Filariasis and serum specific gravity

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Abstract

Filariasis is a problematic tropical vector borne infection. Here, the author proposes an idea on a physical change, serum specific gravity, in serum of filariasis cases and further extrapolates for its clinical usefulness. According to this study, the finalized estimated serum specificity in filariasis is more than that of normal condition. The change of the specific gravity due to additional content or mass can be demonstrated and might be useful for diagnosis and following up of filariasis.

Keywords
Filariasis, Serum specific gravity

Introduction

Filariasis is a problematic tropical vector borne infection [1]. It is classified as a blood infection. Elephantiasis, a complication of filariasis, is the most common infection - induced disability in the present days [2]. For diagnosis, the determination of microfilariasis in blood film is the gold standard [2]. However, the problems of intermittent presentation of the parasite in blood stream and difficulty in microscopic determination bring difficulty in diagnosis of filariasis [2]. Here, the author proposes an idea on a physical change, serum specific gravity, in serum of filariasis cases and further extrapolates for its clinical usefulness.

The hypothesis/Idea

The author proposed this idea based on basic physical principle. Specific gravity of a fluid is directly determined by the "content" and "volume" of the fluid. For serum, as a studied fluid in this work, the volume is primarily set as a fixed parameter and content is set as a variable parameter. The determinants for content of serum is the compositions or colloids within in serum. It should be clarified that content of serum can mean also the mass or weight. In case of filariasis, the microfilaria lives in serum, never in blood cells, hence, acts as the colloids within the serum.

Evaluation of the Hypothesis/Idea

Basic simple mathematical modeling is used. Estimation for the specificity of serum in case of filariasis is done and compared to the normal physiological situation. The verification of the idea can be done by basic comparison between the finding in estimation and actual situation in the real life.
Experimental data

According to the mathematical modeling, the estimated serum specific gravity, hereby assigned as "D", can generally be represented as "M/V" where M is "content" and "V" as volume. In case of normal physiological situation, the "D" is equal to "M/V" and assigned as D1. In case of filariasis, the "D" is equal to "[M + additional content due to microfilaria (hereby described as A)]/V" and assigned as D2. Comparing between D2 and D1, the derived ratio is "M + A/M" or 1 + A/M.

The increased serum specific gravity can be imagined and the additional content due to the microfilaria is the major determinant for increased level of serum specific gravity.

Discussion

The serum specificity is an important blood parameter. In clinical practice, this parameter can be indirectly measured based of basic refractometer [3].

The relationship between specific gravity, water content, and serum protein is mentioned in clinical medicine [4]. The situation of protein extravasation is the main theme for discussion [4]. However, the effect of additional content or mass within the serum has never been proposed. According to this study, the finalized estimated serum specificity in filariasis is more than that of normal condition. Of interest, this observation from theoretical approach should be concordant with the real observation in the clinics. However, there is no direct evidence. There is indirect evidence indicating increased urine specific gravity in filariasis which might indirectly imply the increased serum specific gravity [5]. Indeed, the author has recently proposed for another concept to explain the effect of mass adding due to malarial infection within the red blood cell [6]. It can be seen that the additional mass affects the stability of red blood cell [6]. However, in this work, the additional concept focuses on the serum, not a closed object like the red blood cell. The new hypothesis in this work is an inverse analogy to the previously published paper [6]. The additional mass in the serum brings increased specific gravity, not volume expanding (Table 1). The effects due to the volume expanding as in malarial infected red blood cell [6], is not expected in filariasis. The change of the specific gravity due to additional content or mass can be demonstrated and might be useful for diagnosis and following up of filariasis. For example, the case with higher percentage of infection should have higher specific gravity and the success in treatment might be reflected by lowering of the specific gravity. The proposed concept in this work can also be further implicated in the other abnormalities within the serum. The proposed concept can be well implicated in the other conditions of blood infection that locate in serum such as in relapsing fever. Also, the concept can be also applied for other serum pathologies such as serum sickness.

Table 1. Effect of addition content on to the system of serum comparing to the system of red blood cell

<table>
<thead>
<tr>
<th>Items</th>
<th>System of serum</th>
<th>System of red blood cell [6]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. possible problem</td>
<td>filariasis, serum sickness</td>
<td>malaria, babesiosis, inclusion body</td>
</tr>
<tr>
<td>2. characteristic of &quot;volume&quot; of the system</td>
<td>open, without limitation</td>
<td>closed, within the red blood cell (as a &quot;closed bag&quot;)</td>
</tr>
<tr>
<td>3. possible effect</td>
<td>increased specific</td>
<td>increased red blood cell size, prone to hemolysis</td>
</tr>
</tbody>
</table>
References