

## REVIEW ARTICLE

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# Role of Proangiogenic Factors in Immunopathogenesis of Multiple Sclerosis: A Systemic Review

Kabir Magaji Hamid<sup>1,2</sup> and Abbas Mirshafiey<sup>3</sup>

<sup>1</sup> Department of Immunology, School of Public Health, Tehran University of Medical Sciences-International Campus, Tehran, Iran

<sup>2</sup> Department of Immunology, Faculty of Medical Laboratory Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria

<sup>3</sup> Department of Immunology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran

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## ABSTRACT

Angiogenesis is a complex and balanced process in which new blood vessels form from preexisting ones by sprouting, splitting, growth and remodeling. This phenomenon plays a vital role in many physiological and pathological processes.

However, the disturbance in physiological process can play a role in pathogenesis of some chronic inflammatory diseases, including multiple sclerosis (MS) in human and its animal model. Although the relation between abnormal blood vessels and MS lesions was established in previous studies, but the role of pathological angiogenesis remains unclear.

In this study, the link between proangiogenic factors and multiple sclerosis pathogenesis was examined by conducting a systemic review. Thus we searched the English medical literature via PubMed, ISI web of knowledge, Medline and virtual health library (VHL) databases. In this review, we describe direct and indirect roles of some proangiogenic factors in MS pathogenesis and report the association of these factors with pathological and inflammatory angiogenesis.

**Keywords:** Angiogenesis Inducing Agent; Blood-Brain Barrier; Encephalomyelitis, Autoimmune, Experimental; Endothelial Cells; Extracellular Matrix; Matrix Metalloproteinase; Multiple Sclerosis; Vascular Endothelial Growth Factor A.

## INTRODUCTION

Angiogenesis is a complex and finely balanced process that consists of the formation of new blood vessels from the pre-existing ones such as capillaries

and post-capillary venules. Angiogenesis plays a pivotal role during embryonic development and later; in adult life; in several physiological and pathological conditions.<sup>1</sup>

Under physiological conditions, angiogenesis depends on the tight balance of pro-angiogenic and anti-angiogenic factors.<sup>2</sup> Moreover, in normal tissues, vascular inactivity is maintained by the dominant influence of endogenous anti-angiogenic over pro-angiogenic stimuli.<sup>3</sup> However, disturbance of the

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**Corresponding Author:** Abbas Mirshafiey, PhD;  
Department of Immunology, School of Public Health, Tehran University of Medical Sciences, Tehran-14155, Box: 6446, Iran.  
Tel/ Fax: (+98 21) 6646 2267, E-mail: mirshafiey@tums.ac.ir