Centrifuges, microhematocrit

Health problem addressed
Devices intended to determine the blood’s hematocrit—the ratio of red-cell volume to whole blood volume, expressed as a decimal, a fraction, or a percentage. Microhematocrit centrifuges may be used to help diagnose blood loss, polycythemia (an elevation of the erythrocyte count to above-normal levels), anemia, bone marrow failure, leukemia, and multiple myeloma. High hematocrit levels indicate dehydration and erythrocytosis.

Product description
Basic microhematocrit centrifuge components include a motor that supplies power to the shaft and rotor, centrifuge heads (carriers) that spin on the rotor, and a lid latch and/or lid. The centrifuge head contains the cups or shields that cover the rotor and turns on a spindle. A safety shield in the chamber surrounds the rotor. These centrifuges may or may not use brushes to conduct electricity. Some microhematocrit centrifuges have a reading scale, capillary tube reader, a timer, a braking system, tachometer, and a potentiometer. Some models are equipped with an LCD (liquid crystal display) or LED (light-emitting diode) display and a keyboard, enabling the user to program a specific speed or view device status.

Principles of operation
Centrifuges apply centrifugal force to separate suspended particles from a liquid or to separate liquids of different densities. These liquids can include body fluids (e.g., blood, serum, urine), commercial reagents, or combinations of the two with other additives. By creating forces many times greater than gravity, centrifuges can greatly accelerate separations that occur naturally as a result of density differences. The microhematocrit centrifuge, a special-purpose version of a fixed-head unit, quickly attains speeds of 11,000 rpm and RCFs (relative centrifugal forces) of up to 15,000 g to spin microcapillary tube samples. These tubes require only small blood samples taken from a puncture site or from an anticoagulated venous blood specimen.

Operating steps
- Operator loads the samples into the rotor head within the instrument housing, and closes the lid.
- The appropriate time, rpm, and braking information is programmed, usually by flipping a switch, by adjusting a potentiometer, or by using a keyboard. Some units also permit selection of the degree of braking to be applied to the shaft following centrifugation.

Reported problems
A centrifuge should never be operated with the lid open because of the hazards posed by a flying rotor or the dispersal of biologically hazardous material. Rotors must fit properly on the centrifuge because if the rotor is not securely fastened, it may fly off at extraordinary speed. Tube breakage can occur in centrifuges because of rotor misalignment, old or defective tubes, or incorrect use. Operators should always use universal precautions when performing centrifugation and other functions that may cause exposure to splashed blood or body fluids.

Use and maintenance
User(s): Laboratory technicians
Maintenance: Biomedical engineering staff and/or service contract with the manufacturer or third-party organization
Training: Training by manufacturer and manuals

Environment of use
Settings of use: Clinical laboratory
Requirements: Stable power source

Product specifications
Approx. dimensions (mm): 254 x 318 x 356
Approx. weight (kg): 11
Consumables: Brushes; sample tubes; tube holders; liners
Price range (USD): 300-3,200 (1,600 typical); price covers all types and variations
Typical product life time: 8 years
Shelf life (consumables): NA

Types and variations
- High-speed;
- Brushless