CNS 2017 ANNUAL MEETING
BOSTON, MASSACHUSETTS
OCTOBER 7–11, 2017

# Deciphering the Immunological Response in a Subarachnoid Hemorrhage Murine Model

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## Introduction

Subarachnoid haemorrhage (SAH) is a catastrophic medical condition, frequently resulting from rupture of an intracranial aneurysm. It is associated with significant mortality and morbidity in patients. Early events, including activation of immune cells, following SAH, determine the outcome of the patient. However, sequences of activation of this inflammation remain little understood. The objective of this project is to dissect the inflammatory response to the induction of SAH in a murine model.

## Methods

SAH was induced by intracranial injection of blood into the chiasmatic cistern. Motor phenotype analyses were performed at day 10. The blood and brains of mice were harvested at day 1, 2, 5, 7 and 10 after SAH. The brains were digested and the blood was centrifuged in order to isolate the leukocytes. Leukocyte phenotypes were determined by flow cytometry. Immunofluorescence studies were performed on paraffin embedded brains.

## Results

Our analyzes show that SAH mice have abnormal gait and grip abnormalities. In the brains, we observed an early increase in classical monocytes infiltration and activated microglia. SAH induces an increase in circulating neutrophils and activated CD4 lymphocytes at day 1 and 5 after SAH. Immunofluorescence suggests that SAH results in increased astrocytic activation on Day 7.

## Conclusions

Our results confirm that the microglia is activated and that the monocytes infiltrate the brain prematurely following a SAH. In addition, activated lymphocytes are mobilized in the peripheral blood later. Our analyses also suggest that there is late astrocytic activation. The similarity of the SAH inflammatory signatures in humans and mice confirms the translational aspect of our model. This will allow us to test various immunomodulatory therapies in order to reduce the deficits induced by SAH.

## Learning Objectives

Identify the immune signature in a model of SAH

Discuss of potential immunomodulatory approaches to treat SAH patients