Ibusuki hotspring sand bath (SB)(Sunamushi) is a special thermal therapy using heated sands by natural hotspring gushed at the seashore of Ibusuki city. Heated heavy sands (50°C, 40-60kg) was piled on the lied body. It has traditionally been used here for 250 years to relieve muculoskeletal and neuralgic pain, and still accepts 260 thousands visitors a year. In the present study, cardiovascular and metabolic effects by SB was studied from the viewpoint of accelerated circulation.

Subjects and Methods: General physical parameters (BP, HR, sublingual temperature) and plasma chemistry were examined in 20 healthy males(36 ± 10yrs). The subjects wore thin bathrobe and a venous catheter for blood sampling were set in the forearm. They kept rest in the supine position for 30min and subjected 10min SB at the municipal SB institute with hotspring piping under the sands. In another 28 healthy subjects (44.3 ± 2.4yrs), cardiac outputs and plasma catecholamines (CA) and renin activity (PRA) were measured. In 6 subjects intracardiac study by Swan-Ganz catheterization were performed.

Results: Diastolic pressure were significantly decreased by 6mmHg, and heart rate and sublingual temperature were significantly increased by +20bpm and +1.1°C, respectively, after 10min SB. Venous blood pO₂ and pH was significantly increased by 20mm Torr and 0.03pH, and pCO₂ was significantly reduced by 5mm Torr. Lactate, pyruvate and L/P ratio were significantly reduced suggesting improved oxidative metabolism of peripheral tissues. Plasma CAs and PRA were elevated after SB. All of these results gradually returned to the resting level after 30min. Cardiac output (CO) measured by dye dilution or thermo-dilution method was significantly increased from 5.6l/min to 10.5 l/min after 10min SB, and reduced to 8.1 l/min by removing piled sands. Calculated total peripheral resistance (TPR) was significantly decreased suggesting thermal vasodilation. Although mean right atrial pressure and pulmonary arterial pressure were increased during SB, they were immediately decreased by removing piled sands.

Discussion: All of these results indicate that the basic effects of SB are derived from strong hydrostatic pressure of piled heavy sands and thermal vasodilation. Increased CO due to accelerated venous return and reduced afterload (TPR) will induce sufficient oxygen supply and increased discharge of wasted matters from peripheral tissues. These data seem to be compatible with the clinical effects of SB to relieve musculoskeletal pain and fatigue.

Conclusion: Significant clinical effects is induced by increased CO due to the increased hydrostatic pressure of piled sands and thermal vasodilation.

Keywords: Sand bath, Hydrostatic pressure, Hemodynamic effects, Metabolic effects