**Name of Disorder:** Stroke  
**Essay Title:** Susceptibility to infections after stroke  
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**Date:** 16 June 2014

**Stroke**
Strokes are the second largest cause of death in the world, having approximately 15.3 million occurring every year with a third of these being fatal. In Australia, it is predicted that around 60,000 strokes occur every year, making them the largest cause of death in the country (1). The injury to the brain following stroke is also one of the leading causes of disability and contributes to a heavy financial burden on the health care system of society (2).

A stroke is a neurovascular disease that occurs when the brain is deprived of nutrients from insufficient blood flow due to a blockage (ischemic) or rupture (hemorrhagic) of a brain blood vessel. This is often followed by death of brain cells and the subsequent brain injury can lead to severe consequences such as disability or even death of the stroke patient (3).

**Outcomes of stroke**
As the blood carries nutrients into the brain for its proper function, the deprivation of blood to the brain, in the case of a stroke, causes damage to its cells. The most common outcome of a stroke is impaired cognitive function, which is evident as symptoms of stroke may include memory loss, speech difficulty, vision impairment and loss of sensation. In addition, the damage to the brain caused by the lack of the blood flow has also seen to worsen upon resolution of the blockage due to a number of factors, including the production of reactive oxygen species and the body's immune system (4).

The immune system is a collection of different types of cells and bodily processes which normally has a role in defending the body against harmful disease causing organisms such as bacteria or viruses. Shortly after a stroke, it has been found that there is an alteration in the body's immune system. As blood is allowed to flow back into the brain after a stroke, the increase production of reactive oxygen species and recruitment of immune cells at the sites of damage further enhance brain cell death. Additionally, entry of immune cells into the brain leads to swelling (known as oedema). This brain oedema increases the pressure within the skull and can cause even more collateral brain damage (5). Therefore, the body attempts to counteract the increased inflammation in the brain by signalling the immune system to "slow down" and dampen its response. It was only found recently that this dampening or suppressing of the immune system after stroke also means that the patient is now less effective at defending against bacteria and leads to their increased susceptibility to bacterial infections (6). Indeed, a common complication that occurs in stroke survivors is infection, which can arise only days after their stroke onset. In fact, a major cause of death of stroke patients is infection. On average, around 70% of patients will develop infection as a complication after stroke, the majority being lung (pneumonia) and urinary tract infections (7). Despite the overwhelming evidence that infection is an extremely relevant complication in stroke, the precise underlying mechanisms remain poorly understood.
**Treatments to post-stroke infection**

Preventing the onset or treating infection after a stroke has been shown to reduce the mortality of patients. To avoid bacterial infection in stroke patients, preventative treatment with antibiotics has been studied. Similarly, antibiotics are also used to treat those that already have infection (8). However, due to the wide misuse of antibiotics in the past, antibiotic resistant bacteria have arisen making antibiotic treatments less effective with alternative treatments being required. Currently, investigations are being conducted to investigate the mechanisms behind the control of the patient immune system after stroke, with the ultimate aim to examine compounds that can prevent the weakening of the immune system or strengthen the immune system to avoid the onset of infection after stroke. However, the risk in this type of treatment is high since strengthening the immune system may also exacerbate brain damage after stroke. Therefore, activating the immune system enough to prevent infection but not to an extent where it causes more damage to the brain would be beneficial to improve post-stroke outcomes.

**References**


