Examination of neuroinflammation in multiple sclerosis mouse models via quantification of cyclooxygenase-1 (COX-1) with the PET radioligand, [^{11}C]PS13.

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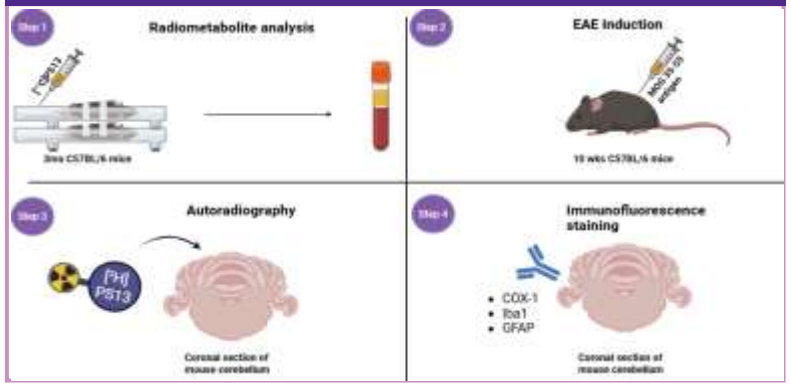
Background

Cyclooxygenase-1 (COX-1) is an enzyme involved in inflammatory processes and has been implicated in neuroinflammation associated with multiple sclerosis (MS). [^{11}C]PS13 is a selective PET radioligand that allows for in vivo quantification of COX-1 expression. Experimental autoimmune encephalomyelitis (EAE) is a widely used mouse model that mimics key features of MS, including neuroinflammatory responses.

PURPOSE / OBJECTIVES

To quantify cyclooxygenase-1 (COX-1) density using the radioligand [^{11}C]PS13 in a mouse model of multiple sclerosis (MS), experimental autoimmune encephalomyelitis.

MATERIAL & METHODS



RESULTS

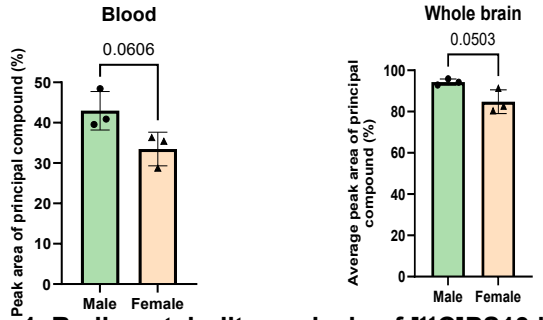


Figure 1. Radiometabolite analysis of [^{11}C]PS13 in mouse brain and blood.
At 60 minutes post-injection, 89.6% of [^{11}C]PS13 remained intact in the brain. A trend toward higher tracer retention was observed in male mice compared to females.

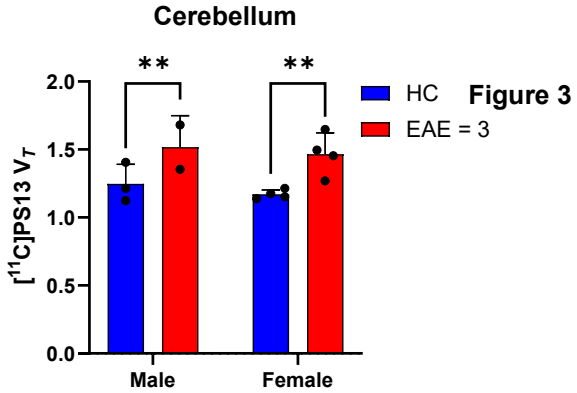
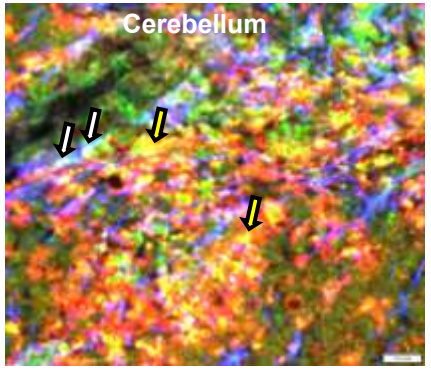


Figure 2. PET imaging of COX-1 expression using [^{11}C]PS13 in EAE and control mice.
Increased binding of [^{11}C]PS13 was observed in EAE mice compared to controls, indicating elevated COX-1 expression in the disease model.



Colocalization of
IBA1/COX-1
IBA1/COX-1/GFAP

Figure 3. Qualitative analysis of COX-1, IBA1, and GFAP expression in the cerebellum of EAE and control mice.
Representative immunofluorescence images show increased COX-1, IBA1, and GFAP expression in EAE mice compared to controls, with greater colocalization of COX-1 with IBA1 than with GFAP.

SUMMARY / CONCLUSION

- We confirmed that [^{11}C]PS13 remains stable in the brain of mice up to 60 minutes post-injection.
- PET data showed increased [^{11}C]PS13 binding in EAE mice, indicating elevated COX-1 levels compared to controls.
- Immunostaining showed increased neuroinflammation in EAE mice, with COX-1 co-localizing more with IBA1 than GFAP, suggesting its association with microglial activation.

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