



## Short Communication

### NEURO-ANTHROPOLOGY OF ZIKA-MICROCEPHALY AND THE MAYAN CIVILIZATION

\*<sup>1</sup>Rodrigo Ramos-Zúñiga, J. <sup>2</sup>Alfonso Gutiérrez-Padilla and <sup>3</sup>Héctor R. Pérez-Gómez

<sup>1</sup>Institute of Translational Neurosciences, CUCS, University of Guadalajara, México

<sup>2</sup>Neonatal Intensive Care Unit. Pediatric Division, Hospital Civil de Guadalajara, FAA. Guadalajara, México

<sup>3</sup>Institute of Infectious Diseases, Hospital Civil de Guadalajara FAA. Guadalajara, México

#### ARTICLE INFO

##### Article History:

Received 20<sup>th</sup> October, 2016  
Received in revised form  
22<sup>nd</sup> November, 2016  
Accepted 19<sup>th</sup> December, 2016  
Published online 30<sup>th</sup> January, 2017

##### Key Words:

Neurotrophic,  
Mayan medicine, Skull,  
Zika virus microcephaly.

#### ABSTRACT

The recent emergency by the presence of the Zika virus and its neurotrophic impact has generated an alert world. This is most significant because a teratogenic result shown in pregnant women vertically, with the consequential impact on fetal neuro-development. The Mayan area is located between the endemic areas that have historically been affected by climatic changes and mutations of certain viruses and vectors that affect human beings. This brief neuro-anthropological analysis raises the possibility that the morphological changes of the skull, the Mayans could have had a therapeutic intention as a possibility and not only cultural purposes.

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#### INTRODUCTION

The emergence of the Zika virus in Latin America has led to an epidemiology alert, having fully identified its neurotrophic role. The risk of microcephaly, and the absence of a preventive and therapeutic regimen call for a global health strategy (Fauci *et al.*, 2016 and Mlakar *et al.*, 2016). The Zika virus has currently become relevant all over the world because of its potential impact on pregnant women and fetal growth. Recent findings show a vertical transmission in pregnant women, resulting in a teratogenic effect (Brasil *et al.*, 2016). It is most likely that the main neurotrophic condition is due to its impact on the migratory processes travelling toward the brain cortex. The expansive migratory effect takes place in a centrifugal and radial manner, thereby explaining the failure in skull growth. (Oliveira-Melo *et al.*, 2016). The Mayan area is located between the endemic areas that have historically been affected by climatic changes and mutations of certain viruses and vectors that affect human beings. From the geo-epidemiology viewpoint and in a retrospective neuro-anthropological dissection, there are few reports that identify this interaction between the ecosystems, the cyclic onset of mutations in vectors (mosquitoes), as well as in the virus; and the morphologic changes in the skull.

This leads to an interest in skull morphology, which has been historically described in the Mayan region of Yucatan, Mexico and that is once again found in the endemic zone of Zika.

#### Retrospective analysis of cases

The neuro-anthropology analyzes of retrospective way the presence of cases related with the ecosystems and its impact in the human life. To the way of an anthropological autopsy, this report is based in the contemporary description in the literature, of cases with microcephaly associated to the virus of the Zika in the area endemic of the Mayan zone. There are two areas of scientific and neuro-anthropological interest: 1) A certain pattern of skull deformity among the Mayans, which has been attributed to intentional deformities (pieces of wood and head binding) for cultural or therapeutic purposes. The particular conformation of the skull in certain individuals of the Mayan population, in which the theory of archaeology and anthropology was the intentional modification for cultural reasons, has been known for a long time. However, was little attention to therapeutic intention for potential congenital changes and against the effects of epidemics affecting the brain development and consequently the skull circumference. ¿It was really a strategy for microcephaly treatment? 2) Anecdotal description of people with microcephaly long time ago in this geographic zone, even in periods of the Twentieth century. Cases that were characterized by his mental

\*Corresponding author: Rodrigo Ramos-Zúñiga,  
Institute of Translational Neurosciences, CUCS, University of  
Guadalajara, México.

retardation and that were presented as exceptional beings in circus shows. Evidence is the description of people with microcephaly and mental retardation were displayed as “freaks” in the Ringling Brothers Circus, according materials from museum archives and Harvard Theater collection. Already 20 performers were exhibited as “pineheads” as the case of sisters from Yucatán in Coney Island as a part of the show in the world circus Sideshow in 1932. Or another “pineheads” as the wild girl from Yucatán, or the Mexican wild boy (Mateen *et al.*, 2010).



Figure 1(a).



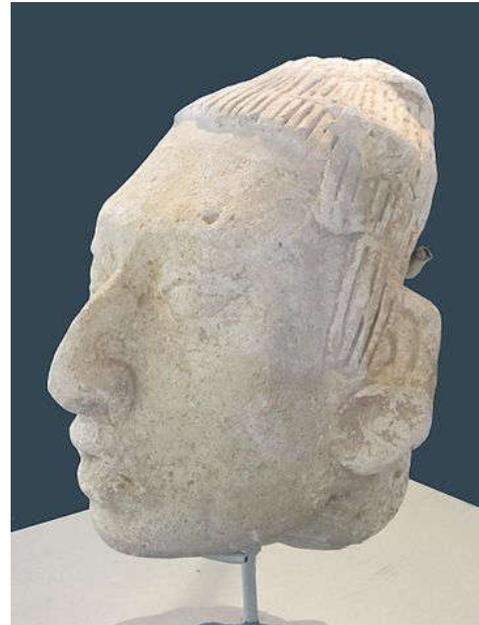
Figure 2(b).

**Skulls and plastic wax models showing morphological changes identified in Mayan culture. Museum of anthropology. Mérida Yucatan, México**

### Evolutionary perspective for Zika microcephaly

There is no rational explanation to identify the reasons for the fall of the Mayan society (250-850 A.D.). A cyclic pattern most likely linked to climatic changes and environmental contingencies undoubtedly resulted in an anthropogenic impact. The link of vector-transmitted infectious diseases plays an unclear role that could be one of the causes that resulted in a demographic change due to environmental transformation and poor sustainability of their agro-nutritional ecosystems. Hydrological transformations and superficial water scarcity and settlements near the cenotes fostered the right environmental context for the development of these diseases. Migration due to epidemic conditions even before the arrival of the Europeans is possibly a scenario open to discussion, and with an apparent cyclic health impact that could prevail beyond the classic stages of the Mayan civilization (Masson, 2012). In the last 20 years resurfaced viral illnesses associated with arthropod-borne in the Western hemisphere with increased aggressiveness: Dengue in 1990,

West Nile in 1999, Chikungunya in 2013, and now the Zika. Usually the Arboviruses are RNA viruses that are transmitted by arthropods, especially mosquitoes that have complex life-cycles involving mammals or birds at the same way of flavivirus (Fauci *et al.*, 2016).



**Figure 2. Head of Mayan people from Comalcalco, México**  
<https://commons.wikimedia.org/w/index.php?curid=19040069>

The greatest impact is the potential emergence of microcephaly associated with Zika virus. The effect in the neural stem cells that are vulnerable to the virus as a target, consequently affect the migration and maturation of cortical neural networks. This effect occurs naturally in radial centrifugal manner is related to brain growth, the formation of cortical sulci and the development of the skull. Microcephaly is a vertical effect of Zika infection in pregnant according to the most recent reports (Adibbi *et al.*, 2016, De Paula-Freitas *et al.*, 2016, Tang *et al.*, 2016). The anthropogenic environmental impact is only a causal factor related with the Maya collapse, and probably the environmental constrains, climatic disasters and warfare another factor. The knowledge and understanding of this conditions and demographic and health contexts due of certain viruses, can be part of the explanation (Carod-Artal, 2004). The vestiges of skulls with microcephaly and/or skull and eye deformities and their association with neurotrophic viruses in the history are an open possibility to study (Figure 1-2).

### Acknowledgements

We wish to thank to Lucía Ledesma-Torres Ph. D. for the courtesy of the picture.

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