Influence of Host on Nutriome on Immunological Control of Protozoal Infections

Emma Hagopian1, Shiveta Bhasker1, Michael Klowak2,3, Ruwandi Kariyawasam2,3, David Harris1, Priyanka Challa1, Celine Lecc1, Rachel Lau3, Andrea K. Boggild1,2,3,4

1Tropical Disease Unit, University Health Network, Toronto, ON, Canada, 2Institute of Medical Sciences, University of Toronto, Toronto, Ontario, Canada, 3Public Health Ontario Laboratories, Public Health Ontario, Toronto, ON, Canada, 4Department of Medicine, University of Toronto, Toronto, Ontario, Canada

Introduction

- Immunologic control of parasitic infections is a combination of humoral and cellular immunity
- Inadequate nutritional status impairs the functioning of the immune system potentially resulting in increased susceptibility to protozoal infections
- Laboratory, epidemiological, and other observational studies provide convincing evidence that micronutrient deficiencies contribute to the mortality and morbidity of infectious diseases1,2
- We aim to synthesize existing knowledge around the interrelationships between nutrients and immune function and demonstrate the ways in which nutrient deficiencies such as zinc, iron and vitamin A impact immune response and defence in patients with protozoal diseases such as leishmaniasis and Chagas disease

Methods

- PubMed, Embase, Medline, Scopus, and LILACS were searched from database inception to March 13, 2019 using combinations of the search terms (Leish* OR Trypanosoma* OR Protozoa*) AND (Vitamin A Deficiency OR Iron Deficiency OR Anemia OR Zinc Deficiency OR Nutrient Deficiency* OR Nutritional Deficiency* OR Nutritional compromised OR Micronutrient* OR Malnutrition OR Nutrition OR Nutritional Status) AND (Immunology OR Deficiency OR Anemia OR Zinc Deficiency OR Nutrient combinations of the search terms

Records Identified Through Database Searching

- PubMed (n = 1115)
- Embase (n = 110)
- Scopus (n = 120)
- Medline (n = 26)
- LILACS (n = 3)

Records After Duplicates Removed

(n = 986)

Results

Table 1. Known immunological effects of micronutrients in cellular, murine, and in vivo models of leishmaniasis and Chagas disease.

<table>
<thead>
<tr>
<th>Micronutrient</th>
<th>Leishmania</th>
<th>Trypanosoma cruzi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc</td>
<td>500 mg/kg</td>
<td>Low levels of zinc reduce tissue and parasite load and enhance Th1 cytokine response in cultures of L. major. Deficient diets lead to greater vesiculization of L. donovani.</td>
</tr>
<tr>
<td>Iron</td>
<td>1000 mg/kg</td>
<td>Elevated systemic iron reduces tissue and parasite load and leads to increased vesiculization of L. donovani.</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>500 mg/kg</td>
<td>Deficiency does not alter clinical course of visceral leishmaniasis, but increased vitamin A supplementation promotes multiplication of L. donovani.</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>500 mg/kg</td>
<td>Elevated systemic vitamin C reduces parasite load and enhances Th1 cytokine response in ulcers of L. major.</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>500 mg/kg</td>
<td>Elevated systemic vitamin D reduces parasite load and enhances Th1 cytokine response in ulcers of L. major.</td>
</tr>
</tbody>
</table>

Future Directions

Contact: Dr. Andrea K. Boggild; E-mail: andrea.boggild@utoronto.ca
@BoggildLab; Website: www.boggildlab.ca

References