

No Open Flames in Biosafety Cabinets

The MIT CAB/ESCRO has reviewed the information from makers of Biosafety Cabinets (BSC), the NSF International Standard, NSF/ANSI 49 Class II Laminar Flow Biosafety Cabinetry, 2004ⁱ, and a variety of reports of laboratory fires and incidents related to use of flammable gas and Bunsen burners in Biological Safety Cabinetsⁱⁱ. Based on this information, the CAB/ESCRO recommends that investigators NOT use Bunsen burners, including the “touch type”, or other heat sources while working in a BSC. Other heat sources include alcohol burners, electric burners or any point-source of heat that might disrupt the protective laminar air flow pattern of a BSC.

This policy is meant to apply to the design and construction of new biological research buildings, laboratory renovations or modifications to Biosafety Cabinets. In effect, new BSCs should be ordered without the gas valve and tissue culture rooms need not have gas lines. In addition, if the opportunity arises to modify BSCs, the gas lines to the BSCs should be capped.

This policy is based on the fact that (a) use of “touch type” Bunsen burners have been associated with several fires; (b) BSC are designed to provide an essentially sterile interior work space when used and operated as designed. This sterile work space is maintained by the laminar flow pattern of the HEPA-filtered air and protects both the research materials and personnel. Airflow distortions created by heat sources disrupt the protective laminar pattern, increasing the chance for possible release of, and exposure to, work materials. In addition heat buildup can damage the HEPA filter, and further compromise the integrity of the cabinet; (c) BSC are designed to meet certain specific stringent operational criteria. These criteria, outlined in the NSF/ANSI 49 Standard, include requirements for performance as well as field/laboratory certification testing. Design, testing, and certification do not include performance assurance or testing in the presence of any active heat source such as a working Bunsen burner or even a “touch plate” type i.e., BSC are never field tested or certified with an active heat source on. The Standard asks “that all removable equipment not essential to the cabinet operation be removed for field/lab certifications”; (d) the motors used in the construction of these BSC are not spark proof and a spark generated could ignite flammable gas vapors. Companies that manufacture BSCs are required by UL to place warning labels that specifically prohibit the use of flammable gasesⁱⁱⁱ or carry broader statements such as

“DO NOT USE FLAMMABLE, TOXIC OR EXPLOSIVE SUBSTANCES IN THIS CABINET”^{iv}

Tissue culture practices and procedures can be altered so that Bunsen burners used for flaming of bottle necks, or bacterial loops, etc., are not needed^v. The use of Bunsen burners or other heat sources does not help a certified BSC maintain a sterile work environment^{vi}.

The CAB/ESCRO recognizes that a policy cannot address all possible circumstances. There may be extenuating circumstances or instances where the investigator deems it

necessary to use a heat source in a BSC for a specific purpose. In those instances, the CAB/ESCRO asks that the investigator submit this request to the Biosafety Program for review and assessment. The request should include the type of heat source, the planned frequency of use and the duration of the requested exception. The request should also include the measures to be taken to prevent fire and excessive heat buildup, as well as to maintain the appropriate protective air flow pattern within the BSC while work is in progress. The Biosafety Program will review these requests and the Institutional Biosafety Officer (BSO) may administratively approve exceptions for devices that produce heat in the absence of flame (e.g. glass bead sterilizer or ceramic loop sterilizer) or are considered lower hazards with finite volumes of fuel (e.g. alcohol burners). Usage of high hazard devices, such as Bunsen burners, require CAB/ESCRO approval before initiation.

References:

ⁱ NSF International Standard/American National Standard, NSF/ANSI 49, 2004.

ⁱⁱ for examples see www.ncsp.tamu.edu/reports/DOE2/doc2,
www2.umdj.edu/eohssweb/aiha/accidents/BSC

ⁱⁱⁱ letter of April 25, 2000 from Baker Company to ALL BAKER REPRESENTATIVES (regarding “warning labels prohibiting use of flammable gases in our cabinets”)

^{iv} www.NuAire.com/biological_safety_cabinets/class2

^v NIH/CDC Biosafety in Microbiological and Biomedical Laboratories, 5th edition, 2007.

^{vi} Baker Company Biosafety Manual, Chapter III. Proper Cabinet Use.

Revision History:

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