VIRUSES AS A CAUSE OF MULTIPLE SCLEROSIS

With a focus on Epstein-Barr virus

Caitlin Shepherd

INTRODUCING MULTIPLE SCLEROSIS (MS)

- Inflammatory autoimmune disease of the CNS
- Axon demyelination
- Myelin seen as a foreign body
- Nerve fibres are damaged, signals are disrupted
- Plaque hallmark – T cells, B cells, plasma cells, macrophages
- Range of symptoms – area of the brain affected

ARGUMENTS FOR VIRAL CAUSE

- Other neurological diseases as a result of viral infection
- Unclear etiology - no known cause
- Genetics + environment
- Identical twin study → only 30% of other twin developed disease
- IgG potential antibody for single infectious agent
- Progression is triggered - by a virus?

EPSTEIN-

- Human her
- 120kb dsD
- 85 protei
- Mechan
  - Entry
  - Trans
  - Laten
  - Reactiva

Key evidence:

Infectious mononucleosis (mono) acts a primary infection for MS. Most common cause of mono is EBV. Risk of MS increased 32x following primary EBV infection.

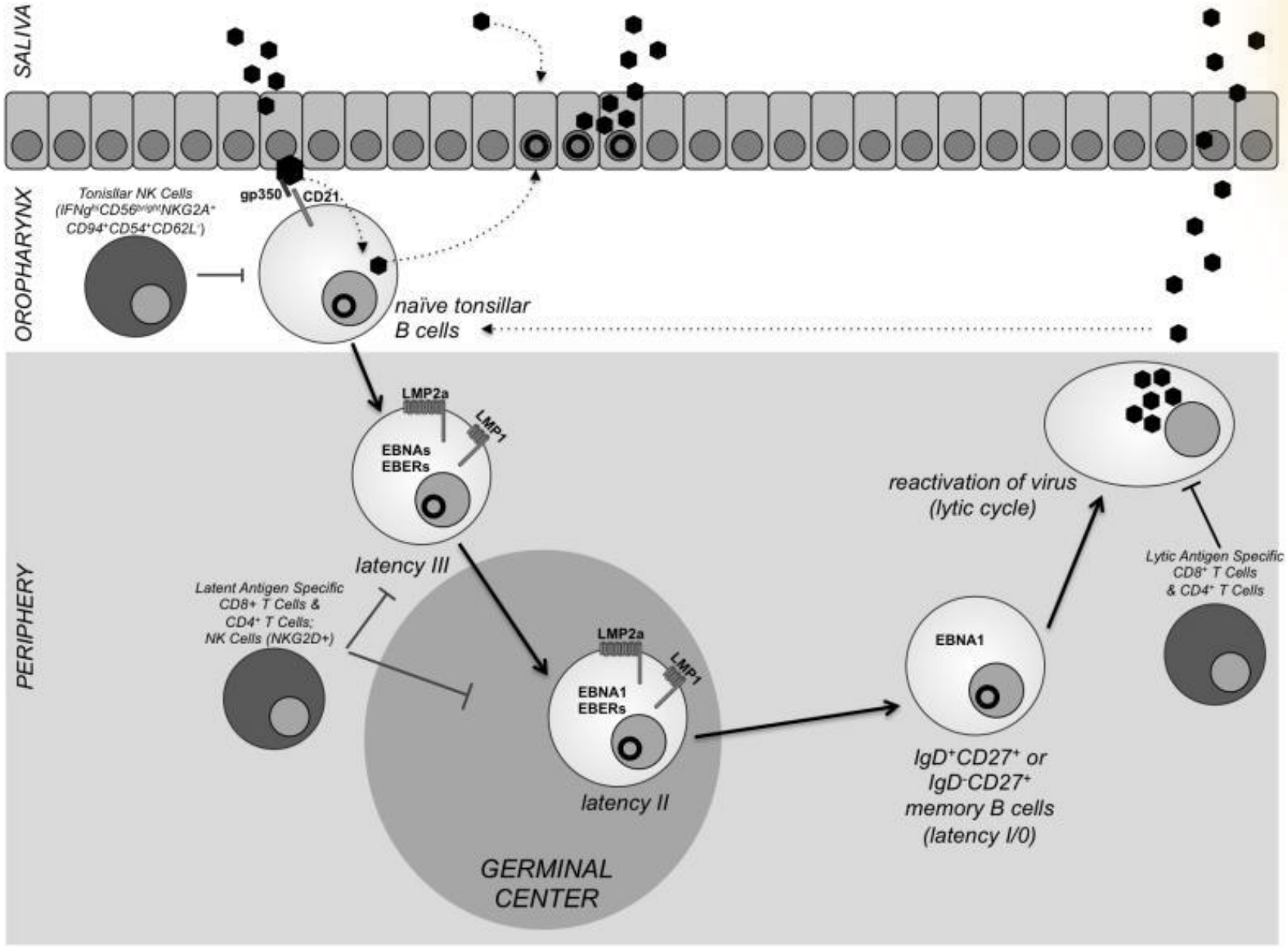
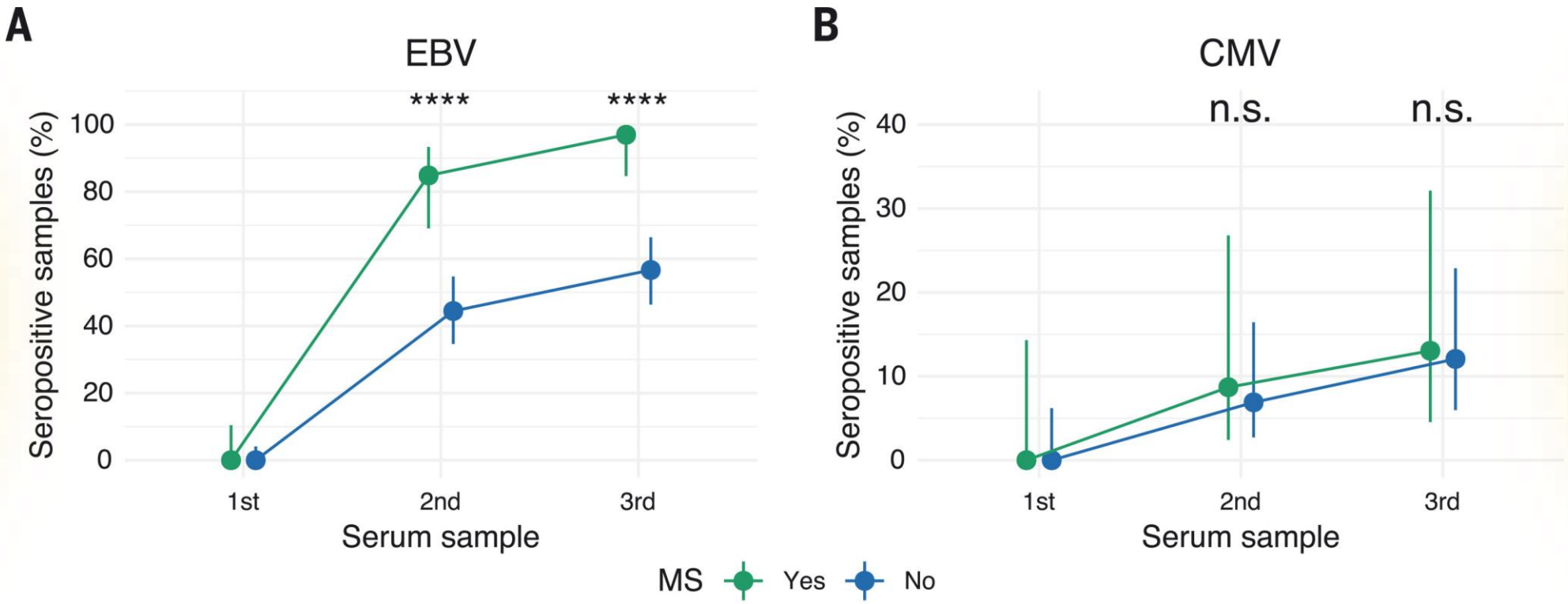


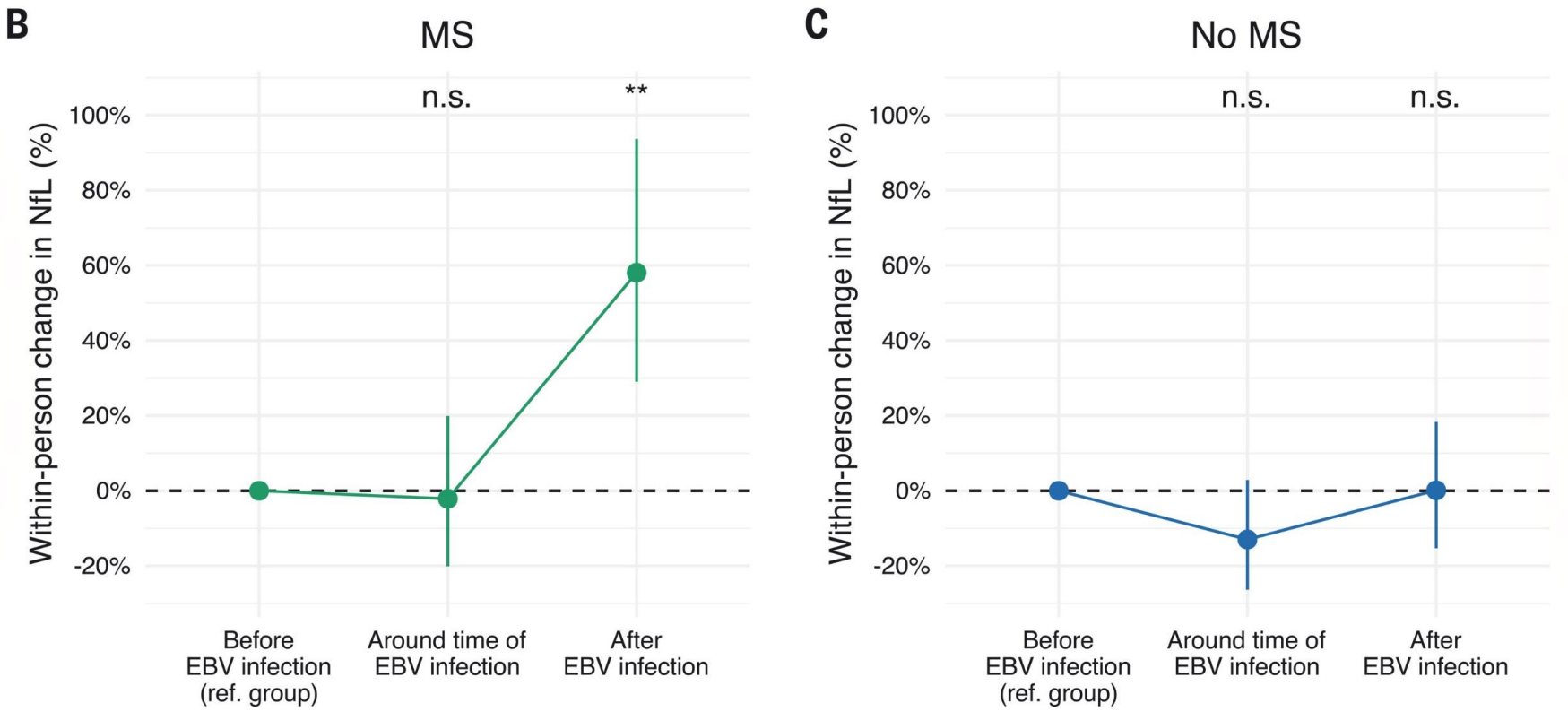
Image reference (2)

EVIDENCE



Proportion of seropositive individuals with/without MS following viral infection of (A) EBV or (B) CMV. Image from reference (1).

EVIDENCE PT.2



Concentration of axonal degeneration biomarker before, during and following infection with EBV. Image from reference (1).

FUTURE TREATMENT & IMPLICATIONS

- Current treatments are immunomodulatory therapies
- Side effects of opportunistic infections & latent infection reactivation
- IFNβ first successful drug – antiviral cytokine to inhibit T cell
- Monoclonal antibodies against lymphocyte surface antigens
  - Natalizumab – leukocyte BBB migration
  - Alemtuzumab – reduce circulating T & B cells
  - Ocrelizumab – selective lymphocyte depletion

THANK YOU FOR LISTENING

REFERENCES

1) Bjornevik K, Cortese M, Healy BC, Kuhle J, Mina MJ, Leng Y, Elledge SJ, Niebuhr DW, Scher AI, Munger KL, Ascherio A. (2022) Longitudinal analysis reveals high prevalence of Epstein-Barr virus associated with multiple sclerosis. Science.

2) Hatton OL, Harris-Arnold A, Schaffert S, Krams SM, Martinez OM. (2014)The interplay between Epstein-Barr virus and B lymphocytes: implications for infection, immunity, and disease. Immunol Res.

3) Owens GP, Gilden D, Burgoon MP, Yu X, Bennett JL. (2011) Viruses and multiple sclerosis. Neuroscientist

4) Sedighi, S., Gholizadeh, O., Yasamineh, S. (2022) Comprehensive Investigations Relationship Between Viral Infections and Multiple Sclerosis Pathogenesis. *Curr Microbiol*

5) Tarlinton, R.E.; Martynova, E.; Rizvanov, A.A.; Khaiboullina, S.; Verma, S. (2020)Role of Viruses in the Pathogenesis of Multiple Sclerosis. *Viruses*