Riunione annuale SIN
Umbria-Marche
Perugia, 7 dicembre 2016

The Role of Immune Response in Cerebral Hemorrhage

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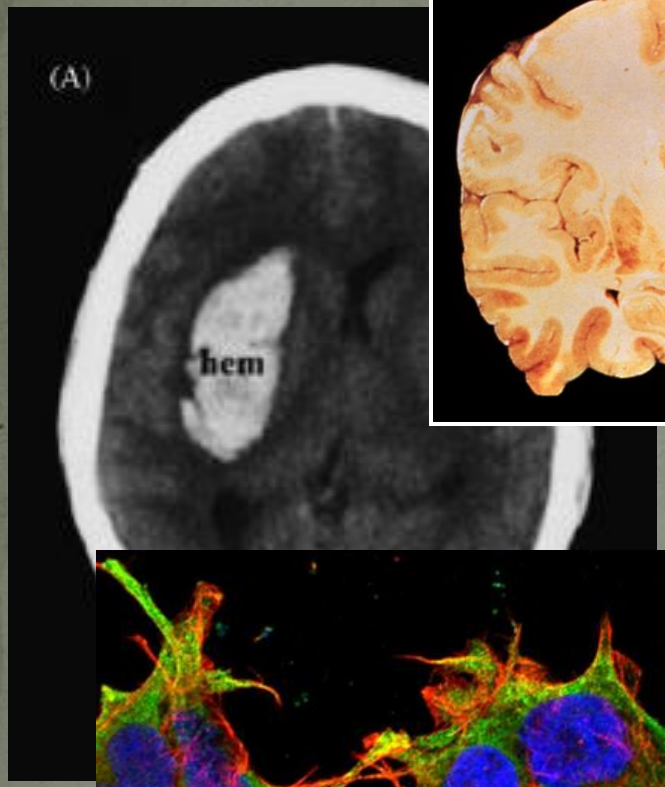

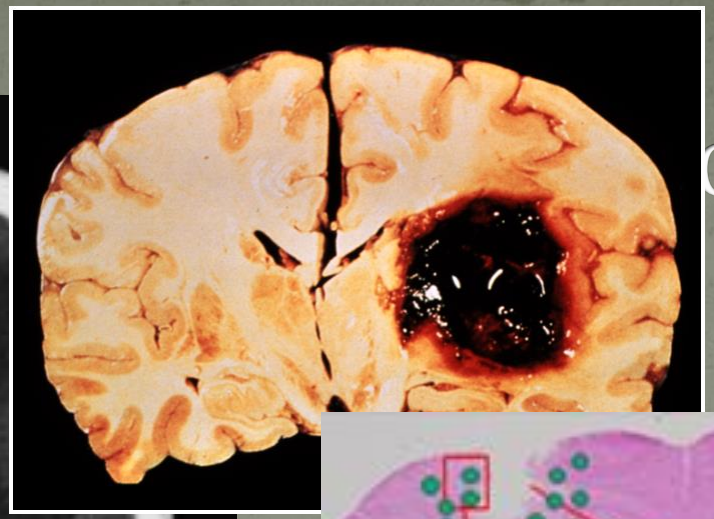

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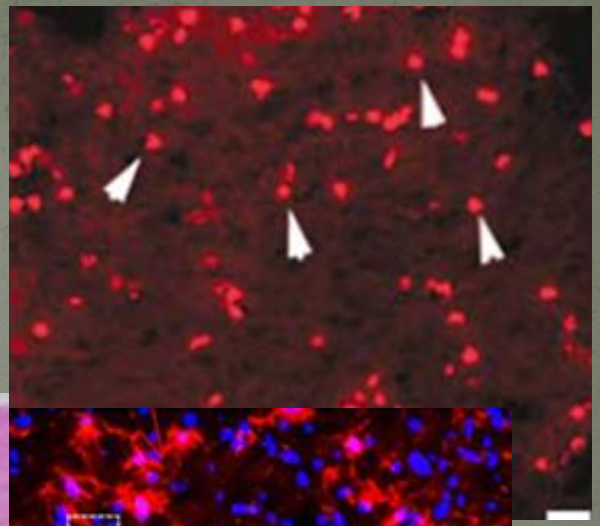
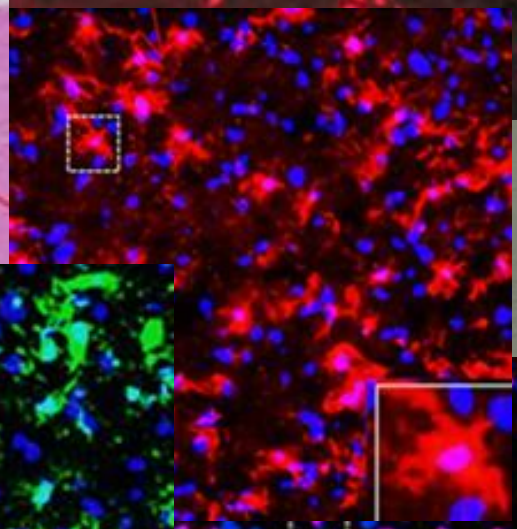
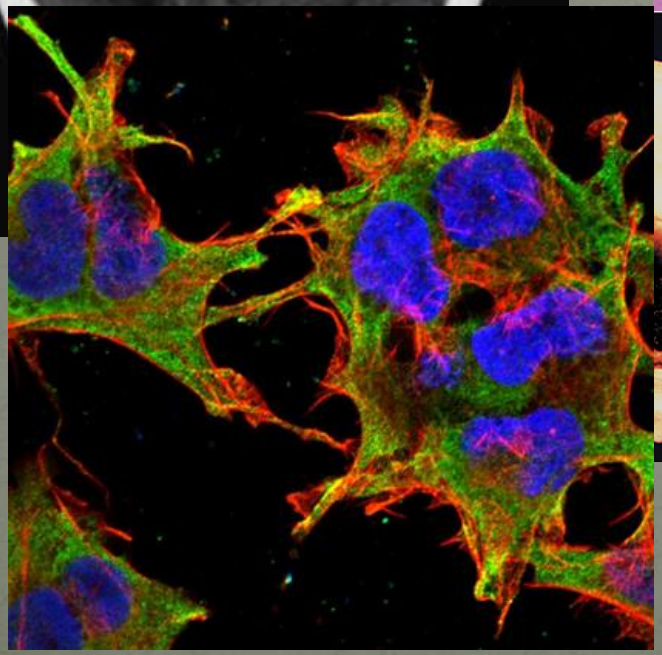
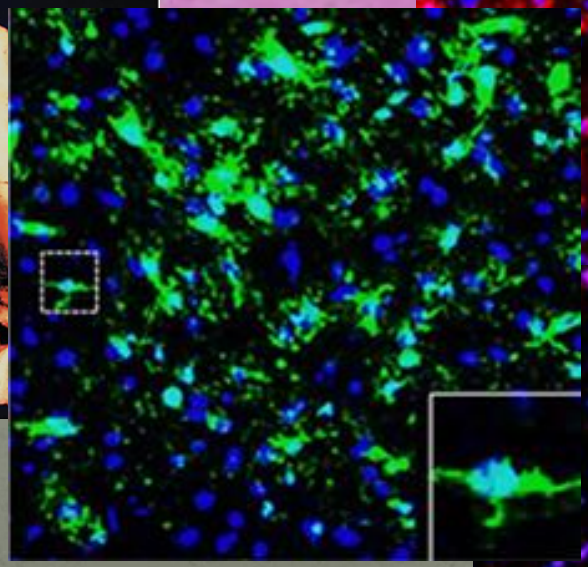
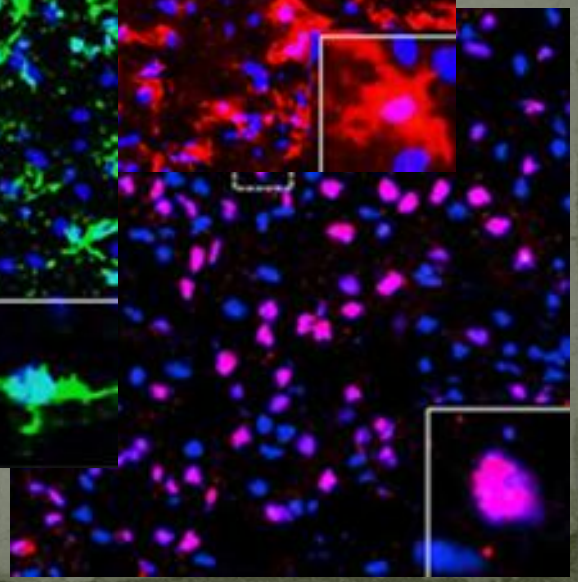


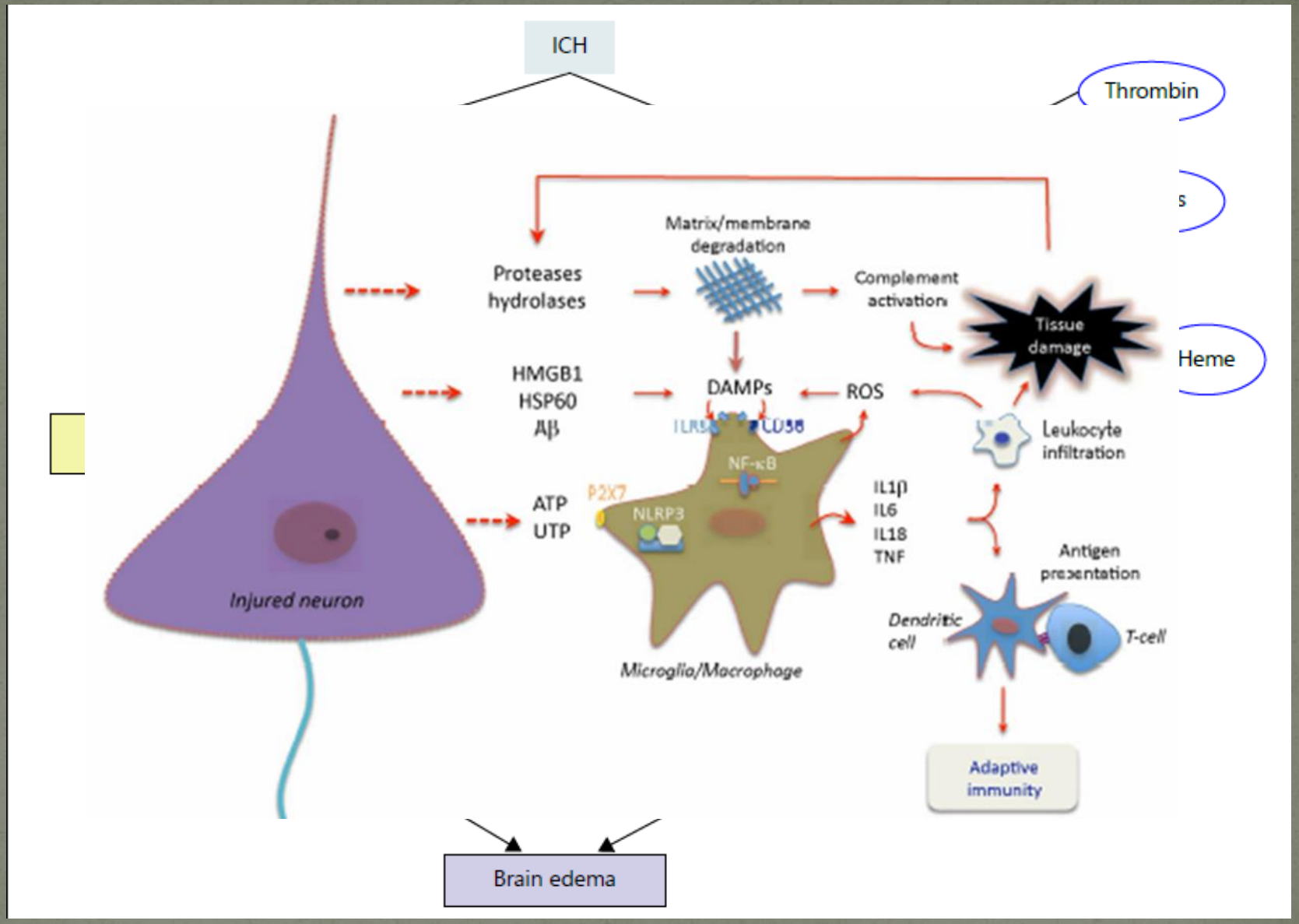




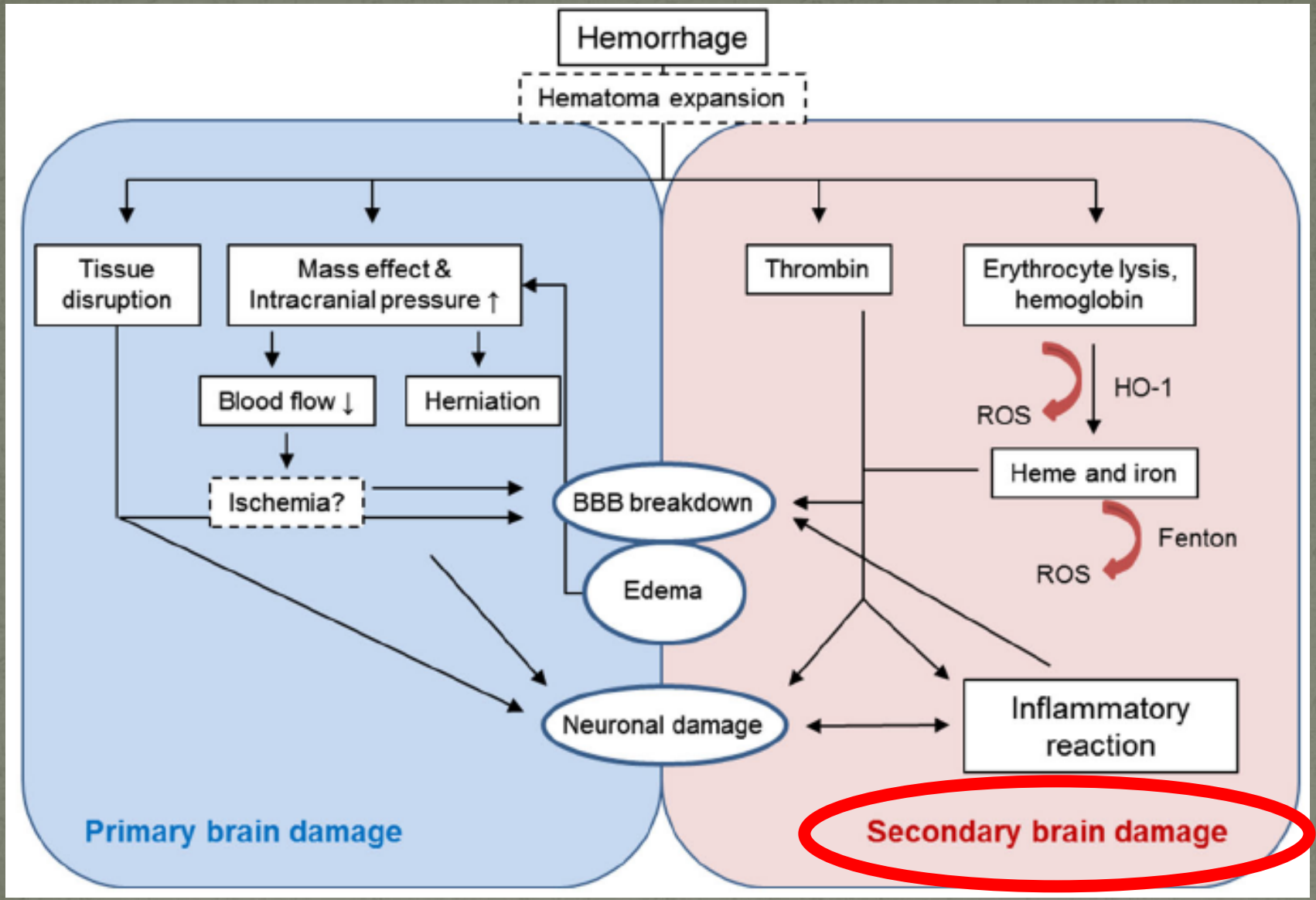




How and to what extent do inflammation and immune system matter in intracerebral hemorrhage ?

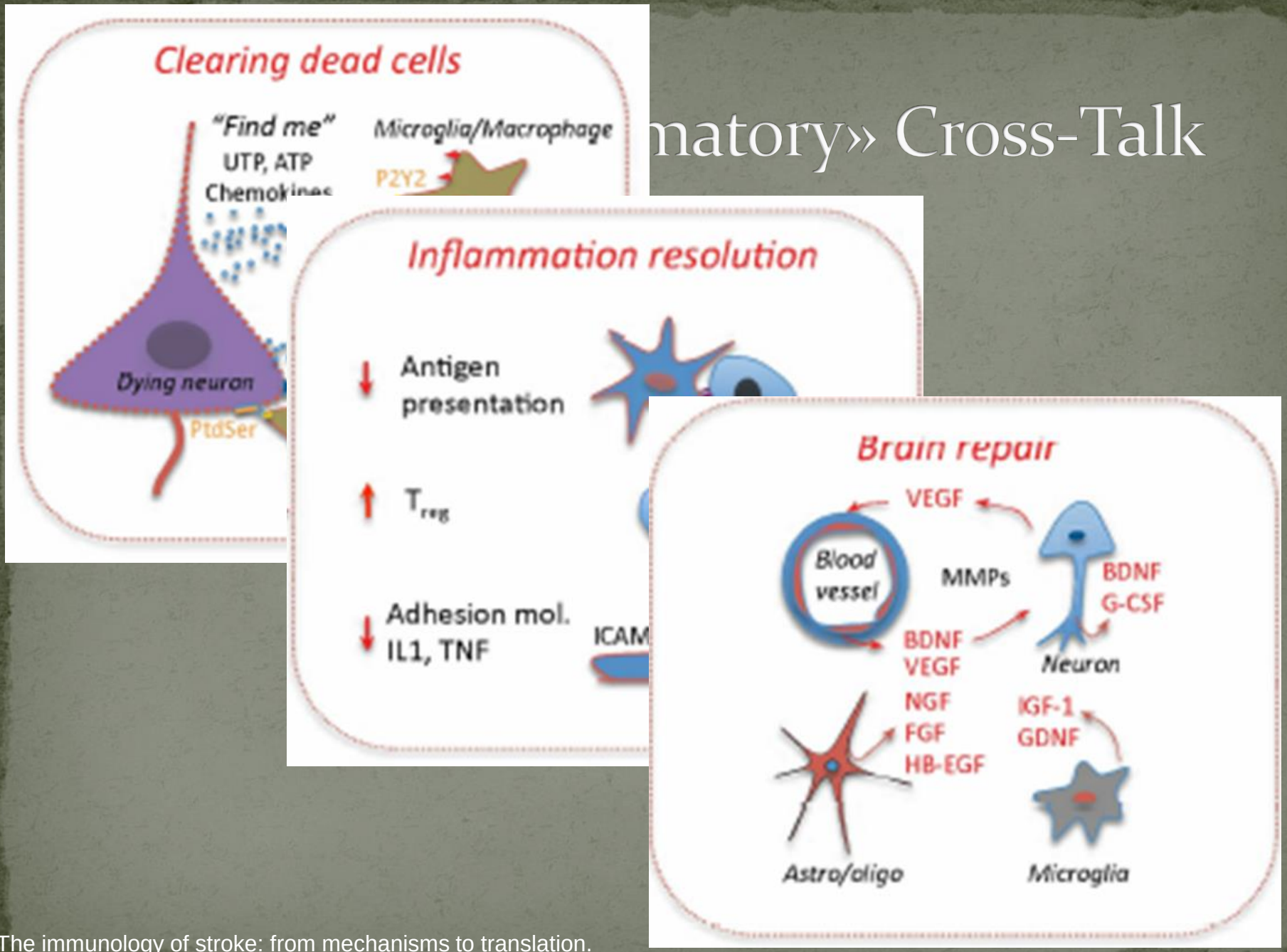


Mechanism and Therapy of Brain Edema after Intracerebral Hemorrhage. *Cerebrovasc Dis* 2016;42:155-69.
The immunology of stroke: from mechanisms to translation. *Nat Med* 2011;17:796-808.



Neuroinflammation after intracerebral hemorrhage
Front Cell Neurosci 2014;8:388

matory» Cross-Talk



The immunology of stroke: from mechanisms to translation. *Nat Med*. 2011;17:796-808.

From Micro- …. To Clinic

Early neurologic deterioration in …ebral hemorrhage

…s and associated factors

…hD; Y. Silva, MD; A. Gil-Peralta, MD, PhD; J. Tejada, MD, PhD; …D, PhD; for the Stroke Project, Cerebrovascular Diseases Group

Table 1 Potential predictors at baseline of END

Predictor	END, n = 61	Non-END, n = 205	*p*
Age, y	72 ± 8	70 ± 11	0.208
Sex, male	64	53	0.143
Time from onset to inclusion, h	6.1 ± 3.1	6.1 ± 3.2	0.992
CSS score	4.5 (3, 6)	5 (3, 6.5)	0.194
Preceding infection, within 15 d	13.1	3.4	0.008
Inflammatory disease, within 30 d	9.8	2.4	0.020
Fever within previous 15 d	9.8	2.9	0.033
Body temperature, °C	37.3 ± 0.7	36.4 ± 0.5	<0.001
Hemoglobin, mg/dL	14.3 ± 1.7	13.8 ± 1.5	0.034
Leukocyte count, ×1,000/mm^3	12.8 ± 3.2	8.6 ± 5.1	<0.001
Neutrophil count, ×1,000/mm^3	10.8 ± 2.9	6.3 ± 4.3	<0.001
Plasma fibrinogen, mg/dL*	546 ± 126	396 ± 119	<0.001
ESR 1st h, mm†	39 ± 14	22 ± 19	<0.001
CPK, U/L‡	220 ± 231	151 ± 150	0.043

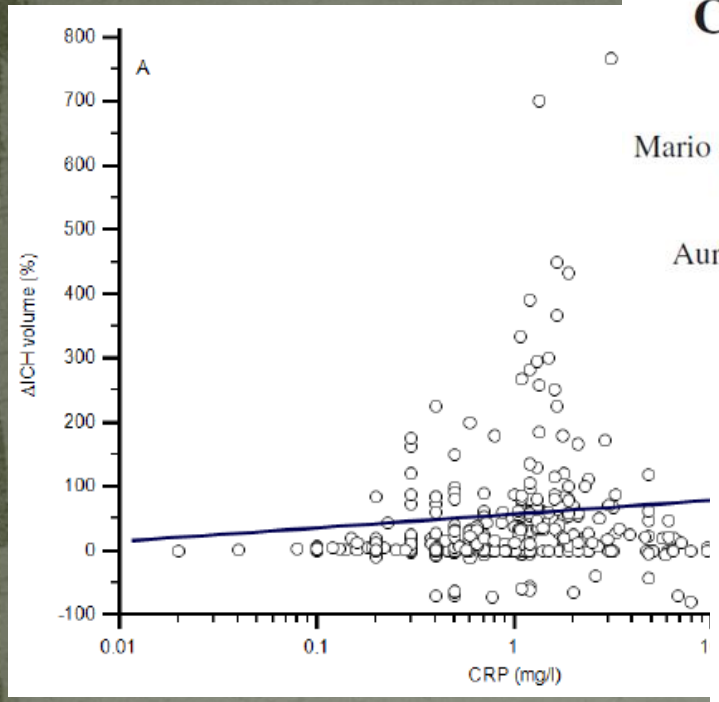
Table 2 Predictors of END selected by final logistic model

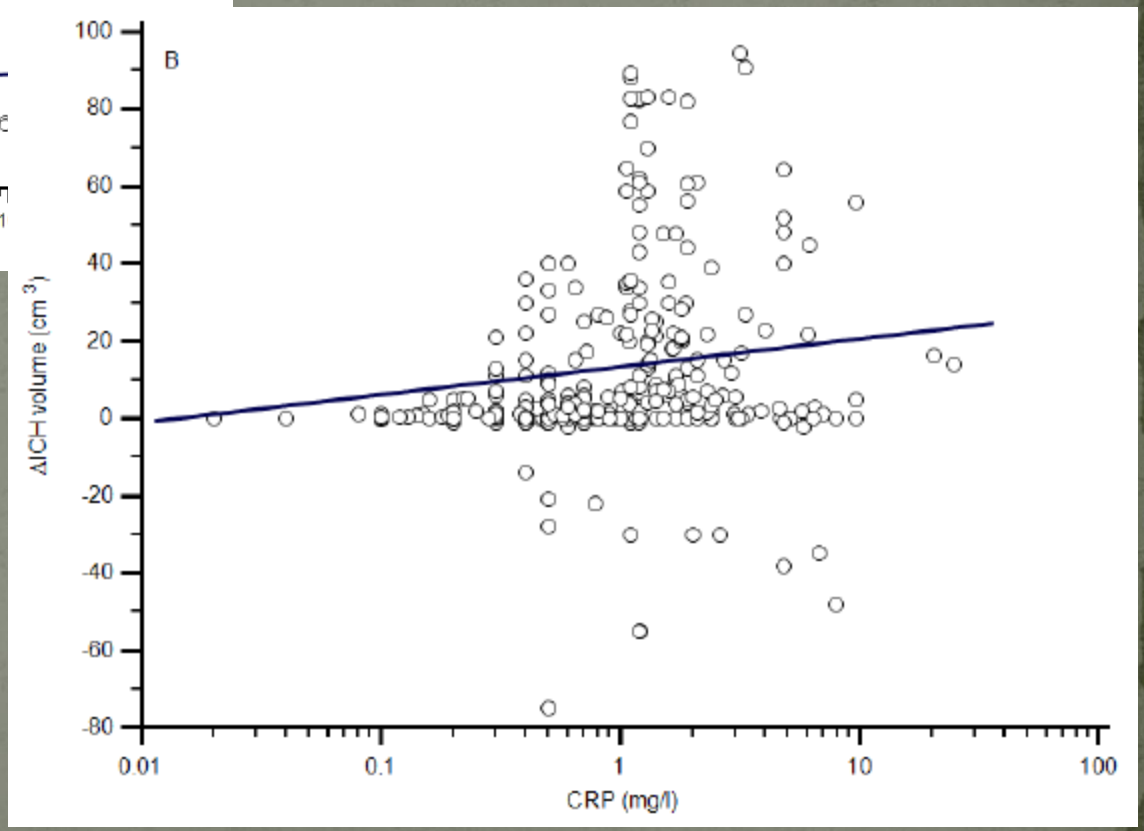
Predictor	Odds ratio	95% CI	*p*
Age	1.00	0.96–1.06	0.77
Sex, male	1.71	0.60–4.84	0.31
Time from onset to inclusion, h	1.00	0.85–1.19	0.92
CSS score	0.94	0.74–1.18	0.62
Body temperature, >37.5° C	24.5	4.8–125	<0.001
Neutrophil count, ×1,000/mm^3	2.08	1.64–2.65	<0.001
Fibrinogen, >523 mg/dL	5.59	1.93–16.2	<0.001

Neurology 2004;63:461-467

C-Reactive Protein Predicts Hematoma Growth in Intracerebral Hemorrhage

Mario Di Napoli, MD; Adrian R. Parry-Jones, PhD, MRCP; Craig J. Smith, MD, MRCP; Stephen J. Hopkins, PhD; Mark Slevin, PhD, FRCPath; Luca Masotti, MD; Veronica Campi, PhD; Puneetpal Singh, PhD; Francesca Papa, MD; Aurel Popa-Wagner, MD, PhD; Valerica Tudorica, MD; Daniel Agustin Godoy, MD

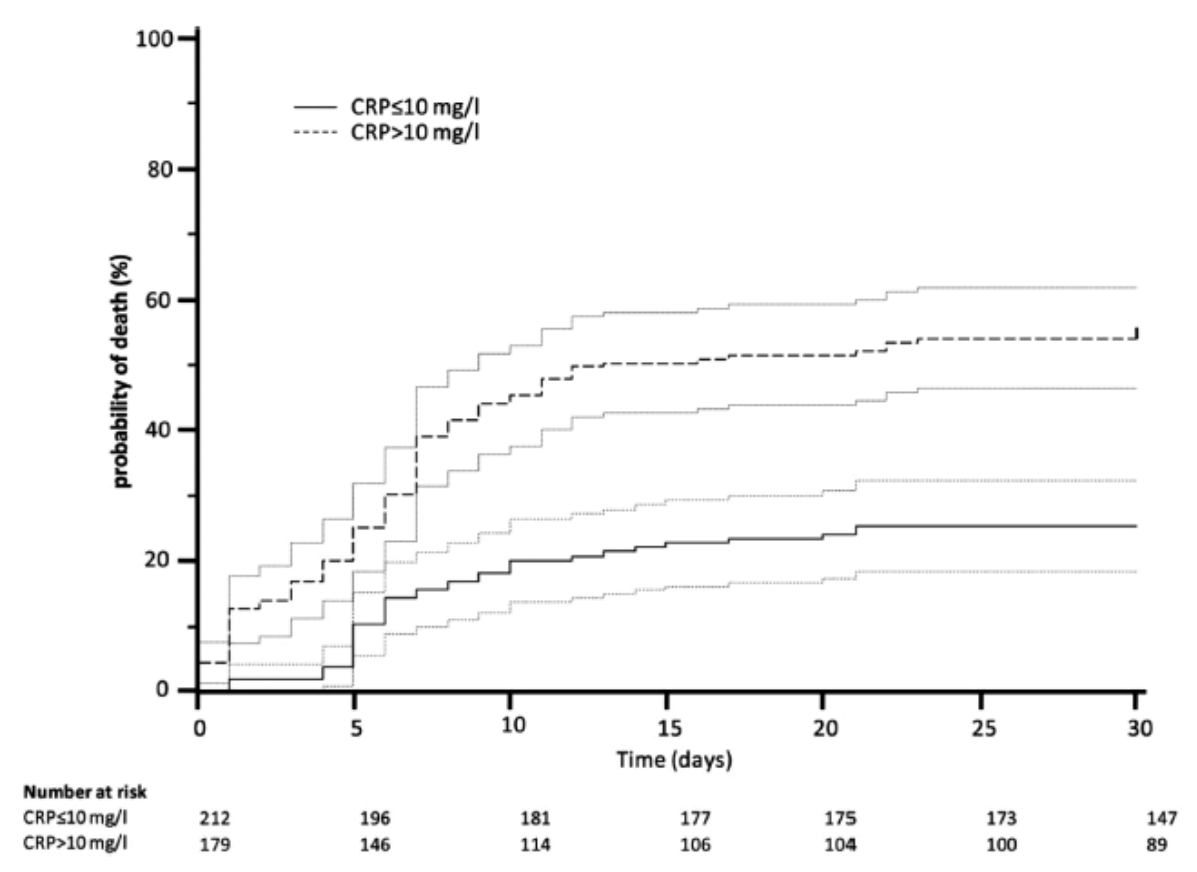




Correlation between CRP concentration in mg/l (reported in log scale) at admission and relative ICH growth (r=0.209; *P*<0.0001), and absolute ICH growth (r=0.210; *P*<0.0001)

Stroke 2014;45:59-65

Risk of death by C-reactive protein (CRP) concentration at admission



Stroke 2014;45:59-65

Adaptive Immunity

Editorial

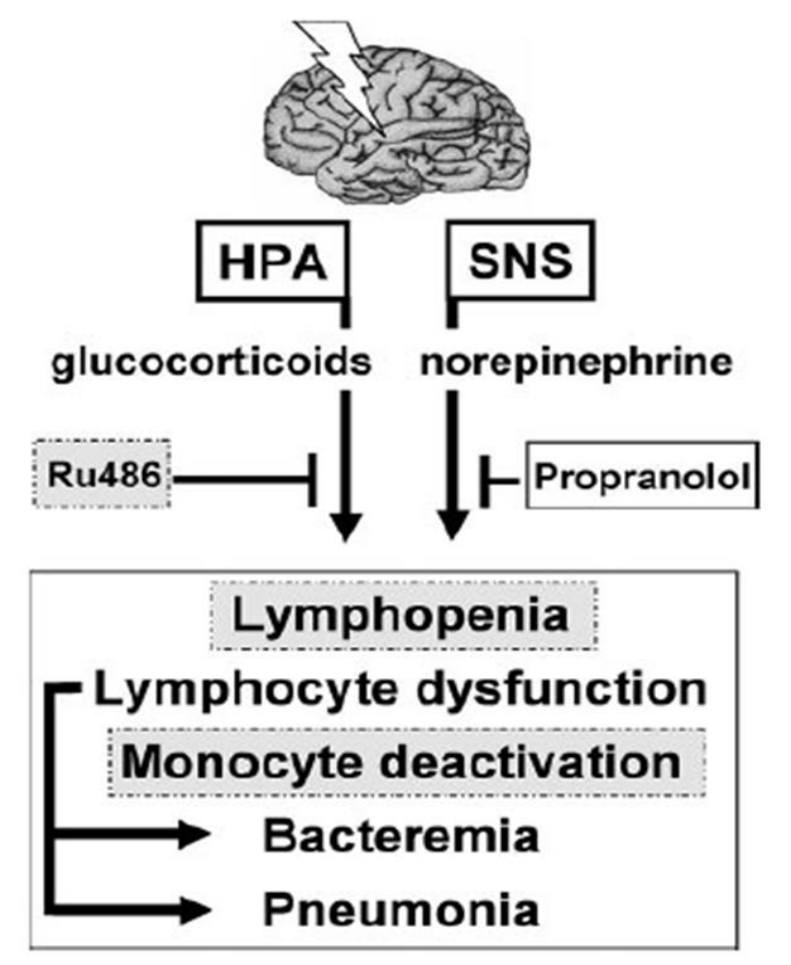
The Forgotten Lymphocyte
Immunity and Stroke

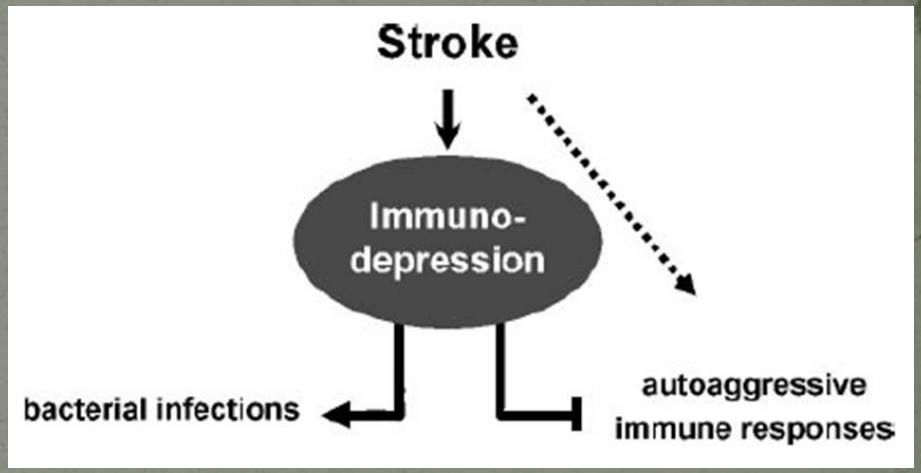
Alison E. Baird, FRACP, PhD

Stroke-Induced Immunodepression
Experimental Evidence and Clinical Relevance

Circulation 2006;113:2035-6

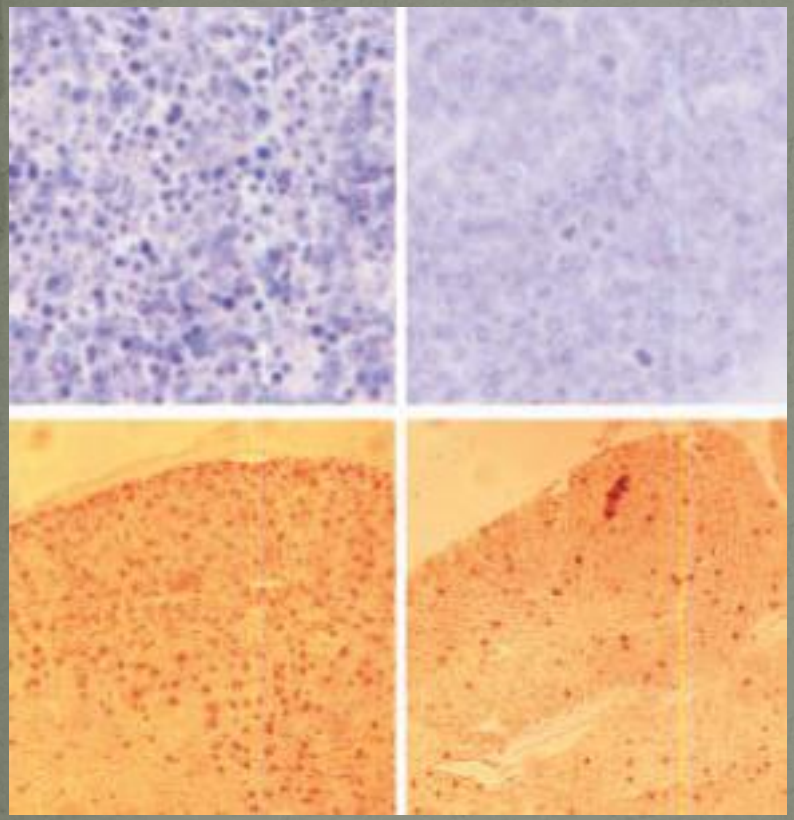
Post-Stroke Immunodepression

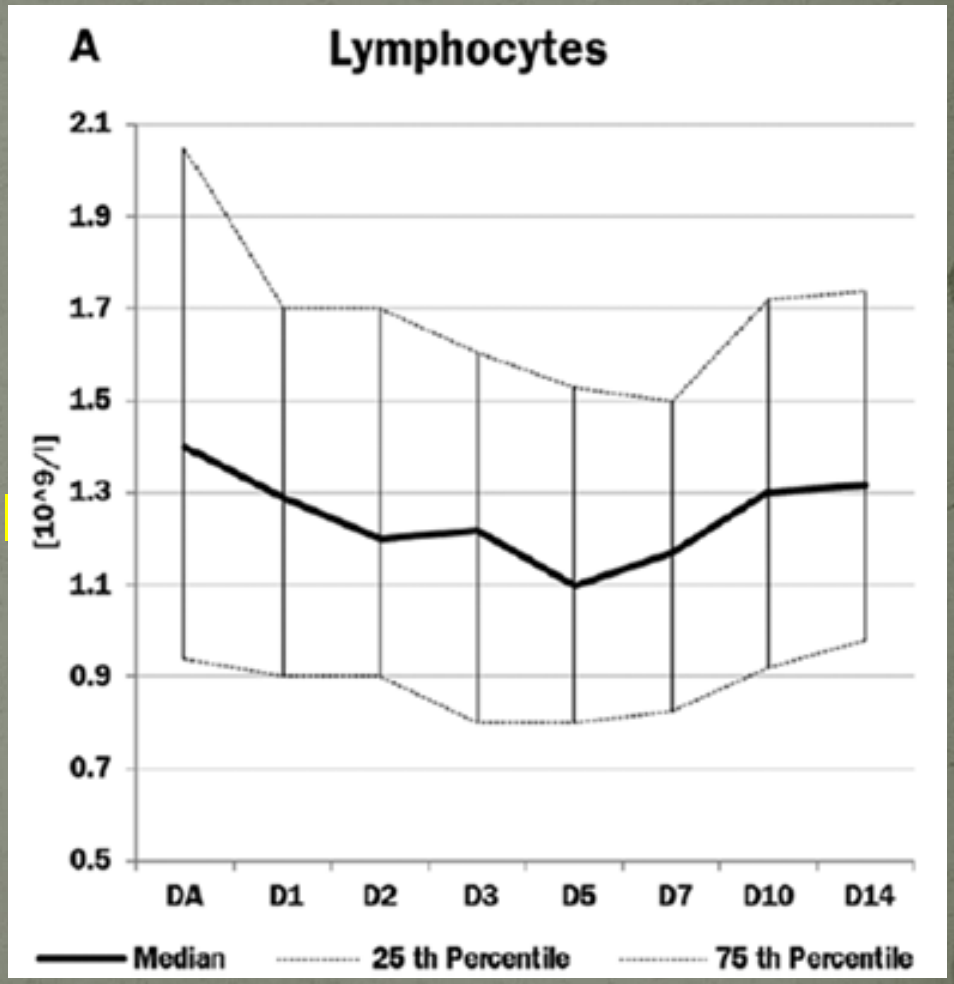




Stroke 2007;38[part 2]:770-3

Post-Stroke Immunodepression

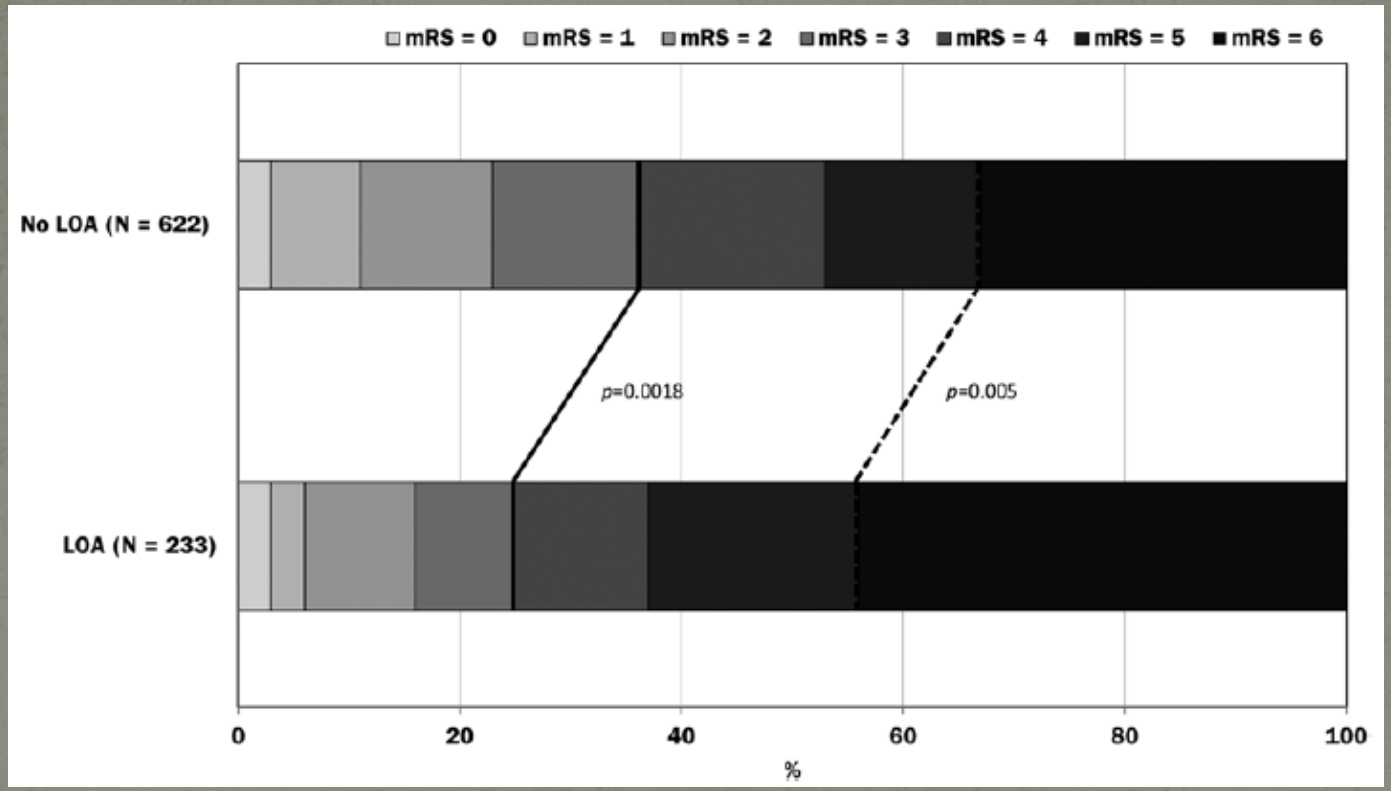




J Exp Med 2003;198:725-36

Stroke 2016;47:1239-46

Lymphocytopenia Is an Independent Predictor of Unfavorable Functional Outcome in Spontaneous Intracerebral Hemorrhage



Distribution of the modified Rankin scale (mRS; 3 months outcome dichotomized into mRS 0–3 vs 4–6) for patients with and without lymphocytopenia on admission (LOA)

Stroke 2016;47:1239-46

Neutrophil-to-Lymphocyte Ratio

Neutrophil-to-Lymphocyte Ratio Predicts the Outcome of Acute Intracerebral Hemorrhage

Simona Lattanzi, MD; Claudia Cagnetti, MD; Leandro Provinciali, MD; Mauro Silvestrini, MD

Associations of Leukocyte Counts and NLR with Death or Major Disability at 3 Months

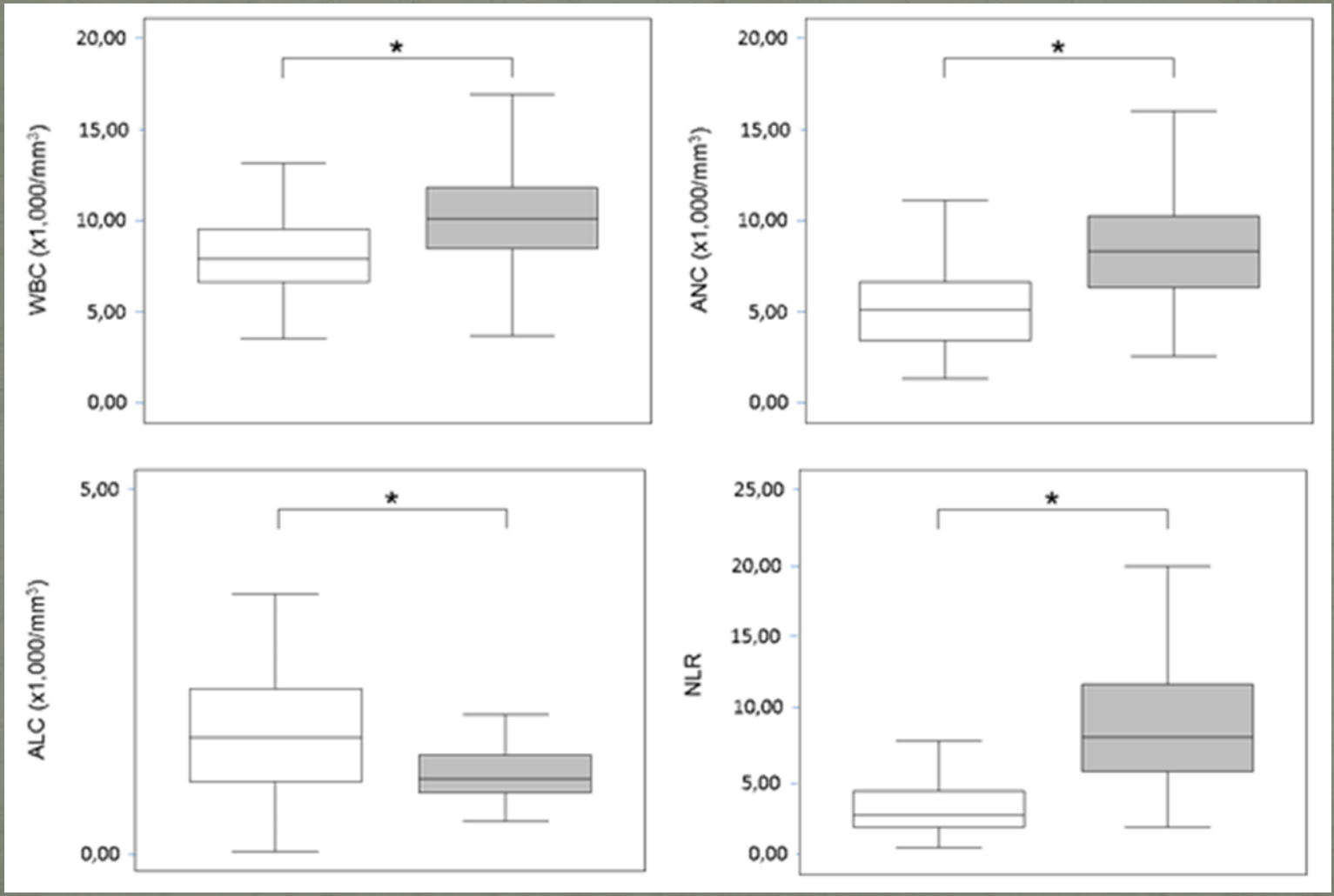
	Unadjusted		Adjusted*	
Independent Variable	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
White blood cells	1.18 (1.05–1.33)	0.005	1.12 (0.98–1.29)	0.094
Absolute neutrophil count	1.36 (1.17–1.58)	<0.001	1.22 (1.03–1.44)	0.023
Absolute lymphocyte count	0.37 (0.23–0.60)	<0.001	0.57 (0.33–0.99)	0.046
Neutrophil-to-lymphocyte ratio	1.34 (1.17–1.53)	<0.001	1.16 (1.02–1.33)	0.031

ORs for every 1000 white blood cells, neutrophils, or lymphocytes and 1-point neutrophil-to-lymphocyte ratio increases are obtained with logistic regression analysis. BP indicates blood pressure; CI, confidence interval; and OR, odds ratio.

*Adjustment by age, sex, initial and discharge National Institutes of Health Stroke Scale scores, baseline intracerebral hemorrhage volume (log transformed), hematoma location, presence of intraventricular hemorrhage, admission systolic BP, systolic BP variability.

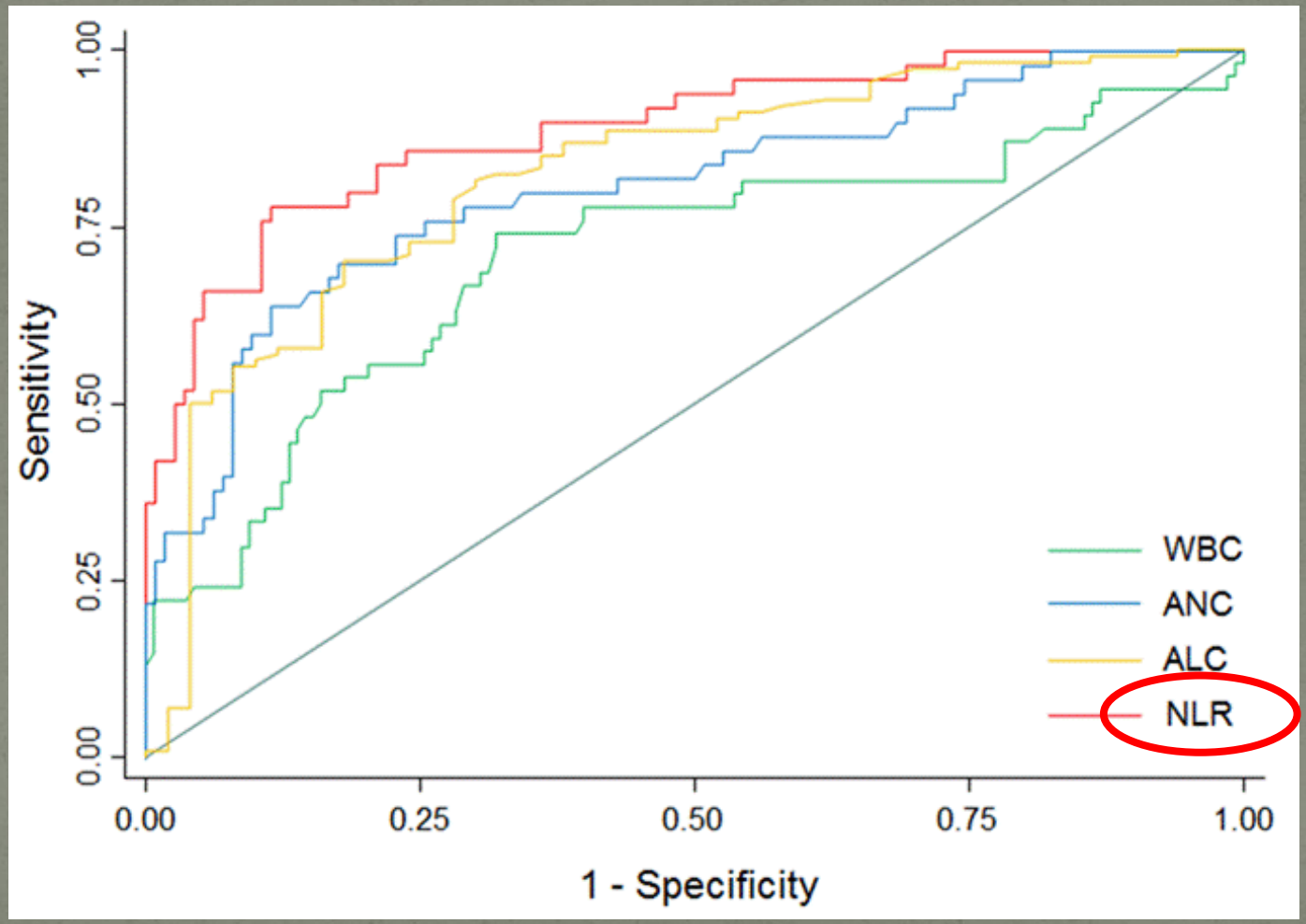
Stroke 2016;47:1654-7

Early Neurological Deterioration



Unpublished personal data

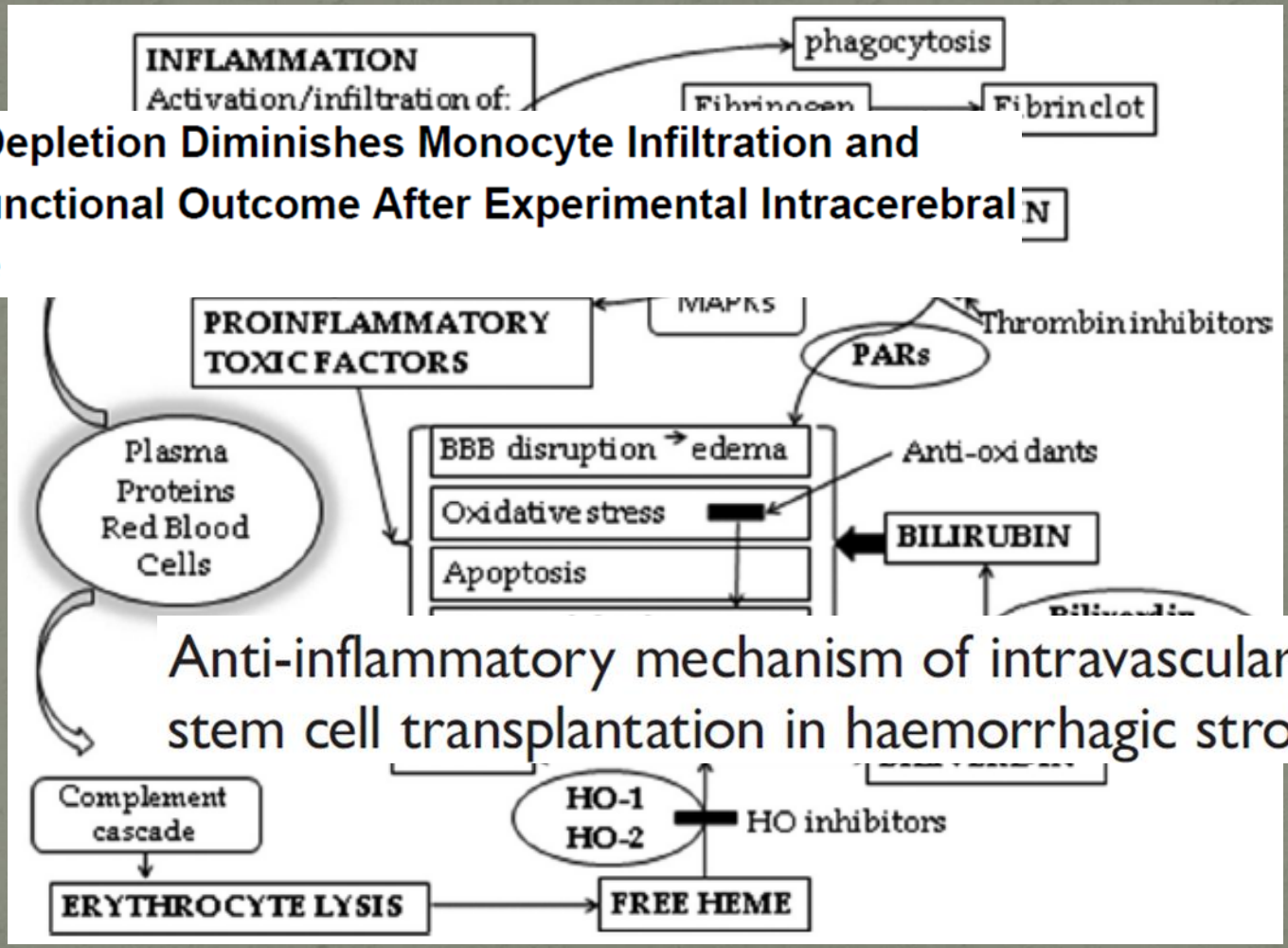
Early Neurological Deterioration



Unpublished personal data

The Immunology of Stroke
From Mechanisms to Translation

Neutrophil Depletion Diminishes Monocyte Infiltration and Improves Functional Outcome After Experimental Intracerebral Hemorrhage



Stroke 2013;44:S74-S78

Key Points

- *Inflammatory mechanisms* are involved in the progression of ICH-induced brain injury by the interplay between immune system, brain, and vasculature
- Early inflammation may exert a detrimental effect on the functional outcome and long term prognosis
- The NLR could integrate the likelihood of secondary brain injury with the susceptibility to post-stroke complications
- Understanding of the ICH-induced inflammatory response and its modulation might have treatment implications
- Thanks

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