

## REVIEW OF HEALTH RISKS ASSOCIATED WITH LARGE AIRPORTS AND THEIR SURROUNDS.

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Does the Auckland Racing Club's decision on Prices Rd, Mangere stack up?

Many airports rank among the top 10 industrial pollution sources in their cities. But while pollution from other sources is stabilising or decreasing, the pollution from aircraft at airports continues to grow due to the tremendous growth in our tourist industry and the lack of controls on airport pollution. Air traffic is projected to double within the next 20 years.

This paper is being presented to try and make some sense out of the scientific evidence becoming available to us in regard to the influence pollution will have on a group of athletic mammals, namely our thoroughbreds.

Horses have approximately 95% of the genetic material found in humans, whilst rats and monkeys have 98% –99.5%, respectively. Although some of the evidence presented is experimental, usually done on rats it can be reasonably expected that the other species will produce similar results. Experimental models to demonstrate effects of pollutions are relatively new, however there is now such a weighted body of evidence accumulating that the trainers contemplating a shift to Prices Road should review the evidence themselves and remember that even if they are happy with their decision, their owners, prospective or otherwise may take a different point of view.

The pollutants are in two broad categories –

1. NOISE           Horses have an extremely good sense of hearing. Humans hear a range of sounds from 30 – 19,000 hertz. Horses can hear a range of 55 – 33,500 hertz. So humans can hear a few lower sounds but horses hear many sounds through their higher frequencies. While their hearing is very sensitive, it is not very precise. A horse may pick up a sound but has difficulty in placing its exact location (he spooks).

Studies in humans adjacent to major airports have concluded that hypertension, heart disease and psychological trauma are influenced by noise exposure.

One example of psychological trauma is the research by the London Institute of Psychiatry. These studies demonstrated that rates of admission to a Psychiatric institution were highest amongst the group nearest the airport.

It has been demonstrated that children who live on the inflight paths of major airports showed a deficit and standardized tests of scholastic achievement as compared to a control group.

A French group demonstrated significant disturbances in REM sleep patterns in people exposed to airport traffic.

Similar effects have been noted in animals however most of the evidence is anecdotal.

2. JET EXHAUST The chemical products of aircraft jet fuel are emitted at the engine nozzle exit as part of a high velocity plume. The gaseous and particulate stream is subject to chemical and dynamic processes that influence the downstream composition. The ultimate fates of aircraft-derived chemicals are determined by larger scale chemical and transport processes.

The major types of Hydrocarbons in the jet fuels are alkanes, cycloalkenes and alkenes. This gives the fuel its characteristic kerosene odour. Aromatic hydrocarbons (e.g. toluene, xylene and benzene) and polycyclic aromatic hydrocarbons are also found in jet fuels. Aromatic hydrocarbons usually only make up a small fraction found in jet fuel. Jet fuel also contains additives which included for various reasons metal deactivators, antioxidants, static dissipates, octane boosters, anti-corrosion and ice inhibitors.

These emissions are influenced by the power settings of the engine. At all settings products of incomplete combustion are present. i.e. VOC's

Volatile Organic Compounds (VOC's) and carbon monoxide (CO) are produced during lower power settings for descent or when idling. Other major gaseous pollutants are oxygenated organic compounds (e.g. formaldehyde) and oxides of nitrogen (NO<sub>x</sub>) NO<sub>x</sub> is produced when engines are at their hottest, such as during take off.

Carbon is found in the form of smoke.

In addition to pollutants released from evaporation or through incomplete combustion, NO<sub>x</sub> and V.O.C's can combine in the atmosphere to form ground level ozone (O<sub>3</sub>).

Formation of ozone usually occurs during periods of strong sunlight during summer months.

To date, no pollutant unique to aircraft emissions has been identified.

To better understand the effects on the lungs of experimental animals and recent human studies it is best to categorize them in their chemical groups.

1. Inorganic gases – carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>) and nitrogen oxides (NO, NO<sub>2</sub>, NO<sub>x</sub>)

2. Volatile Organic Compounds (VOC's) includes hydrocarbon compounds such as alkanes, cycloalkanes, alkenes and aromatic hydrocarbons, such as pentane, butanes, acetylenes, naphthalene, 1,3 – butadiene, benzene, toluene and xylene.

3. Oxygenated Organics including a variety of carbonyl compounds such as aldehydes which include compounds such as formaldehyde and acetaldehyde.

4. Aromatic Hydrocarbons including chrysene and fluoranthene.

Other than carbon dioxide and water vapour the next most abundant is NO<sub>x</sub> (emission indices range from 5 – 25 gm of NO<sub>2</sub> per Kg of fuel burnt).

With respect to ozone photochemistry, NO<sub>x</sub> is the most important and most studied component, its aircraft emission rates are sufficient to affect background levels of ozone.

#### Human Studies

(a) Seattle – King County, Dept. of Public health 1997

When comparing hospitalisation rates the following alarming statistics resulted –

57% higher asthma rate

28% pneumonia/influenza rate

26% higher COPD rate

48% higher morbidity rate for all diseases.

(b) Heartland Research Institute Birmingham 1999

Finding support an association between high occupational exposures to jet exhaust and the incidence of upper and lower respiratory problems.

(c) Human Experimental Exposure to Products of Jet Exhaust.

(1980 –88)

In one group of 32 experimental papers the oxidant pollution combining Ozone and NO<sub>2</sub> was found to be more noxious than ozone alone.

These results stem from the multivariate modelization of the relationship between the relative risk of cough or relative decrease in FEV<sub>1.0</sub> (a lung function test).

1986

Several controlled human studies have shown that a combination of exercise and pollutant exposure (SO<sub>2</sub> or O<sub>3</sub>) caused a marked bronchoconstriction and reduced ventilatory flow when compared to pollution exposure at rest. Younger individuals were more sensitive.

The time of the day appears to matter, the sequence of peak ambient concentrations is first NO<sub>2</sub> followed later in the day by O<sub>3</sub>

1996

21 healthy young non smoking women, during each exposure the subjects were intermittently exercised. Nitrogen dioxide exposure alone did not reduce FEV<sub>1</sub> but did significantly enhance O<sub>3</sub> induced changes.

#### Animal Studies

Exposure protocols were designed to assess lung damage in rats exposed to either O<sub>3</sub> or NO<sub>2</sub> is proportioned to dose rate or cumulative dose. Results clearly demonstrated that when the rats were exposed the lung damage was a function of peak concentration rather than cumulative dose.

A group of rats were exposed and exercised under exposure. The results emphasised the importance of exercise in the production of lung lesions far greater than calculated by simple proportion.

An experiment with baboons demonstrated that injury occurred quite quickly following brief exposure, suggesting that surface epithelium cells are disrupted.

#### Plant Studies

Orly Airport, INRA 1999

Using plant bio-indicators (plants known to respond in a definite way in the presence of specific chemical substances) it was demonstrated that these sites are closely surrounded by a clearly higher amount of air pollution. NO<sub>x</sub>, ozone, and VOC's were the greatest influence.

#### Horse Studies

A study was conducted by Professor W.Tyler , et al, of Davis University Veterinary School, California, to investigate the effects of high speed work in an atmosphere of ozone that simulated Los Angeles air. After a single breeze, "both horses exposed to .8ppm ozone had pulmonary haemorrhages and oedema."

Early last year equine veterinarians from around the world met in Dubai, United Arab Emirates for a symposium on respiratory problems in racehorses. Dr Rantanen, who organised and moderated the symposium, said that horses have

a relatively high incidence of low-grade pneumonia. He lives in Southern California, working out of the San Luis Rey Downs Equine Clinic (Bonsal, CA) and sees many of the best racehorses in the world.

In a survey of 168 horses of all ages, presented for elective surgical procedures when owners were unaware of any respiratory problem, Dr Rantanen found that 29% had ultrasonographic evidence of pneumonia. Trainers are not generally aware of this degree of danger from pneumonia and much of it goes undetected at the racetrack, reducing performance and wasting time and money – even causing permanent disability or death.

Dr Stephen Reed, a speaker at the symposium from the Ohio State University, said that many situations at the track can cause stress, which reduces resistance to the respiratory pathogens. All handling procedures constitute a physical or psychological stress. Stress compromises the two main mechanisms in the lung making it difficult to deal with offending bacteria and dust particles. Most tracks are in or near big cities where there is often a great amount of air pollution.

#### Anecdotal Evidence

“there have been studies showing that a few high speed exercises in an atmosphere with the ozone levels of Los Angeles will cause lung lesions and infections.”

“ Charlie Whittingham has complained that 3 months at Hollywood Park had all his horses coughing, bleeding or down with a virus.”

“Ozone encountered in big city environments is known as a pro-oxidant that encourages the destruction of lung tissue.”

#### The Fit Racehorse II by Tom Ivers

#### Conclusion

A thoroughbred at full gallop requires 2800 – 3000 litres of air, per minute, to accomplish the burning of fuel substrates. The movement of air in and out of the lung is complex and a very delicate balance has been achieved, by nature, between the suction pressures and the thin membrane that transports oxygen into the bloodstream. If this balance is upset by any physical factor in the movement of this air, the lung is damaged and the performance of the horse deteriorates.

Races are being won and lost on milliseconds of time.

The catchword is “exercise” with the realisation that the thoroughbred is a highly specialised animal whose primary defence mechanism is to flee from danger.

During the training of these animals they are asked to do a lot more than is expected in nature. With this in mind every factor required for their high performance should be tuned in such a way that their welfare are not compromised.

There is overwhelming evidence that pollution effects the mammalian lung during exercise. Most research has been done on the gases ozone, NO.x, SO2, either singularly or in combination. It appears that ozone effects the surfactant layer of the lung and the other gaseous admixtures cause damage because of this. Perusal of the scientific papers in the equine physiology section of our site indicates that the process of damage is complex and more research is required.

Before any owner makes a commitment to have his horse trained at such a facility he should have an informed opinion by his trainer of the following:

- Can he be certain that the lung of his horse will not be damaged by the training environment remembering that a small reduction in FEV1 will lose races.
- Will the horse withstand the stress of training and the noise “spikes” caused by incoming or departing jets.

#### The Prices Road Decision

Comparisons have been made with Prices Road, Mangere site and Eagle Farm/Doomben racetracks. However, there are important differences.

Bubble radius (from end of runway to centre of racetrack)

- Eagle Farm 5.50km
- Doomben 5.00km
- Prices Rd 2.70km

Number of Air Movements (International Jets)

- Brisbane Airport 43 daily
- Auckland Airport 165 daily

The contribution the jet aircraft makes to the increase of NO.x in the atmosphere over the next 50 years has been estimated by N.A.S.A. and other scientific bodies.

On average the following applies:-

	1992	1.7	Tg
	2015	2.5	Tg
2050	7.2 – 11.2		Tg

Remember how long Takanini served the industry.

It should be of concern that such a large step as developing a thoroughbred training facility adjacent to growing international airport should be closely scrutinised. The full cost of pollution to the owner and trainer of thoroughbreds is yet to be understood. It is becoming painfully evident that pollutants of stable surrounds and large cities is influencing the athletic capacity of our horses, and measures taken to lessen these chemicals and allergens will pay dividends on raceday. If you have the choice get out of large cities, bringing your horses in only for racetime, and leave as soon as possible.

It is my understanding that Auckland Racing Club has not done any scientific study nor environmental impact on thoroughbreds training at Prices Road.

Cows and one or two standardbreds have been quoted.

If this is not the case, I stand corrected.

What are the Auckland Racing Club's responsibilities to the N.Z. Thoroughbred industry as N.Z.'s premier race club and "flagship"?

In these difficult times for our domestic racing scene careful consideration of any decision which could influence the future of the industry is paramount. N.Z. does manage to convey the impression of clean and green overseas. Any official training track sanctioned by a country's Premier Racing Club, built adjacent to that country's major International Airport with rapidly increasing air traffic and resulting pollution, would surely influence overseas opinion and cause derision in the future.

So what does the Auckland Racing Club look forward to if the Price's Road development continues ?

Less owners and trainers as it becomes increasingly more obvious that the horse's lung has a finite capacity for pollution ?

In light of recent history some owners and trainers are ready to question the ability of the A.R.C. to remain as the “flagship” racecourse of the industry ?  
A “ghost” training track with no monetary value and unlikely purchasers ?  
Possible breach of the Animal Welfare Act 1999 by owners and trainers using Prices Rd ? They have the responsibility to meet the animals’ physical, health and behavioural needs in accordance with good practice and **SCIENTIFIC KNOWLEDGE**. One of the 5 freedoms referred to internationally is “to be protected from injury and disease”. This is part of the Act.