

## Cytokine patterns after therapy with Avonex®, Rebif®, Betaferon® and Cinnovex® in relapsing–remitting multiple sclerosis in Iranian patients

M. Kazemi Arababadi<sup>1</sup>, R. Mosavi<sup>2</sup>, H. Khorramdelazad<sup>3</sup>, N. Yaghini<sup>4</sup>, E. Rezazadeh Zarandi<sup>1</sup>, M. Araste<sup>5</sup>, R. Pourali<sup>6</sup>, Z. Nekhei<sup>5</sup>, D. Kennedy<sup>7</sup>, S. Shahsavari<sup>8,\*</sup>

<sup>1</sup>Department of Microbiology, Hematology & Immunology, Rafsanjan University of Medical Sciences, Iran and Molecular-Medicine Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran

<sup>2</sup>Department of Neurosurgery, Faculty of Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, Iran

<sup>3</sup>Molecular-Medicine Research Center, Rafsanjan University of Medical Sciences, Rafsanjan, Iran

<sup>4</sup>Department of Biochemistry, Rafsanjan University of Medical Sciences, Rafsanjan, Iran

<sup>5</sup>Samenoalaeme Special Diseases Center, Kerman University of Medical Sciences, Kerman, Iran

<sup>6</sup>Bahonar Hospital, Kerman University of Medical Sciences, Kerman, Iran

<sup>7</sup>School of Biomolecular and Physical Science, Eskitis Institute for Cell and Molecular Therapies, Griffith University, Nathan, Australia

<sup>8</sup>School of Medicine, Rafsanjan University of Medical Sciences, Rafsanjan, Iran

**Background and Aims:** Several lines of evidence exist which suggest that changes in the expression of circulating cytokines are linked to the development or reoccurrence of multiple sclerosis (MS). This study aimed to evaluate the serum levels of relevant cytokines after therapy with IFN b formulations in MS patients.

**Methods:** In this study, blood samples were collected from 70 MS patients undergoing four different types of IFN b formulation treatment and 100 healthy controls. After 24 months of treatment, the serum levels of IL 17A, IL 12, IFN g and IL 10 in patients and healthy controls were analyzed by ELISA.

**Results:** Our results demonstrated that serum levels of IL 17A were significantly higher in patients treated with CinnoVex™ and Avonex® when compared with healthy controls. Serum levels of IL 10 were significantly decreased after therapy with CinnoVex, whereas serum levels of IFN b were elevated. No difference in serum levels of IL 12 were detected between patients and controls.

**Conclusions:** Results of our study suggest that CinnoVex and Avonex modulate the immune system less than Rebif® and Betaferon® in MS patients, and an elevated dose of CinnoVex and Avonex may be required for better regulation of the immune system in MS patients.

**Keywords:** Avonex®; Betaferon®; CinnoVex®; Cytokine; Multiple Sclerosis; Rebif®