FOR THE PRINCIPAL INVESTIGATOR:

WHO YOU SHOULD INVOLVE WHEN PURCHASING A BIOSAFETY CABINET

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Selecting a biological safety cabinet (BSC) is a critical part of setting up or upgrading any laboratory. Making the correct decision requires experience and considerable technical knowledge. Laboratory managers, their research staff, and Environmental Health and Safety (EHS) personnel are the best source of the expertise necessary to purchase the correct BSC. They should play a key role in decisions so purchasing teams can avoid problems and additional costs associated with selecting the wrong BSC.

While purchasing decisions necessarily involve management, servicing, and engineering teams, it is advisable to include the people who will use the technology in the selection process.

In the case of biosafety cabinets, laboratory staff have detailed knowledge and day-to-day experience of using such systems and they are well-placed to say which technology will work best in a particular environment.

The researchers whose safety and productivity depends on biosafety equipment have direct knowledge of what equipment will be best for each application. Companies that acknowledge and utilize this expertise stand to gain considerable benefits.

Involve your Environmental Health and Safety (EHS) Department

Your EHS department is made up of professionals holding credentials such as: **Certified Biological Safety Professional (CBSP)** and / or **Registered Biosafety Professional (RBP)**. The National Institutes of Health (NIH) even offers a two year **National Biosafety and Biocontainment Program (NBBTP)** which provides training in regulatory, biocontainment, biosafety, engineering, communications, management, and public relations challenges. Part of the NBBTP program allows for travel to a variety of locations. **One in particular is an annual visit to NuAire in Plymouth, MN** where attendees learn design and performance aspects of the biological safety cabinet.

The Biosafety Professional will be key in performing a detailed risk assessment that will help determine the level of protection needed and may offer recommendations about a manufacturer. They also have valuable information regarding proper use of the product (i.e. biological safety cabinet). The Biosafety Officer has the best interests of the laboratory and personnel in mind.

Key Considerations When Choosing a Biological Safety Cabinet

When purchasing a BSC it is important to begin with a risk assessment to determine the specific requirements. A qualified biosafety professional should have training and field experience that includes methods used to control biohazards, and knowledge of the design, application and testing of BSC's. A summary of this process is determined by many factors based on a risk assessment, biosafety cabinet type/exhausting requirements and assessment of the laboratory environment as per stated in NSF/ANSI 49 Annex E.

The Risk Assessment

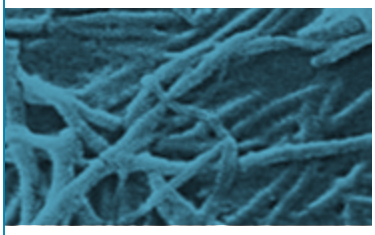
A risk assessment encompasses four main elements:

1) Hazard Identification
2) Exposure Assessment
3) Dose-Response Assessment
4) Risk Characterization / Management

The risk assessment process is performed by a team of internal and external stakeholders. All major hazard types are reviewed, physical, biological, chemical, and radiological. Assessment also includes virulence, toxicity, and other properties of a material, as well as the quantity in which the material will be present, and processing techniques required for safe handling. Within the assessment, if exposure was detected, a plan of effective treatment or mitigation of the exposure. Lastly, a review of personnel training requirements, engineering controls, personal protection equipment, operating procedures, emergency procedures, schedules, etc, is conducted.

The risk assessment process then provides the information needed to select the biosafety cabinet class, type, and exhausting requirements, if needed, as well as the laboratory environment to optimize the design for the application.

According to World Health Organization (WHO) guidance[1]:
"A BSC should be selected primarily in accordance with the type of protection needed: product protection; personnel protection against Risk Group 1–4 microorganisms; personnel protection against exposure to radionuclides and volatile toxic chemicals; or a combination of these."



A risk assessment takes into account types of pathogens likely to be used in research.

It is important to determine what research will be conducted using the BSC. What biohazards will researchers be handling? What volume of research work will be conducted?

A wide range of biological safety cabinets are available. These differ in quality, the applications for which they are best suited, and cost. Choosing the correct system can be a challenge.

Although many look similar on the outside, the technical specifications of cabinets vary widely. Criteria like reliability, design, and energy usage are obvious starting points that can be determined without hands-on experience.

Similarly, it is straightforward to establish whether a biological safety cabinet has been independently tested and deemed to comply with international standards, such as NSF/ANSI 49[2] or EN12469 Bio Safety Standard[3].

Testing information is routinely listed in the technical documents and brochures used to market some cabinets.

While brochures and catalogs can include some of the important considerations, they cannot cover them all and as such should not be used as the sole basis for deciding on a particular system.

Principal investigators can only make fully informed decisions with input from laboratory managers and staff, the people who will use the equipment every day.

Hands-on Experience

For example, glare from light reflected by a biosafety cabinet sash can be a significant problem for researchers. The US Centers for Disease Control and Prevention (CDC) includes avoiding cabinet glare in its guidance for Biosafety in Microbiological and Biomedical Laboratories (BMBL).[4]

But while the guidance is clear, actually determining if a particular cabinet is likely to generate glare that will reduce visibility and, ultimately, impact employee safety requires familiarity with the specific laboratory environment.

Properly engineered Biological Safety Cabinets position windows to reduce glare, improving user visibility and productivity.

It also takes an experienced end user to be able to determine if all areas within a cabinet are going to be reachable, if arm rests have been appropriately positioned, or if the system control panel can be seen from the operator's sitting position.

Similarly, according to the U.S. CDC[3] cleaning is vital to the safe and effective operation of any biosafety cabinet. Again, a member of laboratory staff with practical cleaning experience is likely to be better placed to assess any 'clean-ability' claims made by cabinet manufacturers than a purchasing manager.

A feature such as a motorized, fully adjustable, base stand might seem like a luxury expense, however, only someone who has operated a vivarium lacking an adjustable base stand can fully appreciate the improved ergonomics and increased productivity this feature provides.

An adjustable motorized base stand is an important feature on a BSC.

Similarly, the negative impact that noise generated by a running BSC can have on laboratory productivity and employee morale may well be underestimated by a principal investigator who is not exposed to excessive noise from a poorly engineered cabinet.

Ergonomics and Ease of Use

Determining how users will interact with technology, referred to as "ergonomics", is particularly important when choosing biosafety equipment.

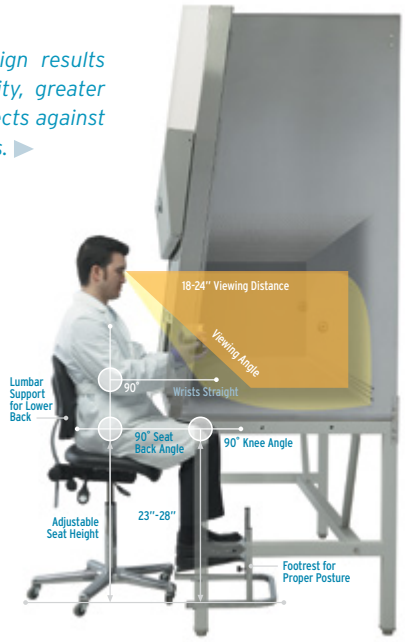
Laboratory staff typically use cabinets for extended periods of time to process batches of samples, which can result in the development of injuries if the system in question has been poorly designed.

According to research from the National Institute of Environmental Health Science[5] *"Laboratory researchers are at risk for repetitive motion injuries during routine laboratory procedures…standing and working in awkward positions in laboratory hoods/biological safety cabinets can also present ergonomic problems."*

As a result most biological safety cabinets also boast an "ergonomic design" in their marketing literature. Again the validity of such claims can only be determined by those with direct experience of interacting with such systems.

Indeed, while catalogs often stress the ergonomic benefits of a particular system, whether or not a cabinet's design will make a lab worker's job easier is most effectively determined when consulting with the staff that are going to use the technology.

Proper ergonomic design results in increased productivity, greater user comfort, and protects against repetitive-strain injuries.



Productivity

The negative impact a poorly chosen biological safety cabinet can have on productivity is something lab mangers and their teams understand better than most. Unreliable equipment prone to frequent failure compromises the staff safety, interrupts work flow, and increases maintenance costs.

Laboratory managers who regularly face such challenges are uniquely placed to provide insight and help purchasing teams strike the correct balance between reliability and cost that takes work volume into account.

Choosing a system with filters that are not designed for the specific task being undertaken will increase replacement costs. Understanding how often is 'too often' in terms of filter replacement is something that only an experienced laboratory technician or manager can determine effectively.

Similarly, in addition to putting employee safety at risk, the contamination resulting from an equipment failure of a poorly chosen biological safety cabinet could result in the laboratory being shut down.

Tech Support

Another reason to include lab managers and EHS in purchasing decisions is their experience in working with supplier support teams. Working with external support teams and technical experts is commonplace for laboratory staff in academia and industry alike.

This experience is invaluable when it comes to determining if the level of assistance being offered by the supplier for a cabinet system is likely to be sufficient, particularly for those who lack direct experience.

Effective support maximizes employee safety and minimizes laboratory downtime. Levels of support can vary depending on the supplier which is something that an experienced laboratory manager will understand and procurement may not.

Conclusion

Principal Investigators should include end users in assessing biosafety cabinets as the experience of day-to-day use is critical to choosing the correct system for the correct application.

Failing to leverage the expertise of lab managers and EHS could result in higher maintenance costs, put employee health and safety at risk, and reduce productivity. Specifications listed in product literature are no match for expertise and experience when investing in technology.

To learn more or to speak with someone at NuAire please visit nuaire.com or call 763-553-1270.

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4) http://www.cdc.gov/biosafety/publications/bmbl5/

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