

Alternatives to Bunsen Burners in a Biological Safety Cabinet

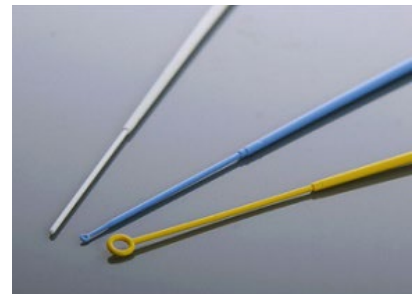
Heat from Bunsen Burners and other heat-generating devices (e.g. Bacti-Cinerator, bead sterilizer) can affect the air flow in biological safety cabinet (BSCs) and as a result can compromise user safety and increase contamination. In addition, excessive heat build-up can damage the HEPA filter and the use of flammable gas inside a BSC is an explosive hazard. Because of the risk of using Bunsen Burners and heat-generating devices inside a BSC, safer alternatives should be used when possible. When your procedure requires a flame or heat-generating device, their use must be approved through the Office of Biological Safety.

For more information on how heat-generating devices affect the air flow in BSCs, please refer to Held, K. F., Thibeault, R., & Boudreau, J. (2019). Heat Sources in a Biosafety Cabinet Compromise Experimental and User Protection. Applied Biosafety. <https://doi.org/10.1177/1535676019831173>.

Safest Alternatives to Bunsen Burners That Don't Generate Heat

The safest alternatives are those that don't use an open flame or generate heat. The use of these alternatives should be explored prior to the use of heat-generating devices.

- Use sterile disposable products such as loops and sterile lab supplies.
- Autoclaved toothpicks or wooden applicator sticks (Fisher catalog # 22-029-491) may be a cheaper alternatives to disposable loops.
- Place tools in autoclavable plastic or foil and autoclave prior to use.
- To remove film from glass slides, flame slides outside of the BSC, wrap in foil, and autoclave prior to use.



Heat-Generating Alternatives That Don't Utilize an Open Flame

Although these alternative devices don't use an open flame, the heat they generate can still decrease the effectiveness of a BSC and compromise the safety of the user. The use of these devices in a BSC will require approval through the Office of Biological Safety.

- The Glass Bead Sterilizer utilizes dry heat (250°C) and can sterilize small instruments such as loops, needles, tweezers, and scissors.



- The Electrical Bunsen Burner utilizes radiant heat (800°C) to sterilize loops and needles, and for heating test tubes, crucibles, small flasks, and beakers. Cooling vents help keep the base cool.



- The Bacti-Cinerator utilizes infrared heat (815°C) to sterilize loops and needles while containing splatter.



Heat-Generating Alternatives That Require a Flammable Fuel Source

If a flame is required for your procedure, the following devices are safer to use than a standard Bunsen Burner. Although the risk of fire or explosion may be reduced due to safety features of the devices, the risks are not eliminated. A thorough risk assessment should be performed before using. The use of these devices in a BSC will also require approval through the Office of Biological Safety.

- An alcohol lamp, or spirit lamp, utilizes flammable solvent such as ethanol. Of all of the heat generating devices tested by *Held, et al.*, the alcohol lamp impacted the airflow in a BSC the least.



- The Integra Flameboy is a handheld torch that can use gas cartridges or be hooked up to house gas*. It utilizes an electric ignition and a flame is only generated as long as the trigger is pulled to prevent a continuous flame. Safe and mindful handling of the torch is required to prevent inadvertent burning of the user, materials in the BSC, and the BSC supply HEPA filter.



- A safety Bunsen Burner such as the Integra Fireboy or Argos FireStar Bunsen Burner ST has several safety features. These burners can use gas cartridges or be hooked up to house gas*. They utilize an electric ignition that can operate from a manual switch, a sensor that detects hand movement, or a foot peddle. An internal gas valve is automatically closed if the flame extinguishes, there is overheating, or faulty, clogged, or missing burner heads are detected. A burn time can be programmed to control the time in use. Even though these burners have an internal gas valve, the main gas valve to the burner must be closed when the burner is not in use. They also don't eliminate the risk of gas leaks at connections or from faulty tubing.



*If devices are hooked up to house gas, additional requirements will need to be met (i.e. flexible gas connections, emergency shut-off valve located outside of BSC).

Contact Information

Please contact the Office of Biological Safety (biosafety@fpm.wisc.edu) if there are any further questions or if you would like to apply for the use of a heat-generating device in a BSC.

Related Policy

IBC Policy: [Institutional Biosafety Committee \(IBC\) - UW-Madison Policy Library \(wisc.edu\)](#)