

"The bottom line is that it is not a good idea to be running marathons in intensely polluted air," said Anthony Hedley, chair professor of the University of Hong Kong's department of community medicine.

"I don't want to be seen to be scaremongering, but for some people it could have serious health consequences."

"People have asked me whether they should run in this and I feel compelled to say if it were me I would give it a miss."

A 53-year-old runner died and thousands received medical attention during last year's marathon, which took place on a day that had very high levels of pollution. Just how much the pollution had to do with those cases remains open to debate but Hedley said some facts were clear.

"It's going to be an assault on the heart, lungs and blood vessels that people would generally want to avoid," he said. "It is not possible to breathe air in Hong Kong without developing what can be best described as inflammatory changes in key body tissue. To live in this environment, unfortunately a substantial proportion of the population is going to pay a price in terms of their future health."

Races organisers were yesterday

keen to allay any fears over the running of Sunday's event, which has attracted a record field of 43,000 runners for the marathon, half-marathon and 10km.

"There was a lot of media coverage last year saying 5,000 people had been treated during the marathon and a lot of people said that was due to the pollution," said William Ko Wai-lam, chairman of the organising committee. "But the fact remains that around 4,000 of those were actually treated for cramped muscles and things that normally come from a race."

Ko said about 400 paramedics would be situated along the course, along with seven ambulances. Government air services and local hospitals would be on alert. "Obviously, the pollution is beyond our

control," he said. "We will make announcements at the start about the API [air pollution index] so people know. All we can do is make people aware and make the race as safe as possible by providing medical and support services."

Hedley, who last year was part of a study on pollution that revealed it was costing Hong Kong 1,600 lives and at least HK\$2 billion a year, said the amount of stress placed on a human's body during a marathon made the effects of polluted air even worse.

"If you engage in what is a supreme physical effort like running a marathon then again there is no question that during that period, in this kind of environment, you're going to get a very large dose of exposure [to pollutants] - what we call a large intake fraction - and it will have a measurable impact on everybody taking part," he said.

Until recently, the 65-year-old professor had been a keen runner, and sometime marathoner. But he says he has developed late-onset asthma and has been forced to hang up his running shoes. "It's a simple of fact, but I'm pretty sure it's due to

New Zealand to escape the smog, while leading triathlete Gary and Gia Mandy will this summer relocate to the north western United States to escape the pollution, which they say has affected the health of their young daughter.

gone to be very high, which carries a rating of 10 to 200. Last year the API stood at 149 in MongKok on the day of the marathon.

Controversy over last year's event has led to increased overseas media interest in this year's marathon, with the US magazine *Sports Illustrated* and the UK's *Sunday Times* reportedly using the event as part of a focus on "sports and the environment" issues.

Former legislator and environmental campaigner Christine Leung was told the negative environmental exposure was something the city could do without.

"I understand where we live, and for people to participate in sport, we need to clean up our air," said Leung, now the CEO of think-tank Civic Exchange. "It is sad that in Hong Kong we have mentioned a lot of negative press on our air quality. This is spurring us to act quickly."

"We will make announcements at the start about the air pollution index so people know"



William Ko Wai-lam
Chairman of organising committee

breathing this polluted air," said Hedley.

A number of leading athletes have recently cited Hong Kong's poor air quality as the reason for their departure from the city.

Last year top distance runner Mark Williams cowed his family to

"These cases are anecdotal, but they are entirely plausible and I would say predictable," said Hedley.

The Hong Kong Observatory website recommends that residents should "reduce physical exertion as far as possible" when the API is

Pro Anthony Hedley

Athletes risk serious heart problems
by running in Hong Kong's
intensively polluted air.

...I will give it a miss...



A photograph of three men in suits playing pool in a dimly lit room. The man in the center is seen from the back, looking towards the pool table. The man on the left is leaning over the table, and the man on the right is standing nearby. The room has a dark, patterned wall and a pool table with a red cloth.

ITTF:

**Adhesives
From VOC solvent to
Water-based**

2006

324 bad days

192 d H K

空氣污染元兇汽車與發電廠



■劉啟漢(左)
昨日表示, 06
年有 324 日屬
空氣污染嚴重日
子。

【本報訊】本港空氣污染嚴重，去年有 324 日的天空都「瞭查查」，即空氣中的二氧化硫及懸浮粒子偏高，而港府常指空氣污染元兇是珠三角地區工廠不斷排放廢氣。思匯政策研究所與科技大學研究發現，324 日空氣污染偏高日子之中，有 192 日是本港的汽車、輪船及發電廠排出廢氣造成，令珠三角區工廠無辜吃了多年「死貓」。

思匯與科大分析本港去年 365 日氣象數據，包括風向、空氣監測站及衛星圖像等，以了解空氣污染源頭。研究發現空氣污染主要元兇並非珠三角區的工廠，而是本港汽車、輪船及發電廠。科大霍英東研究院大氣研究中心主任劉啟漢昨日稱，每年的 11 月至翌年 3 月期間，北風會把珠三角的污染物吹來港，所以這時期污染源頭是珠三角地區。4 月至 8 月時少了北風，本地的汽車、輪船及發電廠排出廢氣，則成為空氣污染元兇。思匯行政總監陸基蕙指出，研究顯示引致本港空氣污染並非全與珠三角區工廠有關，相反港府有責任制訂電子道路收費及鼓勵輪船用較環保的蒸餾油作燃料。

500 學校響應熄燈運動

此外，環保組織環保觸覺發起「321 齊熄燈運動」，昨日有 500 間中學、小學與幼稚園，以及立法會大樓，於昨早 11 時 55 分熄燈 5 分鐘，以喚醒公眾關注能源問題。環保觸覺要求當局制訂發電廠的排放上限，並儘早採用再生能源發電。

■陳國基
團透過中
申請特區
圖利。



八

分類

行動次數
被捕黑工人
被捕賣淫人

我會做好

曾蔭權參選行政長官記者會

Donald Tsang Chief Executive

Press Conference



1.2

Practical Points

Unfortunately

Can't escape from our environment!



Practical Points

Check API from radio or TV or

<http://www.epd.gov.hk>

General Advice

- Train in morning
- Stay away from traffic
- Indoor vs outdoor
- High risk group

What do we do in 2009?

- Pollution free indoor training area
- Filtration plant
- Training in other countries

Indoor Air Pollutants

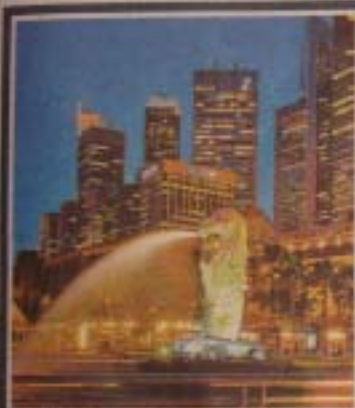
- WHO 2000
 - 2.7% global burden of diseases
 - 1.6 M death
- Acute lower respiratory infection in children 800,000 death / yr < 5 yrs
- Chronic obstructive pulmonary disease in adult

Common Indoor Pollutants

- Radon gas
- Formaldehyde
- Volatile organic compounds
- Chemical pollutants
- Airborne particulates
- Mould bacteria

全球最理想居所排23位

空氣污染削港競爭力



■新加坡



■澳洲悉尼

亞洲人眼中最理想居住的城市

排名	城市	排名	城市
1	新加坡	10	日本東京
2	澳洲悉尼	10	比利時布魯塞爾
3	澳洲墨爾本	10	德國波恩
4	日本神戶	10	愛爾蘭都柏林
5	澳洲坎培拉	10	瑞士巴塞爾
6	加拿大溫哥華	10	瑞士日內瓦
6	丹麥哥本哈根	23	中國香港
8	新西蘭威靈頓	56	中國澳門

【本報訊】日漸變差的空氣質素正在蠶食本港的競爭力。一項國際調查顯示，在亞洲人眼中，新加坡連續九年成為「全球最理想居住城市」，本港的全球排名則由五年前的第18位，下跌至最新的23位，不但遠遜於新加坡，甚至遭日本的東京亦迎頭趕上。專家指，本港吸引力下滑，日漸惡化的污染問題是元兇之一。

記者：盧文鳳

據人力資源顧問 ECA International 每年都會對不同城市的生活水平進行比較，評選準則包括氣候、空氣質素、醫療服務、房屋與相關設施、社交網絡、休閒設備、基礎建設、個人安全及政治氣氛等。06/07 年度評選對象涵蓋全球 254 個城市，共訪問了近千名在不同地區工作的人士。

名列第 5 位，雖然全球排名較 05/06 年度高 6 位，但仍較五年前的排名低 5 位。

至於香港主要競爭對手新加坡，則連續九年高踞榜首，日本的神戶、大阪及東京，排名都在香港之上，其中東京由五年前的第 33 位升至現時第 10 位。

鄰近對手排名升

香港其他競爭對手的生活水平亦以高速度改善，例如澳門由 80 位躍升至 56 位，上海亦由 103 位火速升至 76 位。

ECA International 香港區總經理關禮廉表示，對外籍員工而言，香港的生活水平相對較高，雖然完善的基礎設施及不斷減少的自然災害，令本港排名今年重拾升軌，但仍遠遠落後於新加坡。關禮廉說：「當中最大的分別是香港空氣質素有持續惡化的趨勢。」他形容，空氣污染已變成為在港外派員工高度關注的問題。

有關調查結果，將用作企業制訂外派員工津貼的指標。由於香港排名降低，ECA International 建議一些欲招聘外地員工的企業，支付較五年前更高的手冊津貼，以吸引優秀人才加盟。



An aerial photograph of a dense urban skyline, likely Hong Kong, viewed from an elevated position. The foreground shows a dark, forested hillside. The middle ground is filled with numerous high-rise buildings of various colors and heights. In the background, a large body of water is visible, with more buildings and structures on the opposite side. The sky is overcast and hazy. The word "You!" is written in a large, bold, red font across the center of the image.

You !