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Expression of IL-22 and in the CNS of experimental autoimmune encephalomyelitis mice

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Introduction

Background
Interleukin (IL)-22, a T-helper (Th)-17 linked cytokine, has been associated with several autoimmune diseases. However, the role of IL-22 in multiple sclerosis (MS) has still be elucidated.1

While IL-22 is believed to aid in lymphocyte infiltration2 of the CNS and elevated levels were observed in serum and lesion of MS patients, studies have highlighted potentially protective functions3 within MS and experimental autoimmune encephalomyelitis (EAE) – an animal model of MS.

Aim
This study aims to characterise the expression of IL-22 and its receptor subunit IL-22R1 in normal and EAE CNS tissue, and examine any potential correlation between expression level and disease severity.

Methods

EAE Induction
• C57BL/6 female mice were immunised subcutaneously with MOG35-51 peptide or vehicle emulsified in complete Freund’s adjuvant.
• Mice were weighed daily and scored based on tail/leg paralysis.

Immunohistochemistry
• Immunohistochemistry was used to determine IL-22 (Abcam; ab18499) and IL-22R1 (R&D; MAB42941) expression and co-localisation with CNS resident cells and infiltrating immune cells.

Results

Figure 1 MOG induced EAE follows a monophasic disease course: Following immunisation, mice were scored daily. Clinical scores expressed as an average ± S.E.M. EAE, n=6-39; PBS, n=6-23. **P<0.005, ***P<0.001 versus PBS.

Figure 2 Serum expression of IL-22 correlates with EAE disease progression: Serum expression of IL-22 was determined by ELISA. EAE, n=6; PBS, n=5. **P<0.01, ***P<0.001 versus PBS. ***P<0.001 versus EAE peak.

Figure 3 IL-22 expression in spinal correlates with EAE disease progression: Spinal cord sections were stained for expression of IL-22. Expression quantified using ImageJ. n=6 for all groups. **P<0.01, ***P<0.001 versus PBS.

Figure 4 IL-22 co-localises with neurons and astrocytes: Double fluorescence staining was used to determine co-localisation of IL-22 with neurons and astrocytes. Expression quantified using ImageJ. n=6 for all groups. Scale bar= 100 μm. ***P<0.001 versus naïve.

Figure 5 IL-22 co-localises with several immune cells: Double fluorescence staining was used to determine co-localisation of IL-22 with various infiltrating immune cells. All sections used were peak EAE. Expression quantified using ImageJ. n=5 for each group. Scale bar= 50μm.

Conclusion

Our data shows that:
• Serum IL-22 elevated during EAE in a similar manner to MS patients during active disease.
• IL-22 and IL-22R1 expression elevated in EAE spinal cord tissue, particularly within proximity of inflammatory lesions.
• Neurons express comparable levels of IL-22 and IL-22R1 in naïve and EAE mice however astrocytic expression of both is elevated during EAE specifically within the inflammatory lesions.
• Our data suggests IL-22 plays an important role in the development and progression of CNS inflammation however whether this function is mediated through astrocytes or other means has still to be determined.