

Monodzukuri for Medicine

Japan's *monodzukuri* technologies are attracting attention from overseas for their potential use in the manufacture of medical appliances. Masaki Yamada introduces such medical appliances from among winning products in the Monodzukuri Nippon Grand Award.

Artificial Ventilator for Premature Infants

Metran Co. (Kawaguchi City, Saitama Prefecture), with thirty-five employees has developed an artificial ventilator to save the lives of extremely premature infants.

The president of the company is Tran Ngoc Phuc, who hails from Vietnam. Phuc came to Japan for his tertiary studies in 1968. After graduating from university, he gained experience with a Japanese medical equipment manufacturer, before founding Metran in 1984 and commencing research and development of an artificial ventilator for premature infants (newborns with a birth-weight of 2,500 g or under).

Traditionally, artificial ventilators took the form of inserting a tube from the mouth or nose,

and delivering air into the lungs using pressure. However, with this method, the pressure may damage the pulmonary alveoli of newborn premature infants and, in the worst-case scenario, lead to death. In order to improve upon this type of ventilation, Phuc focused on a method of delivering oxygen using oscillation rather than pressure.

“The HFO- (high-frequency oscillatory ventilation) type artificial ventilators that we developed were able to deliver oxygen to the pulmonary alveoli at one burst using 900 oscillations per minute. The use of this method to deliver oxygen practically eliminates changes in airway pressure, minimizing damage to the pulmonary alveoli,” explains Phuc.

Named “Humming,” to date this artificial ventilator has been delivered to approximately 90% of neonatal intensive care units in Japan, with around 1400 machines shipped. It is also highly regarded overseas. To date more than 200 of the Humming ventilators have been exported to twelve countries.

“Currently, we are handling global maintenance and sales in partnership with major manufacturers of medical electronic devices,” says Phuc. “We would like to promote the Humming ventilators more widely overseas, so that it can provide treatment benefits to newborns.”

Metran President Tran Ngoc Phuc with the artificial ventilator for premature infants that was awarded the METI Minister's Prize in the Monoduzukuri Nippon Grand Award



MASAKI YAMADA

Medical Fixative that Cures with Light

Alcare Co. (Sumida Ward, Tokyo), a company with about 440 employees, was the first in the world to develop Opticure Splint, a medical fixative that cures with sunlight or fluorescent light.

When treating bone fractures, sprains, or dislocations, fixatives such as plaster casts and water curable casts are normally used to rest the affected part and maintain stability. However, the curing of such fixatives requires water. Further, the curing process takes over thirty minutes. Opticure Splint uses light curing polyurethane acrylate monomer, allowing curing to take place simply by exposure to visible light such as sunlight or fluorescent light. Furthermore, the curing process takes only a few seconds using sunlight, and just 20–30 seconds if exposed to a strong light such as LED or fluorescent lamp from close range. This means that the curing time and place can be controlled as desired, which was not possible with traditional fixatives.

“As no water is required, it can be utilized in places where you wish to keep the environment clean, such as the operating theater, examination room, or hospital ward,” says Tetsuji Iwasaki, managing executive officer of the company’s Research & Development Department. “It can also be utilized at disaster sites when it is difficult to prepare water.”

Opticure Splint demonstrated its effectiveness in the Great East Japan Earthquake.

Opticure Splint, winner of the Monodzukuri Nippon Grand Award Special Prize

Though it was difficult to obtain water in the quake-affected areas for a long period, doctors were able to treat victims with bone fractures or sprains using a medical lighting unit. It was also well-received by patients, since it prevents discomfort when the affected part gets wet.

Opticure Sprint is somewhat expensive compared with existing fixatives. However, it completely does away with the need to prepare water and clean up after treatment, and as such the total cost including manpower expenses is relatively cheap.

“Opticure Splint can be used not only for the treatment of bone fractures, but to prevent injury in the elderly or athletes, or for rehabilitation,” says Iwasaki. “In the future, I would like to promote its usefulness to medical personnel in other countries through overseas exhibitions or conference presentations.”



Masaki Yamada is a freelance writer.



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