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Body temperature control and regulation-educational mechanical model of blood flow regulation

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Maintaining body temperature within an optimum range, so called thermoregulation, is a complex process based on a number of mechanisms (e.g. sweat secretion, shivering and blood flow regulation). Visualization of selected control and regulation processes may be attractive way of teaching. The aim of the study was to design and construct a mechanical model of a body response to temperature changes. Presented device consists of elements used in home appliance (e.g. electrovalve, thermostat and pump) and generally reachable materials (e.g. tubes, plastic box, hydraulic tees, silicon, metal zip-ties, heater and electronic thermometer). All of them have been chosen, taking into account the criterion of analogues into the human body. Plastic box filled with water simulates human's body because of the similar density. Thicker tube, situated on the bottom, correspond to the deep blood vessels whereas the thinner one joined above symbolize those surficial. Water circulation in the tubes is provided by the pump so as to simulate the work of the heart pumping blood into the vessels. Thermostat sensor represents thermoreceptors and thermostat on his own, sending an electrical impulse to the electrovalve, is a well representative of hypothalamus. Mechanism is quite simple-when water temperature reaches 38°C, sensor sends signal to the thermostat which is conjunct with the electrovalve. Then electrovalve opens and the water flow through the upper tube starts. This leads to heat exchange with environment and decrease of water temperature. When temperature falls to about 36°C, the electrovalve closes what stops water flow through smaller tube.

Biography

Katarzyna Matusiak has completed her PhD in 2009 at the AGH University of Science and Technology in Krakow. From the beginning, her work is specifically involved in the search for new methods of teaching. Her search activity focuses on issues related to the dosimetry and imaging techniques in medicine.

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