Vision ENGINEERING

Case Study

# WHY 4K DIGITAL MICROSCOPES ARE ESSENTIAL FOR MONITORING IPSC CELL CULTURES IN CANCER RESEARCH

At Clermont-Ferrand, the NEURO-DOL research unit (UMR Inserm UCA 1107) investigates the mechanisms of pain across multiple conditions.

Within its “Pain and Cancer” programme, the team focuses on chemotherapy-induced peripheral neuropathy (CIPN). To explore this, researchers use human induced pluripotent stem cells (iPSCs) differentiated into sensory neurons. These human models build on earlier work in rodents and provide new insight into how anticancer treatments alter sensory pathways. To succeed, the lab needed a way to monitor delicate cultures in a biosafety cabinet with precision, speed and minimal disruption.

## The Challenge: Monitoring iPSC cultures inside biosafety cabinets

iPSC colonies require daily visual checks to maintain quality and track neuronal differentiation. Observations must be performed under strict level 2 biosafety conditions, where space is limited and workflow must remain efficient. Traditional monitoring methods risk disturbing the cultures or failing to capture subtle morphological changes. The lab required a digital microscope with 4K resolution that could provide real-time imaging and accurate documentation in a confined environment.

## The Solution: Makrolite 4K digital microscope

Makrolite 4K digital microscope from Vision Engineering was installed directly inside the biosafety cabinet. This gave researchers a reliable way to monitor iPSC colonies in high resolution, assessing morphology, health and progression without staining or handling the cells. Once differentiation protocols began, Makrolite 4K supported efficient daily checks, ensuring any anomalies or unwanted changes were detected at the earliest stage.

**Key Benefits of 4K digital microscopes in cell culture monitoring:**

- 4K resolution for detailed observation of colony morphology and health
- Real-time visualisation without staining or manipulation, preserving sample integrity
- High-quality documentation with 4K images suitable for publications, reports and traceability
- Compact format designed to fit within level 2 biosafety cabinets
- Enhanced contrast options with black/white baseplates, helping to identify small cell clusters

## The Outcome: Improved accuracy and reliability

By using Makrolite 4K, the NEURO-DOL team significantly improved its ability to track the development of human iPSC-derived neurons. Researchers gained faster insights, clearer experimental records, and more reliable monitoring of delicate cultures. The system became a core part of their translational research into cancer-related pain, enabling more confident decisions in their daily work.

*For NEURO-DOL, 4K digital imaging became a core element of translational research into cancer-related pain.*

## Vision Engineering's solution for 4K digital imaging in life sciences

While Makrolite 4K played an important role in this research, Vision Engineering now offers the EVO Cam HALO as its next-generation solution. HALO combines 4K resolution, real-time screen-based viewing, intelligent lens mounts, and clip-on lighting in a compact design suited to biosafety cabinets. For life science laboratories working with iPSCs or other sensitive cultures, EVO Cam HALO delivers the clarity, flexibility and reliability required for accurate monitoring and documentation.

## Frequently Asked Questions

**Q: What is the advantage of using a 4K digital microscope in cell culture work?**

4K resolution delivers detailed images that reveal subtle changes in colony morphology, supporting faster, more confident decisions and reducing the risk of missed early signs.

**Q: Can a 4K digital microscope be used inside a biosafety cabinet or laminar flow cabinet?**

Yes. Compact systems like EVO Cam HALO fit inside Class II biosafety cabinets (user and sample protection) and laminar flow cabinets (sample-only protection), providing clear, non-invasive monitoring in real time.

**Q: How does a digital microscope improve documentation in life science labs?**

They capture 4K images and video that can be archived, shared or used in publications, improving traceability and creating a visual record of experimental progress.

**Q: What is the difference between Makrolite 4K and EVO Cam HALO?**

Makrolite 4K has been widely used for lab monitoring. EVO Cam HALO is the next-generation system, adding intelligent lens mounts, clip-on lighting and more flexible illumination options.

**Q: Where else is EVO Cam HALO solving problems beyond cell culture research?**

HALO is used in electronics (soldering checks), medical devices (implant and tool inspection), aerospace and automotive (surface and contamination checks), plus plastics, seed research and manufacturing for real-time quality control.