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Acute ischaemia stroke is the most common form of stroke and is caused by a thrombus or an embolus occluding an intracranial artery. It is a disease that remains essentially untreatable, apart from thrombolytic therapy, which can only be given to a limited number of those patients that present within a short time of the occlusive event.

Since many of the patients that survive a stroke are disabled to some extent, the healthcare burden placed on society by stroke is extremely high. This is compounded by the fact that the incidence of stroke increases with age and the percentage of the population over 65 years old is also increasing in the developed world. In the late 1980s and early 1990s, there was an explosion of research in the field leading to the advent of a range of compounds that showed good efficacy in animal models of stroke. Subsequent clinical trials with these compounds have been disappointing, with little or no efficacy observed in patients. The reasons for this lack of efficacy are clear for some compounds e.g. dose limiting side effects (especially cardiovascular) or poor preclinical characterisation of time window and active dose. Therefore a positive neuroprotective effect in man, with which to validate the preclinical models, is still lacking. However the clinical trials carried out to date have been valuable and have highlighted shortcomings in terms of the characterisation of functional endpoints that are currently being addressed. In particular, non-invasive imaging techniques such as MRI are being used in both animals and man in an attempt to predict long term outcome after a stroke.

Future work in both basic and applied research is focused on three main areas: prevention (including genetic studies to identify individuals at most risk), neuroprotection and regeneration/repair strategies.

Many of the risk factors for stroke are preventable or can be treated, e.g. hypertension, smoking. It is clear that in some families there is a genetic component but the genes underlying this increased stroke risk have not been identified. Current efforts to identify stroke-related genes have used genetically susceptible rats, and some promising loci and candidate genes have been found. In terms of neuroprotective approaches, the study of apoptotic pathways in stroke has provided several potential therapeutic strategies. These include targeting caspases and DNA repair mechanisms. Other strategies involve modulation of glutamatergic function and inhibition of free radical generation. Inflammatory mediators have also provided promising targets for intervention such as anti-adhesion approaches. It is likely that a combination of therapies may be required to see maximum rates of recovery from stroke.

Finally, recent benefits observed preclinically with growth factors suggests that therapeutics targeted at enhancing repair or regeneration may be of value in stroke. However this area will provide major challenges in terms of defining clinical endpoints.