17-6 Spread to medical and beauty industry of the artificial high-concentrate bicarbonate warm water in Japan, and the utility

Masaharu MAEDA, Jun YAMAMOTO, Osamu KINOSHITA, Akari SHIODA
Department of Rehabilitation, International University of Health & Welfare graduate school

Less than 0.5% of hot springs in Japan is natural carbonated hot springs. Therefore, the spread of artificial bicarbonate (CO$_2$) water in Japan starts by developing the gas-permeable membrane.

There are two methods to produce artificial CO$_2$ water. The first is gas-permeable membrane method and the second is pressurizing stir method. Both are widespread. Because the gas-permeable membrane method is provided by stable concentration in medical treatment, generally the stirring methods spread because a price is cheap.

There is a custom of whole body bathing in Japan from old days, and the CO$_2$ warm water bathing has spread all over Japan in about ten years recently.

The vasodilation effect can be caused by the CO$_2$ in warm water of 41 degrees Celsius (approximately 1,000ppm: max saturation under conditions of atmospheric pressure), which is the temperature favored by Japanese people. This differs from the vasodilation caused by the nitric oxide (NO) by thermal, and the reason is thought to be the participation of hormone from a blood vessel endothelium such as prostaglandin E2.

When CO$_2$ penetrates from the epidermis and it reaches the dermis, it enhances the entering blood vessel to the capillary of the dermis.

The blood vessel is enhanced according to the concentration of CO$_2$.

A wide capillary increases volume flow of blood, sends the tissue oxygen and nourishment, and accentuates the renewal of the skin.

By the use of this mechanism, arteriosclerosis obliterans using the footbath and the pressure sore treatment in the medical, and cosmetics with CO$_2$ water are widespread in the beauty industry in Japan.

Moreover, a vasodilated vessel carries the febris easily from the warm water to the inside of the body, and raises the body temperature high early.

Body temperature increases CO$_2$ water 1.5 degrees Celsius, tap water 1.0 degrees Celsius by the warm water hole body bathing of 41 degrees Celsius 15 minutes from before bathing.

This phenomenon of CO$_2$ warm water raises the body temperature easier than the tap water, and works as a heat stress for the human body.

It provides to increasing of the immunity (natural killer cell activities) and the heat shock protein (HSP) caused by this stress, and it consequentially enhances health promotion.

In addition, using the bulla from unstable CO$_2$ to clean the hair and the hair root and to improve the blood circulation of the scalp is becoming popular in Japanese hair salon. Though custom of the drinking CO$_2$ water has been performed in Europe from long ago, it
became popular in Japan several years ago, for the appetite increase with small and for the diet with large amount. These spread as one of the dieting methods of a woman from last 2 years.

Japan is a country that can use the favor of high concentrate artificial CO\textsubscript{2} warm water anywhere, for the development and the widespread of the high concentrated artificial CO\textsubscript{2} producing apparatus.

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