



SCU Centrifuge Safety Procedure

PLEASE NOTE: You must receive proper training prior to centrifuge use!

Elements Required for Effective Centrifuge Use

Centrifuges can create safety risks if not used correctly. These risks include materials ejected at high speed due to imbalanced loads, release of infectious or hazardous aerosols; and entrapment or serious injury if interlock is not working correctly. Proper loading, preventing aerosols and ensuring equipment is functioning correctly contribute to safe centrifuge use:

- Centrifuges loads should be accurately balanced in pairs with the pairs evenly distributed around the rotor (1/2 gram at 1 G is roughly equivalent to 250 Kg @ 500,000 G's).
- Tubes used in centrifuges must be inspected for damage prior to use, not overfilled - three quarters should be maximum fill, and that the tube will operate in the correct position (and not leak on the rotor head).
- Sealed buckets or rotors should be used to process any bloodborne pathogens or bio-hazardous materials.
- For flammable and/or hazardous materials, the centrifuge should be under negative pressure to a suitable exhaust system.

NOTE: all new centrifuges brought on campus must have functional interlocks.

Centrifuge User Safety Precautions:

Because centrifuges operate at high speeds, proper use is important to ensure operator safety. Prevent injuries when using the centrifuge by observing the following rules:

1. **Required Personal Protective Equipment:** Lab coat with sleeves fully extended to the wrists, safety glasses with side shields, gloves, and shoes that fully enclose the foot.
2. **Items that cannot be used in the Centrifuge:** tubes other than metal or plastic.
3. **Inspect Centrifuge Prior to Use:** if you find a problem, notify your supervisor or the Laboratory Manager/Technician. Do not operate the centrifuge until it has been properly repaired.
4. **Inspect Rotors prior to installation/loading:** look for cracks, dings or dents, and pitting – all of which can cause a catastrophic failure in the rotor. Rotors should be clean.

General Centrifuge Use Instructions:

- Operate centrifuges in designated laboratory space only to ensure adequate ventilation.
- Inspect the inside of the centrifuge cups for rough walls caused by erosion and any adhered matter. Contact the Laboratory Manager/Technician if erosion or adhered matter is found.
- Check tubes to be placed in the centrifuge before each use.

- Use only metal or plastic tubes (other than nitrocellulose).
 - Do not use tubes that are cracked.
 - Check compatibility of the tube material to the solvent medium (some solvents may cause the tubes to swell or crack in the rotor).
- Do not scratch or otherwise damage the aluminum oxide layer that protects the centrifuge's underlying metal.
- Make sure the rotor, tubes, and spindle are dry and clean and that the rotor is properly seated and secured to the drive hub. Tubes must be properly balanced in the rotor.
- Many rotors incorporate an o-ring in the lid or rotor body – make sure the o-ring is present and in good condition prior to use. O-rings may require grease to achieve a proper seal. Do not use o-rings that are overly dry or cracked.
- With Biosafety Level 2 or higher material, rotors must have aerosol containment ("O-rings") or be used in a Biosafety cabinet. Rotors must be loaded and unloaded in a Biosafety cabinet.
- With radioactive material, keep centrifuge behind an appropriate shield while spinning.
- Set and confirm the proper run speed each time to prevent over-speeding.
 - Observe speed reductions specified in the centrifuge manual for running high-density solutions, plastic adapters, or stainless steel tubes.
- A "safety distance" of 30 cm must be observed around the centrifuge while it is in operation. No objects which can cause damage when destroyed must be within this distance (this includes chemicals, biological hazards, gas cylinders, and electrical circuitry).
- User will stay at the centrifuge until full operating speed is attained and machine appears to be running safely without vibration. If vibration occurs the centrifuge must be stopped immediately and load balances checked. Swing-out buckets should be checked for clearance and support.
- If a tube breaks during the run, do the following:
 - Turn off the centrifuge and contact the Laboratory Manager/Technician.
- Make sure the rotor has STOPPED before opening the centrifuge lid when the run is complete. Never attempt to open the lid of a centrifuge or slow the rotor by hand while the rotor is in motion as serious injury may result.
- Some centrifuges are refrigerated and need to be kept CLOSED when powered on or else they build ice that can melt into the spindle and drive causing corrosion. When FINISHED, the unit should be powered off and the lid should be opened to allow any condensation to evaporate.
- Clean tubes, rotors, and centrifuge interiors after use. Never leave a centrifuge in a contaminated state.
 - Wash only the buckets of a swinging bucket rotor. Never immerse the body of the rotor — the hanger mechanisms are hard to dry and can rust.
 - Use only deionized or distilled water and a mild soap – do not use scrubbing pads or abrasive cleaners on rotors!
 - Do not autoclave rotors at temperatures above 100°C.

High Speed Centrifuge Use (additional requirements to General Use):

- High Speed Centrifuge use requires training by the Laboratory Manager/ Technician prior to use.
- Avoiding rotor failure is critically important. Follow these guidelines to reduce the risk of rotor failure:
 - Use the correct rotor with the correct centrifuge (e.g., Beckman rotors in Beckman centrifuges).
 - Use sealed rotors, sealed buckets, or a guard bowl with a gasket and cover as well as safety centrifuge tubes (tube or bottle carrier with sealable cap or "O" gasketed cap).
- Follow the manufacturer's instructions. Maximum speed and sample density ratings designated by the manufacturer for each rotor are intended to prevent stress failures.
- Before running an ultracentrifuge, check the classification decal on the ultracentrifuge and make sure it matches the classification decal on the rotor.
- Complete a log entry for each centrifuge use.
- Plastic centrifuge tubes must be discarded after one cycle of ultra-centrifugation.
- Follow the manufacturer's cleaning and disinfection recommendations to avoid rotor fatigue, distortion, and corrosion. Maintenance of tubes, rotors, and other components requires considerable care. No single method is suitable for all items.

Centrifuge Laboratory Manager Responsibilities

- Anyone under your responsibility must be trained prior to using a centrifuge.
- High-speed rotor heads are prone to metal fatigue. Failure to discard rotors after a predetermined amount of use can result in dangerous and expensive rotor disintegration.

Reference

- Beckman Coulter
(<https://www.beckmancoulter.com/wsrportal/wsr/support/frequently-asked-questions-faq/centrifugation/index.htm>)
- SCU Chemical Hygiene Plan