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CNS derived Extracellular Vesicles as Biomarkers in Multiple Sclerosis (MS)

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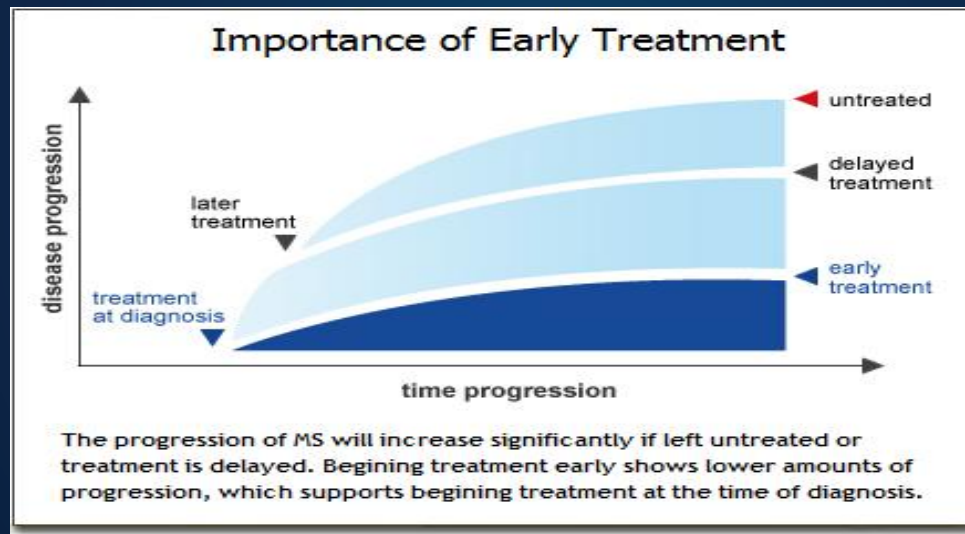


**Sidney Kimmel
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CNS derived Extracellular Vesicles as Biomarkers in Multiple Sclerosis (MS)

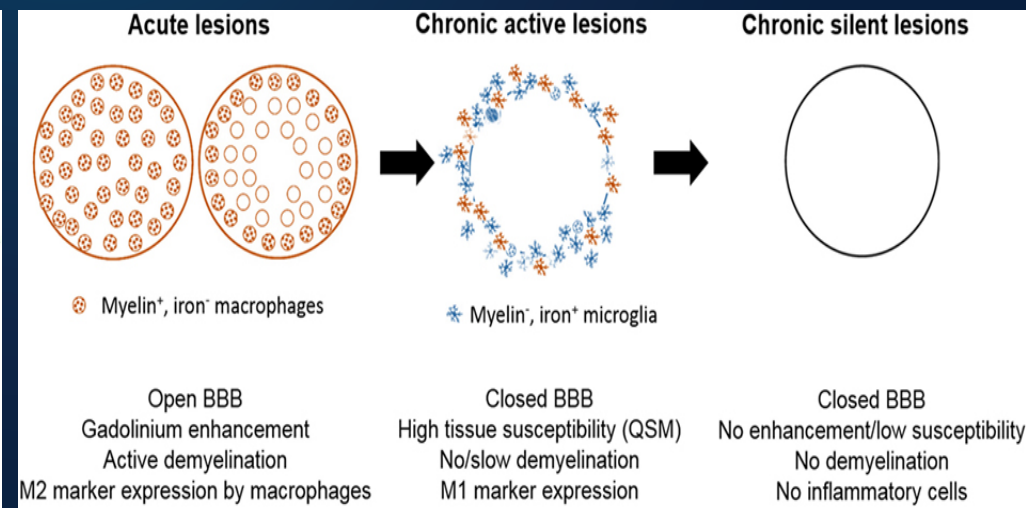
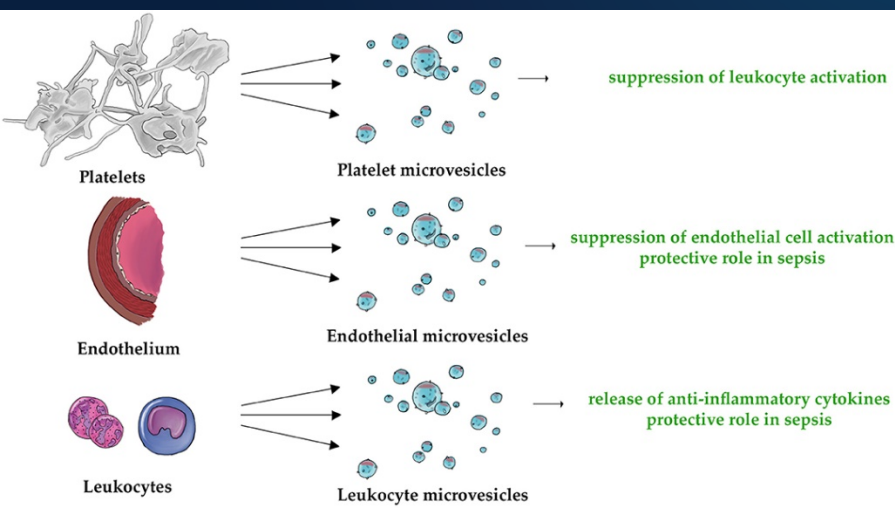
By Anshel Kenkare, with advisor
Dr. Abdolmohamad Rostami (*)

- MS is a clinically heterogenous disease making it difficult to diagnose arising from a demyelinating pathology
- Initiating treatment of MS early has been shown to improve patient outcomes and slow disease progression



- This study aims to find biomarkers to categorize biological changes in MS (through extracellular vesicles containing oligodendrocyte proteins) → Earlier and more accurate clinical decision making!

- Extracellular vesicles can help categorize autoimmune disease
- The blood brain barrier is dysregulated in Multiple Sclerosis





Extracellular Vesicles in Cancer Detection: Hopes and Hypes

Tony Hu • Joy Wolfram • Sudhir Srivastava

Published: September 29, 2020 • DOI: <https://doi.org/10.1016/j.trecan.2020.09.003> • Check for updates

Extracellular Vesicles in Alzheimer's and Parkinson's Disease: Small Entities with Large Consequences

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Immune profiling of plasma-derived extracellular vesicles identifies Parkinson disease

Elena Vacchi, Jacopo Burrello, Dario Di Silvestre, Alessio Burrello, Sara Bolis, Pierluigi Mauri, Giuseppe Vassalli, Carlo W. Cereda, Cinthia Farina, Lucio Barile, Alain Kaelin-Lang, Giorgia Melli

First published August 12, 2020, DOI: <https://doi.org/10.1212/NXI.0000000000000866>

Review | [Open Access](#) | Published: 10 June 2019

Neuronally derived extracellular vesicles: an emerging tool for understanding Alzheimer's disease

[Luke S. Watson](#), [Eric D. Hamlett](#), [Tyler D. Stone](#) & [Catrina Sims-Robinson](#)

Molecular Neurodegeneration **14**, Article number: 22 (2019) | [Cite this article](#)

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Extracellular vesicle (EV)-polyphenol nanoaggregates for microRNA-based cancer diagnosis

[Minjeong Jang](#), [Giwoong Choi](#), [Yoon Young Choi](#), [Jae Eun Lee](#), [Jik-Han Jung](#), [Seung Won Oh](#), [Dai Hoon Han](#), [Haeshin Lee](#), [Ji-Ho Park](#), [Jae-Ho Cheong](#) & [Pilnam Kim](#)

NPG Asia Materials **11**, Article number: 79 (2019) | [Cite this article](#)

1817 Accesses | 4 Altmetric | [Metrics](#)

Objectives & Hypothesis

- Research Question
 - How do the extracellular vesicles contents of cerebrospinal fluid (CSF) and blood compare between unmedicated patients diagnosed with MS and non-inflammatory headache controls?
- Hypothesis
 - There will be a greater number of extracellular vesicles visible in the CSF and blood of unmedicated MS patients compared to healthy controls. Furthermore, vesicles in the unmedicated patients with MS will show signs of immune dysregulation.

Approach

MS Patients

Headache Patients

Receiving a lumbar puncture for
clinical care

Consent to have a
non-clinically
significant portion of
the CSF used for
research

Subset who
also consent
to a blood
draw

Isolated
CSF

CSF with
EVs
Removed

Isolated
CSF EVs

Isolated
Plasma

Plasma
with EVs
removed

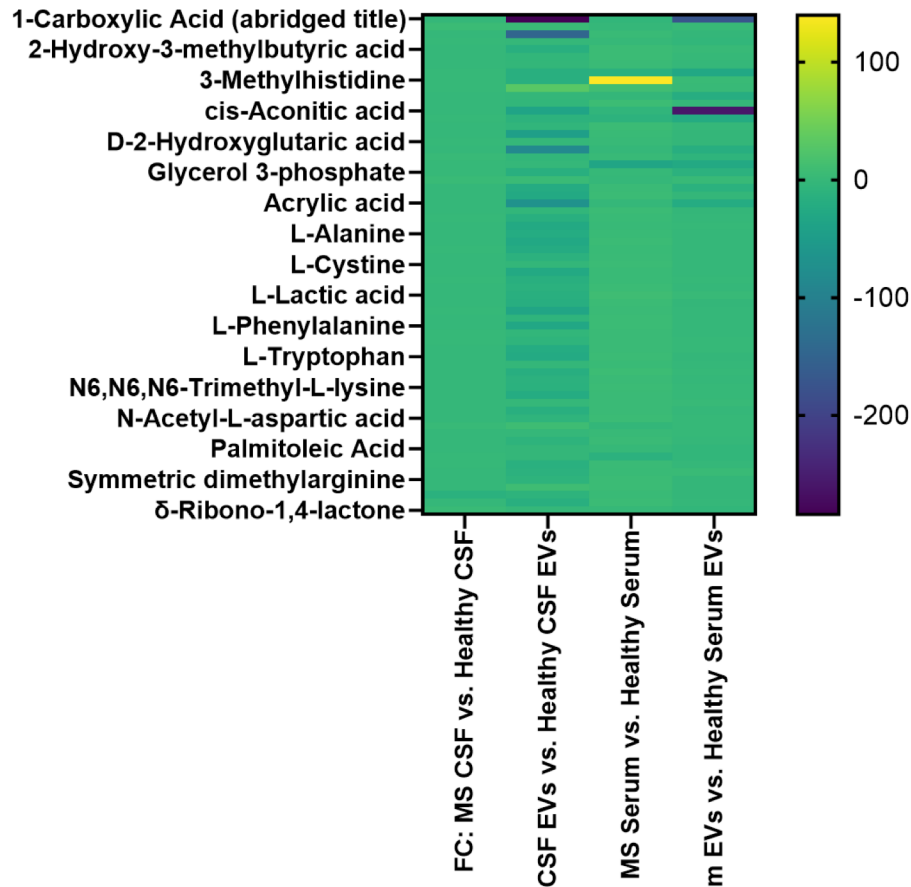
Isolated
Plasma EVs

Approach & Results

- Analysis
 - 7 confirmed MS CSF samples and 10 Headache CSF samples were received
 - 3 non-confirmed MS patients → 1 radiologically isolated syndrome and 2 patients with a high suspicion
 - All of these patients provided blood samples
 - 5 MS and Headache patients also provided blood
 - Vesicles were visualized for each sample to confirm presence and count is being conducted
 - Metabolomic analysis is currently being conducted on the samples and will be available March 15th



Initial Metabolomic Analysis



- Currently we are waiting on the majority of the data
 - Initial data
 - Suggests that EVs can provide inflammatory markers better than isolated CSF
 - Blood is most likely not as useful for categorizing MS at its diagnostic phase
 - Counted EV samples show increased EVs in control samples → This is being further analyzed
 - Complete Data
 - Will be available in March



Role of extracellular vesicles in neurodegenerative diseases

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Future Directions

- Repeating the experiment on a larger sample size of frozen CSF to confirm the results
- We expect to find novel biomarkers that can show signs of damage in MS
 - In future research, we would hope to sub stratify and look for changes in biomarkers associated with progression in MS. This could be helpful as in MS progression, biological pathology often arises before clinical symptom onset
- We hope the new biomarkers determined will lead to more research into using extracellular vesicles as diagnostic tools and hope the biomarkers will provide further insight into the underlying pathology of MS
- If data holds up for vesicle count being increased analyzing vesicular membrane integrity may be a future avenue for investigation

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