CO₂ Balneotherapy in Japan

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Abstract: Natural CO₂ springs have been scarcely utilized in Japan, whereas artificial CO₂ bathing has become popular by the introduction of CO₂ tablets and other apparatus for CO₂ water supply. Artificial CO₂ bathing is indicated for degenerative connective tissue disorders such as scleroderma, common stiff and painful shoulders, chronic joint pain, lumbago, and trophic changes due to insufficient peripheral circulation by virtue of the increase of tissue pO₂ and the improvement of tissue perfusion. Artificial CO₂ bathing promotes recovery from fatigue and is beneficial in women whose health has been adversely affected by cold.

Key words: CO₂-balneotherapy, Artificial CO₂-bathing, Tissue pO₂, Tissue perfusion, Connective tissue disorders.

CO₂ balneotherapy is classified into natural and artificial baths.

1. Natural CO₂ baths.
   Natural CO₂ baths are not so well utilized in Japan mainly because, they are located only in the active volcanic zones. Secondly, Japanese people have not familiarized with the beneficial effects of CO₂ and parties concerned about apa-resort management have not made serious efforts to popularize CO₂ baths, because of the lack of knowledge. Thirdly, the traditional habit of short time bathing at higher than 40°C constitutes a barrier to bathing in low temperature natural CO₂ baths containing a high CO₂ concentration. Furthermore, the inadequacy of social health care policies is an obstacle in promoting balneotherapy in the remote places inconveniently situated.

Although there are about 15 medicinal CO₂ springs in Japan, none of them are actively utilized for the treatment (Fig. 1).

2. Artificial CO₂ bathings.
   According to the results of the experimental studies on bathing with artificially carbonated water, favorable physiological effects of CO₂ were clarified such as the increase of tissue pO₂ and the improvement of tissue perfusion by means of mass spectrometry prior to other results (Table 1). These effects ameliorate degenerative tis-
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Leading works on the effect of CO2 bathing in the 1980's

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Tabal 1

The essential factor in CO2 bathing.

Physiological effects are specifically produced by the chemical substance of CO2, not by the temperature of bathing water or other factors. Therefore, artificial CO2 bathing can be used daily apart from the environmental factors of resort area and/or medicinal springs.

2-4 CO2 water supply.

For routine CO2 bathing, we developed 1) a 50g CO2 tablet, made from sodium hydrogen carbonate and succinic acid, producing fine bubbles in water; 100ppm in a 150-liter tub at 40°C, (CO2 tablets for artificial CO2 bathing are now popularized among the general public, and have a market share of 30% in bath preparations in Japan), 2) an apparatus for mixing CO2 and water using a dispersion mixer, supplying CO2 water of 1000ppm in a 280-liter tub at 40°C in 30 minutes (Fig. 2), and 3) an apparatus with a gas condensing heater system, supplying CO2 water of 100-150ppm at 40°C (Fig. 3).

CO2 bathing is performed for longer than 10 minutes at a temperature below 40°C.
The indication for CO₂ bathing.

CO₂ bathing is indicated for degenerative connective tissue disorders such as scleroderma, common stiff and painful shoulders, chronic joint pain and lumbago. Signs of amelioration usually appear in a month or so¹⁵), secondly, for the incurable wounds due to chronic occlusive diseases of the peripheral arteries and pressure sores, in which granulation tissues appear to improve in a couple of months⁸,¹¹,¹⁶), and thirdly, for essential hypertension, in which a hypotensive effect will be seen in 6 - 12 months¹⁷).

The artificial CO₂ bathing is also useful as a matter of routine for recovery from fatigue and for women whose health has been adversely affected by cold¹⁰,¹⁵).

In conclusion, there has been much controversy for many years regarding the relative merits of natural CO₂ springs and artificially prepared carbonated water, but we believe that CO₂ does improve the microhemodynamics in tissue apart from other factors in mineral salts without any complications in both experimental and practical bases¹⁸).

References


(In Japanese with English summary).


日本に於ける二酸化炭素療法の現況

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日本では、天然の二酸化炭素泉は殆ど利用されていない。一方、CO₂錠剤、CO₂給水装置が

開発されて人工二酸化炭素泉がよく用いられるようになってきた。皮下組織の酸素分圧の上昇と組織循環の改善という好ましい生理作用により、結合繊の退行性変化による慢性障害、すなわち強皮症、関節症、慢性関節痛、腰痛症、および末梢循環障害に伴う組織の栄養障害に適応がある。また、疲労回復を促進し、いわゆる冷え症に好ましく作用する。