



## From the Director

This is the first newsletter for the "Using our Brains" tissue donor program. The launch in NSW Parliament House on the 10<sup>th</sup> April, 2002 will signify the beginning of new opportunities for studying diseases of the brain. Research workers can use brain tissues after death for a whole range of different studies aimed at finding causes and cures of brain diseases. All sorts of discoveries have been made using such tissues – new drugs for Parkinson's disease, for example.

We want you to consider donating your brain for medical research after you die. People who are normal are as important as those with brain diseases. We need normal tissues to compare with diseased tissues – hence the importance of "Using our Brains".

Your decision to become a donor relieves your family from having to make such a decision for you after you die and we think it is healthy that families discuss these issues during life. It has been interesting to note the responses of many people who I have asked about donation. Most of us have already thought about it in regard to organ donation for transplantation (on driving licences) – there seems to me to be little difference between organ donation for transplantation or for research. The majority of my friends and acquaintances have said "yes – it is no use to me after I die!" Of course some have specific religious or other reasons for declining and we respect these decisions.

Please help us to achieve our goal of a better understanding and better treatment for diseases of the brain.

Professor Clive Harper  
Programme Director

## The human brain - what do we know?

### How big is the brain?

The adult human brain weighs between 1250-1400g, approximately the weight of a 1.25L bottle of Coke. The brain is about 2% of the total body weight. A newborn human brain weighs between 350-400g. For comparison, here are the brain weights of some other species:

- elephant = 6,000 g (6kg)
- chimpanzee = 420 g
- beagle dog = 72 g
- cat = 30 g
- rat = 2 g

### What is a neuron?

A neuron is a nerve cell. The brain is made up of about 100 billion (100x1000 x1,000,000) neurons. You could squeeze 100 neurons (each typically 10 microns in diameter) side-by-side across a 1mm scale. If you were going to count all 100 billion cells at a rate of 1 cell per second it would take you about 3,171 years!

### How do neurons function?

Neurons interact with one another by specialized connections called "synapses". Chemical messengers called "neurotransmitters" are released at a synapse to stimulate the next neuron. Each neuron produces an average of 600 synapses with other neurons, so the total number of synapses in the human brain is a very large number (~60 trillion). To make this number more

### Using Our Brains Statistics

Expressions of interest: 18

Registered donors: 10

Tissue collected: 0





Did you know that 85% of all neurons are found in just one layer of the cerebellum?

Did you know that more than half of all neurons undergo programmed cell death in the last 3 months before birth?

managable to comprehend, there are about about 500 million synapses per cubic millimetre of brain tissue. Yet a fully functional brain consumes a modest amount of power - about the same energy as that used by a fridge light-bulb!

#### **How long is a neuron?**

The axons (or "output wiring") of some neurons are very short - less than a millimetre in length. The axons of other neurons are very long. For instance, some motor neuron axons begin in the lower spinal cord and extend to the extremities of the foot - a distance of more than a metre in many adults.

#### **Do we use just 10% of our brain?**

This percentage is one that is repeatedly seen in ads that feature the image of Albert Einstein. However, it is unlikely to be true. The myth assumes an extreme localization of functions in the brain. The myth implies that the "used" part of the brain is a discrete area, and the "unused" part is like an appendix or tonsil, taking up space but essentially unnecessary. But if all those parts of the brain are unused, removal or damage to the "unused" part of the brain should be minor or unnoticed. Yet people who have suffered head trauma, a stroke, or other brain injury are frequently severely impaired. Have you ever

heard a doctor say, "... But luckily when that bullet entered his skull, it only damaged the 90 percent of his brain he didn't use"?

#### **How fast does information travel in the nervous system?**

Information travels at different speeds within different types of neurons. Transmission can be as slow as 0.5 metres/sec or as fast as 120 metres/sec.

**Watch this space each month for the latest breaking advances in human brain research from around the world.**