Particle Identification

Introduction

Parenteral pharmaceutical products are required to be safe and efficacious. Health authorities have set regulations for the quality of parenteral preparations such as the requirement to characterize and control particulate matter. Particles in parenteral formulations can be categorized by size in submicron, subvisible and visible particles. Visible particles are mobile undissolved particles, other than gas bubbles, detected by the naked eye using a standardized procedure described in national pharmacopoeias. The US, European, and Japanese pharmacopeias have established requirements for the control of visible particles. Although the national requirements may slightly vary, the intent remains the same, limiting visible particles in parenteral products to ensure manufacturing process control and patient safety. Despite well-established health authority expectations and inspection procedures, visible particle incidents remain a primary cause for health authority audit observations and product recalls.

Therefore, a holistic strategy to characterize and control visible particles in parenteral drug products needs to be established by every pharmaceutical manufacturer. Such strategy comprises adequate product development and implementation of a visible particle control strategy. Of particular concern is the diligent design and qualification of the visible particle training kit, including selection of the size and type of visible particles in relation to the visible particle operator's capabilities. In an event of unexpected and unwanted visible particles, efficient detection and identification procedures are necessary to determine the nature and origin of particles.

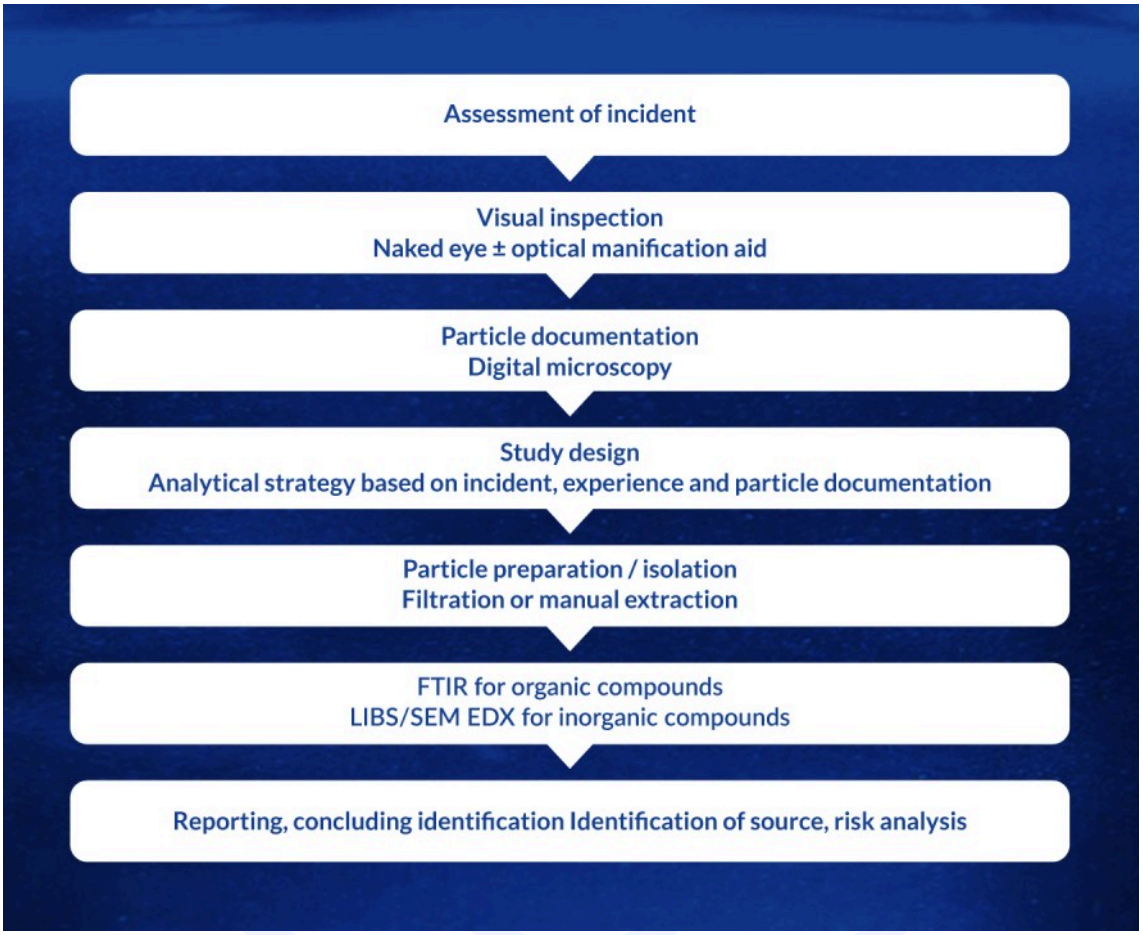
Particle identification can be challenging, as particles often consist of a mixture of different substances. For example, visible particles can be of proteinaceous nature, metals shedding from process equipment, polymers, particles originated from the primary packaging or fibers from process equipment or gowning material.

Analytical Toolbox

Analytical methods such as light microscopy, Fourier transform infrared spectroscopy (FTIR), laser microscopy coupled with laser induced breakdown spectroscopy (LIBS) or scanning electron microscopy coupled with energy dispersive X-ray microanalysis (SEM/EDX), have been the primary and proven methodologies to be effective for particle identification. RAMAN micro-spectroscopy has been applied in some cases as a secondary additional method for particle identification. These methods have been used in various fields such as forensics and geology. In the pharmaceutical industry, they are routinely used for the identification of contaminants in manufacturing facilities or when particles appear during analytical stability studies.

Typically, a combination of analytical methodologies is applied to ensure adequate documentation and identification of visible particles. In addition, an accurate sample preparation procedure is necessary to ensure successful isolation of visible particles and to avoid introducing contaminants during the preparation process.

The Clear Solutions Laboratories visible particle identification process



Selecting the right collaboration partner for visible particle identification and issue resolution in the pharmaceutical context requires several important considerations:

At Clear Solutions Laboratories, we have extensive experience in visible particle identification in pharmaceutical products. We have a deep understanding of the manufacturing process, process equipment, and product contacting materials, as well as knowledge of potential sources of environmental particles. Our expertise in particle morphology, size, and material evaluation enables us to assess the criticality and safety risks associated with different visible particles. Additionally, we have a sound understanding of pharmaceutical quality systems and deviation management, which is crucial for efficient issue resolution.

We understand that agility and speed are vital when dealing with unexpected visible particles during manufacturing or batch release and stability testing. Therefore, we offer fast and efficient particle identification services that can be finalized within 1-3 days, enabling timely issue resolution.
Lastly, we have a profound understanding of the expectations and requirements of health authorities and the global regulatory landscape. Our ability to provide expert guidance on compliance and documentation makes us an ideal collaboration partner for visible particle identification and issue resolution in the pharmaceutical context.

Summary

In conclusion, the pharmaceutical industry has a responsibility to manufacture high-quality therapeutic products. Regulations by health authorities exist to ensure the quality of parenteral solutions regarding visible particles. Efficient sample preparation procedures and identification analytical methodologies are necessary to determine the nature and origin of particles, and the combination of analytical techniques is of great interest but must be suitable for the samples to be analyzed. Finally, experience in visible particle issue resolution in the pharmaceutical context is required.