

## Wearable and Compact Wireless Sensor Nodes for Measuring the Temperature of the Base of a Calf's Tail

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Calves have low resistance to viruses or bacteria and are predisposed to respiratory diseases such as pneumonia. Respiratory disease is the number-one cause of death in calves. An effective method for the early detection of respiratory diseases is to measure the rectal temperature with a thermometer. However, this cannot be frequently conducted because it requires too much time and effort of the farmers. As a method requiring minimal time and effort, we have developed wireless sensor nodes to automatically measure the body surface temperature of a calf. The sensor nodes are designed to be compact by using a 3-axis accelerometer with a temperature-sensing function and a chip antenna, which can measure any body surface of a calf. The fabricated sensor nodes, which can measure both temperature and acceleration, are  $18 \times 18 \times 7$  mm<sup>3</sup> and weigh 6.5 g including batteries. Their primary advantages are light weight and small size. Thus, we can easily attach the sensor nodes to the base of the calf's tail, which is one of the slimmest parts, and successfully measure the body surface temperature.

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