THE POWER OF PARTNERSHIP

From resources to support, the right partner can help you tackle cell culture contamination

Among the myriad of unique challenges lab managers face each day, they must also remain vigilant for the possibility of cell culture contamination. Prevention requires a robust contamination monitoring program, and the presence of contamination requires swift action to mitigate financial losses, and protect the organization's credibility and reputation. Understanding the consequences of contamination, as well as potential sources, are the first steps toward developing an effective contamination control program. While the task may seem daunting, there is no need to go it alone. The team at Corning understands these challenges and has a broad portfolio of vessels, surfaces, media, filtration options, and consumables to support accurate and reproducible results, as well as a team of experts to guide you along the way.

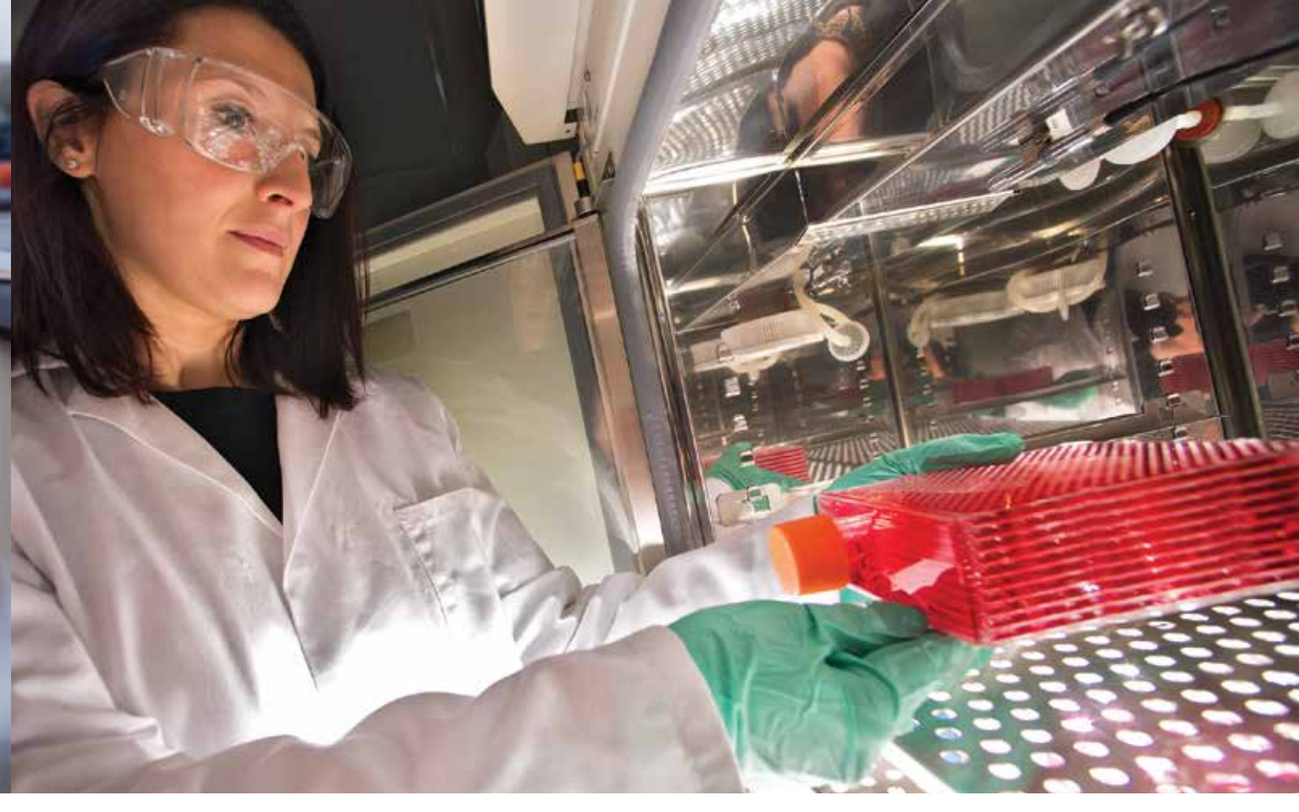
THE COSTS OF CONTAMINATION: MONEY, TIME, AND YOUR REPUTATION

There are varying degrees of cell culture contamination. Under well-controlled conditions, only an occasional plate or well may be affected, whereas less stringent controls can lead to more frequent contamination, or the loss of an entire experiment. Mycoplasma or cell line cross-contamination however, can be devastating, bringing into question the validity of current and past work, and potentially bringing multiple experiments and research programs to a halt.

Numerous resources—financial and human— are invested into every cell culture experiment. When contamination occurs, plates, media, cells, and numerous other consumables are wasted. The costs may be negligible for a few plates or flasks, but can be enormous when entire experiments are lost. For laboratories producing vaccines, drugs, or monoclonal antibodies, contamination can destroy entire batches, further contributing to financial loss.

In addition to supplies and products, the time invested by skilled scientists and technicians is also lost when an experiment must be repeated. These individuals are also diverted away from other essential tasks to address contamination or restart an experiment.

Beyond financial losses, cell line cross-contamination can have serious consequences for a laboratory's reputation. Working with multiple cell types without proper controls can lead to the transfer of cells from one culture to another, and subsequent proliferation may render the resulting data irreproducible and likely invalid. This contamination may also be difficult to trace, and previous publications may need to be retracted if the data is in question.



Implementing appropriate controls and preventive measures significantly reduces the risk of contamination, thereby preserving a laboratory's assets and reputation. Understanding how contamination occurs is the first step in the process.

THE SOURCE OF THE PROBLEM

Cell culture contaminants can be divided into two main categories: chemical contaminants and biological contaminants. Chemical contaminants are broadly defined as nonliving substances that have undesirable effects on the cell culture system. Most commonly, chemical contaminants including metal ions, endotoxins, and other impurities are introduced into cell culture media from the reagents and water used to make them, or via various additives such as sera. Storage containers and instruments are also a potential source of chemical contaminants. Plastic tubing and storage bottles, for example, may contain plasticizers that can contaminate cultures, whereas disinfectants, detergents, germicides and pesticides may create deposits and residues on glassware, pipets, and instruments that subsequently contaminate cell cultures. Impure gases used in CO_2 incubators are also a potential source of contamination. A less obvious source of contamination is laboratory lighting, as fluorescent light exposure may generate free radicals in media via photoactivation of tryptophan, riboflavin, or HEPES.

There are also numerous biological contaminants to consider, with some more readily detectable than others. Bacteria, molds, and yeasts are ubiquitous in the environment and rapidly flourish in cell cultures— especially in the absence of antibiotics. In the presence of antibiotics, bacterial proliferation is slower, and detection via microscopic observation is more challenging. Viruses and protozoa are also potential contaminants however viruses have limited infectivity and contamination with protozoa occurs very infrequently.

Mycoplasma contamination poses a much more serious threat. The combination of small size (0.15 to 0.3 µm diameter), a lack of cell wall, and fastidious growth requirements which are readily supplied by cell culture enable mycoplasmas to readily infect cell cultures. Aggressive management is essential to contain and prevent this type of contamination. Cell line cross-contamination is also a major concern, as the consequences often extend beyond a single plate, and threaten data integrity.

Biological contaminants are often introduced from supplies and instruments that are improperly sterilized, or during their storage and use. Many of these contaminants are also airborne, with people, laboratory equipment (such as freezers, centrifuges, and ovens), and animal care facilities serving as generators of vast numbers of particles and aerosols. Accidents such as inaccurate labelling or mishandling samples are the leading cause of cell line cross-contamination.

TAKING CONTROL

The foundation of a successful cell culture contamination management strategy consists of a thorough understanding of the nature of contamination, a contamination monitoring program, and each team member adhering to good housekeeping practices. Further, using antibiotics sparingly can help to prevent the development of resistant organisms, and strategic use of the cell repository can reduce the risk of cell line cross-contamination. Above all, adhering to good aseptic techniques is a simple, and effective way to reduce contamination and ensure accurate, reproducible outcomes.

The prospect of controlling so many different sources of contamination can be overwhelming and managing cell culture contamination requires a coordinated effort by all laboratory personnel. As such, implementing a robust contamination control strategy can be challenging for busy laboratory personnel. A reliable, reputable partner with the right expertise can help overcome these challenges and ensure the success of your cell culture applications.

WE'RE HERE TO HELP

Successful cell culture experiments begin with high quality supplies and consumables. These help to reduce the risk of contamination, and are essential for consistent, reliable and reproducible results. In addition to a large portfolio of high-quality cell culture supplies and consumables, Corning is your partner on the path to successful cell culture research. Offering scientific expertise and educational support, Corning helps you to design your contamination management program and overcome many of the challenges of cell culture research. We're here to be your partner, every step of the way.