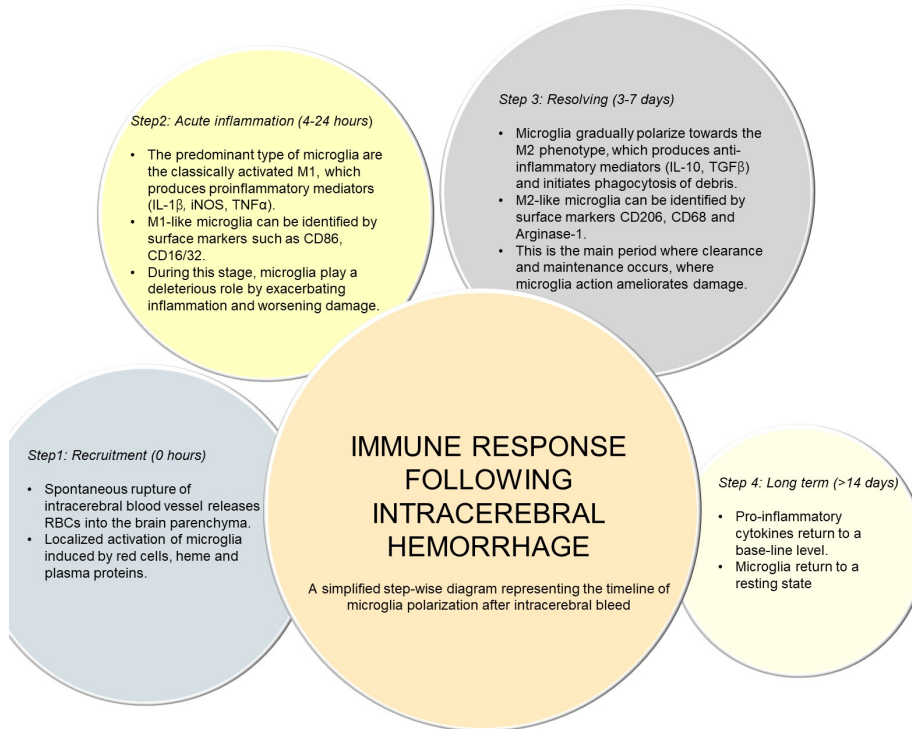


# Vaccination against stroke

## The role of microglia immune tolerance against recurrent intracerebral hemorrhage

Shin-Shin LEE<sup>1</sup>, Gilberto Ka Kit LEUNG<sup>1</sup>  
<sup>1</sup>Department of Surgery, the University of Hong Kong



### Objectives:

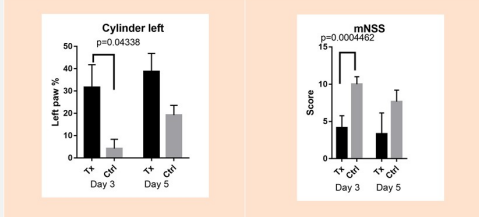
- To observe the immune response following a moderate-sized hemorrhagic stroke in murine model.
- To analyze involvement of M1 and M2 polarization of microglia following hemorrhagic stroke.
- To determine whether a previous stroke may influence immune response of a second insult of the same nature.
- To compare hematoma clearance rate, behavioral test scores, and microglia polarization within mice with a previous hemorrhagic stroke and mice with no previous exposure.

### Methods:

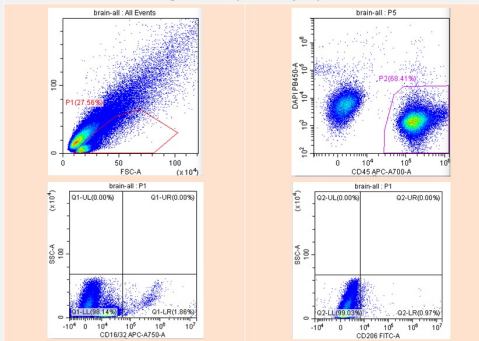
- Modified Neurological Scoring System (mNSS) comprises of four categories that assesses both motor and sensory deficits.
- Rotarod tests for general motor coordination. Results are marked as duration before fall.
- Cylinder test measures spontaneous left paw and right paw usage. A higher left paw usage percentage indicates worsened outcome.
- Flow cytometry: CD45Int /CD11bHigh are identified as brain-derived microglia (to differentiate from blood-derived macrophages: CD45High/CD11bHigh).
- Histology samples: Brains are sectioned at 2mm thickness and hematoma size is measured by ImageJ threshold quantification.

### Results:

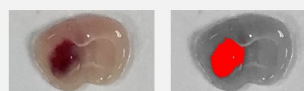
- Previous injury (Tx) ameliorates damage of intracerebral hemorrhage and improves behavioral test outcomes compared to control group (Ctrl).



- Flow cytometry reveals an M1 to M2 shift at 24 hour time point after intracerebral hemorrhage in mice previously exposed to similar stimuli.



Beam-walking test: left limb falls off beam (arrow), indicating left side hemiplegia caused by induction of intracerebral hemorrhage in the right basal ganglia



Original brain histology section  
Threshold gating by ImageJ—to quantify hematoma size

### Discussion and Conclusions:

- Microglia, as brain-resident derivatives of macrophages, exerts inflammatory and anti-inflammatory effects depending on polarization pathways.
- The hematoma clearing, alternative activation pathway (M2) is upregulated and occurs earlier in mice with previous intracerebral bleeds. This attenuates damage caused by inflammation and alters the immune cascade that follows an acute intracerebral hemorrhage, as supported by behavioral testing and hematoma size at both 24 hours and 7 days following injury.