

## Human neuroimmune response against *angiostrongylus cantonensis*

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### ABSTRACT

**Introduction:** *Angiostrongylus cantonensis* is a zoonotic pathogen that causes human angiostrongyliasis; its main clinical manifestation is eosinophilic meningitis. It was reported in Cuba for the first time in America.

**Objective:** To review the main immunological findings about the human neuroimmune response against this parasite.

**Methods:** This paper is based on a review of the papers mainly from Cuban authors published in the last 10 years about the human neuroimmune response against this helminth. This information becomes more relevant after the introduction of the African giant snail *Lissachatina fulica* in Cuba in 2014.

**Results:** The humoral immune response is based on the immunoglobulin intrathecal synthesis. When the third-stage larvae go to the central nervous system at the first lumbar puncture there are no major immunoglobulin synthesis. One week later an immune intrathecal response is done by a two-class major immunoglobulin class mainly IgG+ IgA. Intrathecal activation of complement is evident of intrathecal synthesis of major

immunoglobulins during this disease. The activation of complement system components in cerebrospinal fluid is relevant to the understanding of this tropical disease, which is emerging in the Western hemisphere. Intrathecal synthesis of at least one of the major immunoglobulins and a wide spectrum of patterns may be observed. Although intrathecal synthesis of C3c and IgE is always present, C4 intrathecal synthesis does not occur in every patient. The diversity of intrathecal synthesis and activation of the different complement pathways enables their division into three variant groups. In each one could be finding the activation of one or several complement pathways including the participation of MBL, MASP-2 and ficolins as part of the lectin pathway complement activation.

**Conclusion:** The neuroimmune response against *Angiostrongylus cantonensis* eosinophilic meningoencephalitis is an example of the host-parasite interaction.

**Keywords:** *Angiostrongylus cantonensis*; eosinophilic meningitis; immune response.

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## INTRODUCTION

The helminth *Angiostrongylus cantonensis* was first reported in America in Cuba in 1981. Since these date up to now there are a group of Cubans researchers that are devoted to discover how the human as erratic host could develops its immune response in the central nervous system. This parasite produces an eosinophilic meningoencephalitis.<sup>(1)</sup>

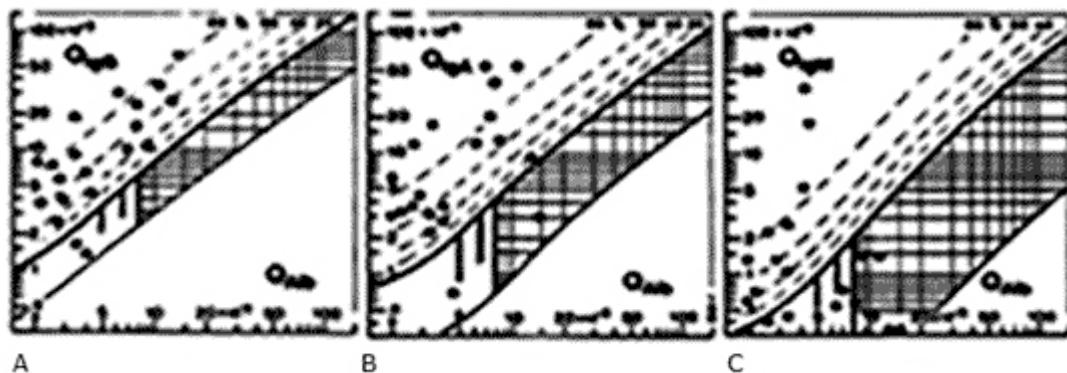
## METHODS

This paper is based on a review of the papers mainly from Cuban authors published in the last 10 years about the human neuroimmune response against this helminth. This information becomes more relevant after the introduction of the African giant snail *Lissachatina fulica* in Cuba in 2014.

## RESULTS

The humoral immune response is based on the immunoglobulin intrathecal synthesis. When the third-stage larvae go to the central nervous system at the first lumbar puncture there are no major immunoglobulin syntheses.

One week later an immune intrathecal response is done by a two class major immunoglobulin class mainly IgG+ IgA. It can be observed in the corresponding reibergram. (Fig. 1)<sup>(1)</sup>



**Fig. 1-** Major immunoglobulins reibergram in human angiostrongyliasis. A - IgG. B - IgA.  
C - IgM.

In the first lumbar puncture it is possible to find IgE<sup>(2)</sup> and C3c<sup>(3)</sup> (Fig. 2) intrathecal synthesis and with the major immunoglobulins reibergrams can be an auxiliary method of human angiostrongyloidosis diagnosis.

Intrathecal activation of complement is evident of intrathecal synthesis of major immunoglobulins during the acute phase of the disease.

The activation of complement system components in cerebrospinal fluid is relevant to the understanding of this tropical disease, which is emerging in the Western hemisphere.

Intrathecal synthesis of at least one of the major immunoglobulins and a wide spectrum of patterns may be observed. Although intrathecal synthesis of C3c and IgE is always present, C4 intrathecal synthesis does not occur in every patient. (Fig. 2)<sup>(4)</sup>

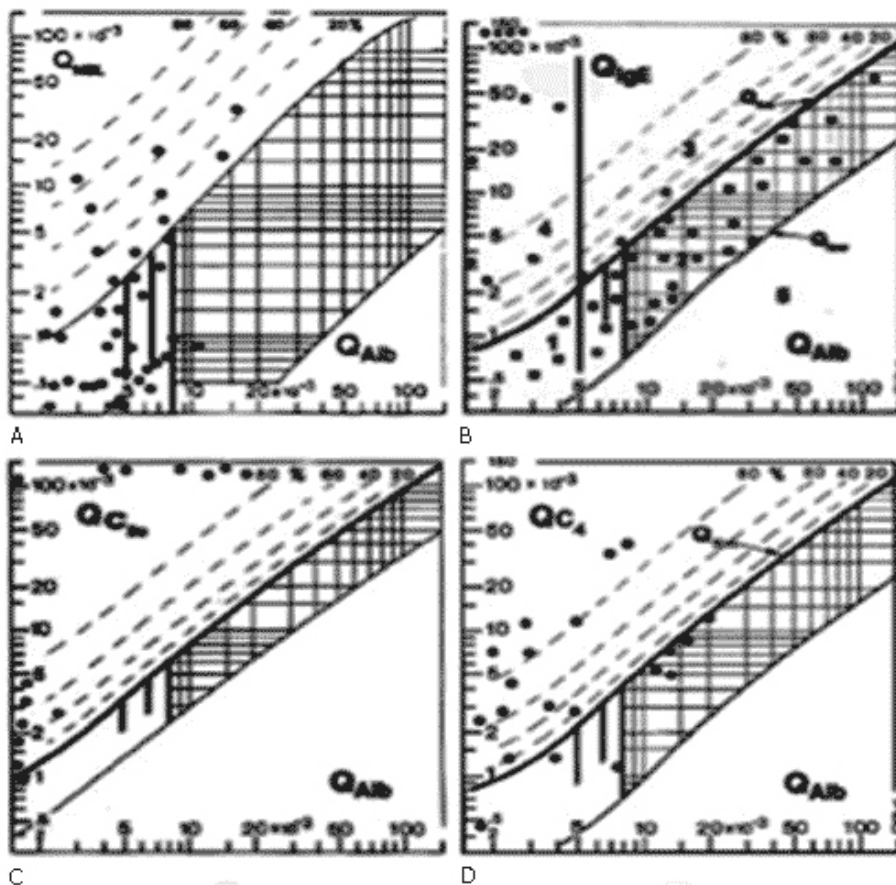


Fig. 2- Other reibergrams A - MBL. B - IgE. C - C3c. D - C4.

The diversity of intrathecal synthesis and activation of the different complement pathways enables their division into three variant groups.<sup>(5)</sup> In each one could be find the activation of one or several complement pathways.

In the lectin pathway complement activation MBL constitutes one of the five initiators. It was possible to quantify the intrathecal synthesis of MBL by using the corresponding reibergram. (Fig. 2). Also it was reported three pediatric patients suffering from *Angiostrongylus cantonensis* meningoencephalitis that has a MBL deficiency.<sup>(6)</sup>

In addition H-ficolin and M-ficolin intrathecal synthesis was observed in patients with this helminthiasis that affect the central nervous system.<sup>(7)</sup>

In Table 1 it is possible to found the list of the published papers from 2009 to 2018.

**Table 1-** Last papers from LABCEL published from 2009-2018

Angiostrongyliasis in the Americas. Emerg Infect Dis 2009;15: 991. Alberto Juan Dorta-Contreras, María Esther Magraner-Tarrau, Eduardo Sánchez Zulueta	<b>2009</b>
Activación y biosíntesis intratecal de C3c en niños con meningoencefalitis eosinofílica por <i>Angiostrongylus cantonensis</i> . Rev Neurol. 2009; 48:632-5. Bárbara Padilla-Docal, Alberto Juan Dorta-Contreras, Raisa Bu Coifíu-Fanego.	
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Neuroimmunological findings from the first report of <i>Angiostrongylus cantonensis</i> outbreak in Ecuador[abstract] Int J Infect Dis 2010;14S1: 76.023.A. J. Dorta-Contreras1, B. Padilla-Docal, J. M. Moreira, L. Martini Robles, J. Muzzio Aroca, F. Alarcon, R. Bu Coifíu Fanego.	
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Different intrathecal immunoglobulins synthesis patterns in human host indicate different strains of Angiostrongylus cantonensis. Med Hypotheses. 2012 Jun 8. [Epub ahead of print];79: 311-12 Padilla-Docal B, Dorta-Contreras AJ.	<b>2012</b>
Intrathecal Activation as a Typical Immune Response within the Central Nervous System in Angiostrongyliasis Am. J. Trop. Med. Hyg.2013; 88(2); 230-235. Barbara Padilla-Docal, Ivonne Iglesias-Gonzalez, Raisa Bu-Coifui-Fanego, Carmen Aleida Socarras-Hernandez, and Alberto Juan Dorta-Contreras.	<b>2013</b>
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## CONCLUSIONS

The neuroimmune response against *Angiostrongylus cantonensis* eosinophilic meningoencephalitis is an example of the host-parasite interaction.

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