● *Western Bulldog players at VU's Altitude Hotel.*

# LIVING THE HIGH LIFE

A LOW-OXYGEN 'ALTITUDE HOTEL' AT VICTORIA UNIVERSITY'S FOOTSCRAY PARK CAMPUS IS ONE OF ONLY TWO FACILITIES IN AUSTRALIA THAT OFFER ATHLETES AND MEDICAL RESEARCHERS THE OPPORTUNITY TO EXPERIENCE THE EFFECTS OF SIMULATED HIGH ALTITUDE LIVING.

**KAMINI RAJARETHNAM**

IF YOU ARE LOOKING TO WIN A GOLD MEDAL at the 2016 Olympic Games in Rio de Janeiro, it might be a good idea to first head off to the high altitudes of Colorado or the Himalayas to reap the benefits of altitude training.

Or you could head to Victoria University's Footscray Park Campus and spend some time at its state-of-the-art Altitude Hotel.

Situated in the heart of VU's sport and learning precinct, the hotel is a low-oxygen (hypoxic) facility that simulates a high altitude environment by increasing the level of nitrogen in the air. This causes an increase in haemoglobin in the blood of the hotel's occupants. Haemoglobin is the protein that binds oxygen molecules to red blood cells. The more haemoglobin in the blood cells, the more efficient the cells will be at carrying oxygen around the body.

By lowering the oxygen level from the normal 20.9% to around 15.5% by pumping nitrogen throughout the hotel, the hotel's atmosphere simulates an altitude of around 3500 metres. Athletes have long known the enhancement that a higher red blood cell count can give to their performance in training and competition. While a simulated high altitude environment is often used by elite athletes preparing for competitions at high altitudes, it is mainly used by athletes when training for sea-level events because the potential benefits are even better.

VU's Altitude Hotel is one of only two such facilities in Australia, the other situated at the Australian Institute of Sport in Canberra. The so-called hotel – just don't expect room service – has only four bedrooms, each with bunk beds, a bathroom, kitchen and a lounge, and can house up to 16 people at a time. However, each room can be set to a different altitude so guests can choose to 'live' in Bolivia or Arizona, or whichever altitude that best suits their training or competing agenda.

Altitude training is commonly conducted in one of three ways; live high, train high; live low, train high; and live high, train low. Athletes often train or live in low oxygen environments so they can be on a level playing field with athletes who normally live at high altitudes.

Dr Robert Aughey, senior lecturer in exercise and sport physiology at the University's Institute for Sport, Exercise and Active Living (ISEAL), and a senior sports scientist at the Western Bulldogs Football Club, is an authority on altitude training and the physiology of Australian Rules football players.

According to Aughey, a 'live high, train low' program enables athletes to reap the benefits of high altitude living, while training outside the simulated environment at their usual intensity and frequency.

Using this technique, athletes live in the hotel for 12 to 14 hours a day for five to 10 days. At the same time they maintain their standard training regime in Melbourne's low altitude setting of around 40 metres above sea level.

"Altitude training typically leads to performance improvements of one to two per cent. This sounds small, but is quite a big change for an elite athlete," says Aughey. "The smallest worthwhile change in athletic performance is 0.3%, so a change of one to two per cent is really good."

Since VU's Altitude Hotel opened in 2011, researchers have conducted two major studies with more in the pipeline for 2013.

Mathew Inness, a PhD student at VU's School of Sport and Exercise Science, is investigating whether the technique of living high and training low improves team sport athlete performance as much as it does for individual events such as cycling, rowing, athletics and swimming. He is also looking at the effects of multiple exposures to altitude training over a period of time, particularly for Australian Rules football players.

Meanwhile, Aughey says it is still not known whether 'living low, training high' is better than 'living high, training low', so a comparative study between the two techniques will be undertaken by Inness under Aughey's supervision.

Athletes can 'train high' at VU in simulated high altitudes at its Environmental Exercise Laboratory, also located in the sport and learning precinct at Footscray Park Campus. Here, stationary bikes and a treadmill are available for up to 10 athletes at a time to acclimatise to a hot and high humid environment, or exercise in simulated sunlight, wind or low oxygen environments.

ALTITUDE
0–3500 METRES PLUS

HUMIDITY
20–90%

TEMPERATURE
+5° TO +40° CELSIUS

*Environmental exercise lab: acclimatises up to 10 athletes at simulated altitude as well as high humidity and low oxygen.*

## REACHING NEW HEIGHTS

**THE 1968 OLYMPIC GAMES HELD IN MEXICO CITY,** at an altitude of 2240m above sea level, were the first games staged at a high altitude. The high altitude proved advantageous for events requiring bursts of energy such as the high jump and sprint races because the air was thinner and therefore had less resistance than air at sea level. This allowed runners to run faster and jumpers to jump further. The same principle also applied to objects thrown such as a discus or javelin, which travelled further.

The number of world records set at Mexico City was indicative of the impact of the thinner air on performance.

- American athlete Bob Beamon jumped an astonishing 8.9 metres in the long jump, smashing the previous record by 55 centimetres.
- American track athlete Jim Hines became the first man to break the 10-second barrier in the 100-metre sprint.
- American track athlete Lee Evans became the first man to break 44-second barrier in the 400-metre sprint.

MOUNT EVEREST
**8848M**

LA PAZ, BOLIVIA
**3200M**

MEXICO CITY
**2240M**

DENVER, COLORADO
**1580M**

MELBOURNE
**63M**

AMSTERDAM
**0M**

LAKE EYRE
**15M**

DEAD SEA
**-424M**

In another Altitude Hotel project, the first of its kind in the world, ISEAL research leader Professor David Bishop is investigating the impacts of hypoxia (low oxygen levels) on both muscle physiology and fitness levels. The project is studying the consequences on healthy subjects when they are subjected to reduced oxygen levels for extended periods.

"A greater understanding of adaptations to hypoxia is essential to better understand the basis of pathological conditions such as pulmonary diseases, which are characterised by a reduced availability of oxygen,'' says Bishop.

Chronic obstructive pulmonary disease is a condition that leads to permanent low oxygen levels in the blood accompanied by aerobic fitness impairment.

As part of the study, six participants lived 24 hours a day in the Altitude Hotel for 19 days at a simulated altitude of 3200 metres. "The study of chronic hypoxia in healthy subjects is a novel experimental approach to understand the effects of hypoxia in diseases where it is not clear if hypoxia, or other elements associated with the disease, is the cause of the patient's disability," says Bishop.

Bishop aims to find out if hypoxic living causes impairments at the muscle level. If so, it will help determine specific treatments, which will be groundbreaking in the field of medical research.

When the Altitude Hotel is not being used for research it is available for commercial use. Australian Football League clubs such as Port Adelaide and the Western Bulldogs have used it as part of their pre-season training. A room costs $660 per night and athletes typically stay in the hotel for two to three weeks.

Aughey says there is still much to learn about the effects of low and high oxygen environments on the human body. "Right now it's just a matter of getting funding to do more research," he says. "There is certainly no lack of ideas."