Medical Views on the Differences between Japanese and Western Hot Spring

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One of the most important knowledge I have gained through my study of balneology and medical hydrology is that there are certain differences between Japan and western countries regarding hot springs. I feel very strongly that it is mandatory for our mutual understanding and for the progress of the medical hydrology to know these differences. This is the reason why I have chosen this title for this lecture.

1. The differences of the hot spring per se (Table 1). In table 1, I have summarized the characteristics of Japanese hot springs.

Table 1  Characteristics of hot springs in Japan

1. Hot springs and spas are both numerous in numbers, (approximately 18000 hot springs and 1700 spas)
2. High temperature.
3. Diluteness of hot springs (Solute 1 to 3 η/L).
4. Majority of hot springs are acid springs (especially acid-vitriol-alum-springs).
5. Relatively low concentration of H₂S, HS⁻ in sulfur springs than western springs, and its concentration is high in acid-vitriol-springs.
6. Springs containing boric acid and iodine, are relatively numerous in number.
7. Others.

1) In Japan, there are more than 18000 hot springs in more than 1700 spas. Namely, in numbers of both hot springs and and spas, Japan exceeds the western countries by several times.
2) Secondly, the majority of Japanese springs are high in temperature and some of them reach temperature over 100°C. In western countries, contrary to this, most of the hot springs are characterized as cold mineral springs or lukewarm springs and the highest temperature does not go up to more than 70 to 80°C.

I think this difference is reflected upon the fact that Japanese favour hot spring bath of the temperature of 43 to 45°C., and westerner enjoy lukewarm bath at around the temperature of 36 to 38°C. This difference is certainly an important characteristics of Japanese bathing from medical point of view.
3) Japanese springs are usually the dilute one, solute contents ranges around 1 to 3 mg per liter.
4) Many of the Japanese hot springs are acid springs containing large quantity of free...
mineral acids such as sulfuric acid or hydrochloric acid. Furthermore, the acid springs contain iron ions, alminum ions as well as hydrogen sulphide. Thus the Japanese acid springs are often the mixture of the acid spring, vitriol spring, alum spring and sulphur spring. Consequently, they are classified as acid-alum-vitriol springs.

5) It is interesting to note that many of the western springs are sulphur springs containing considerable amount of hydrogen sulphate and hydrosulphic ions, but acid springs and acid vitriol springs are very few in number.

6) Numbers of Japanese hot springs contain boric acid, iodine and silicon.

7) Majority of arsen containing springs in Japan are belong to acid-alum-vitriol springs, but in western countries, they belong to salt, iron, sulphur or sulfated springs.

2. Differences in the balneotherapeutic method (Table 2).

As it is shown in the table 2, the main method of balneotherapy in Japan is the bath cure and drinking cure is available only in 5 to 10% of patients. Furthermore, Japanese bathing style is typically an high-temperature and frequent bathing namely, 43 to 45°C. and 3 to 6 times in a day).

**Table 2** Characteristics of balneotherapeutic method in Japan

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<td>1.</td>
<td>Bath cure plays main role.</td>
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<td>2.</td>
<td>Drinking cure is seldom put into practice (5 to 10%).</td>
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<tr>
<td>3.</td>
<td>Frequent and high temperature bathing (43 to 45°C. and 3 to 6 times in a day)</td>
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<td>4.</td>
<td>Special cure done in limited numbers of institutions only</td>
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<td>(Inharation, douche, steam, electric, mud, moor etc.)</td>
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This is completely a different bathing style from that of the western way of bathing where bathing is done only once a day but for longer duration in lukewarm spring of low temperature of 96 to 38°C. Special methods of spa-treatment, such as mud bath, moor bath, hot spring douche, steam bath and inhalation cure, are done in Japan in limited numbers of institutions only.

These differences of the balneotherapeutic method, as it will be discussed presently, is one of the most important factors of the differences observed in between the Japanese and the western balneotherapy.

3. The differences in the mechanism of the balneotherapeutic effect on the human body (Table 3).

**Table 3** Differences in the mechanisms of balneotherapeutic effect on human body

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<th>Japanese balneotherapy</th>
<th>Western balneotherapy</th>
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<tbody>
<tr>
<td>1. Effect of temperature</td>
<td>+</td>
<td>+</td>
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<tr>
<td>2. Mechanical effects</td>
<td>+</td>
<td>±</td>
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<tr>
<td>(such as hydrostatic pressure and buoyancy)</td>
<td></td>
<td></td>
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<tr>
<td>3. Chemical constituents</td>
<td>+</td>
<td>#</td>
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<tr>
<td>4. Nonspecific alternative effect (balneal reaction)</td>
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The factors involved in the balneotherapeutic effect on human body are listed up in the table 3. These are the factors through which the balneotherapeutic effects take place.

The effect of the temperature of the hot spring per se and the mechanical or physical effects of the bathing, such as the hydrostatic pressure and buoyancy, are not hitherto thought to be specific factors of hot spring and much importance is not attached to this by many balneologists. However, the importance of these factors are receiving more and more interests and attention recently from the stand point of rehabilitation medicine, namely, hydrotherapy as a method of physiotherapy.

The factor listed up as the third factor in table 3, namely the chemical constituents of the hot spring water and its effect is thought to be the most important factor of balneotherapy and therefore used as the base of classification of thermal waters as well as the main guiding factor in deciding the indication of hot spring therapy.

The fourth factor can be called as the nonspecific alterative effect. By this term, it is understood that the combined actions of the above mentioned three factors manifest as the nonspecific stimulus to the human body and changes various functions through biological reactions. This is known from olden time by balneologist variously as balneal reactions or thermal crisis. As I have already pointed out, many thermal waters in Japan are acid springs with strong stimulatory effects, and the bathing style in Japan is characterized by its high temperature and frequent bathing. If one considers all these facts together, then it can be readily understood that why this fourth factor is thought to be the most important medical characteristics of spa-treatment in Japan and estimated as the main factor in balneal therapeutic effects by Japanese balneologists. In fact, balneal reaction occur in Japan subjectively in 15 to 40% of all spa patients and the frequency or incidence is estimated to be around 60 to 85% by our own investigations.

Contrary to this fact, in western balneal treatment, drinking cure plays an important role and therefore the effect of the chemical constituents or solutes will be estimated as the most important factor in balneal therapeutic effects. I believe that is the most important difference from the medical point of view between western and Japanese hot spring cure. This fact also explains why my study of the balneology is centered around the medical study on the balneal reaction or thermal crisis.

4. The differences in the social utilization of hot springs.

There are two aspects in the development (or exploitation) activity of the hot spring in human community. One is the science of the hot spring and the other is the actual utilization and management of the hot springs in the public community. In German words, the former is termed as "Badewissenschaft" and the other "Badewirtschaft". These two aspects of the hot springs are very nicely cooperated in western hot springs. In western countries, the hot springs are well under public control for the purpose of the advancement of health and public welfare. As the health resort, western spa has appropriate environments and suitable facilities. In Japan, many of spas are onty the leisure lands, place of sight seeing, place of playing, a sort of Las Vegas or Coney Island. The environmental development of spas in Japan are frequently done without any concern to the public welfare and health. Regrettably as it is, Japanese spas can not be called as
the place for the advancement of health and public welfare and unfortunately this makes another important difference between western and Japanese spa.

Conclusion:

To conclude, I have pointed out that there are some differences between western and Japanese hot springs mostly from the medical point of view. I have summarized these differences into four points. I also pointed out that in Japan particularly, although the science of the hot spring, such including chemistry, physics, medicine, geophysics and geology, has shown tremendous advances, all contributing to the understanding of the hot spring but in social utilization and management of the hot springs there remain many problems. The hot springs, this wonderful natural resource is not fully utilized, especially in Japan for the benefit of public health and for betterment of public welfare.

With recent advancement of technology and economical advancements, the problem of environmental pollution became the center of the public attention. Realization of the fact that social advancement sometimes is done by sacrificing mother nature necessary for our own health called out attention to the importance of keeping natural environment for the sake of public welfare. From this point of view, re-evaluation of the hot springs as the resort necessary for keeping public health is gradually taking place. I am delighted to realize this and feel great pride for this is what we balneologists have been advocating through out study of the balneology.

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<th>Table 4</th>
<th>Differences in the social utilization and management of hot springs</th>
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<td>1.</td>
<td>Development of hot springs done mostly as sightseeing projects or for the purpose of leisure</td>
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<td>2.</td>
<td>Spa is not considered as the health resort.</td>
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<td>3.</td>
<td>Many of hot springs are privately owned, and are not considered as public property.</td>
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<td>4.</td>
<td>Not enough communication between the balneology and social hot spring management.</td>
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References