

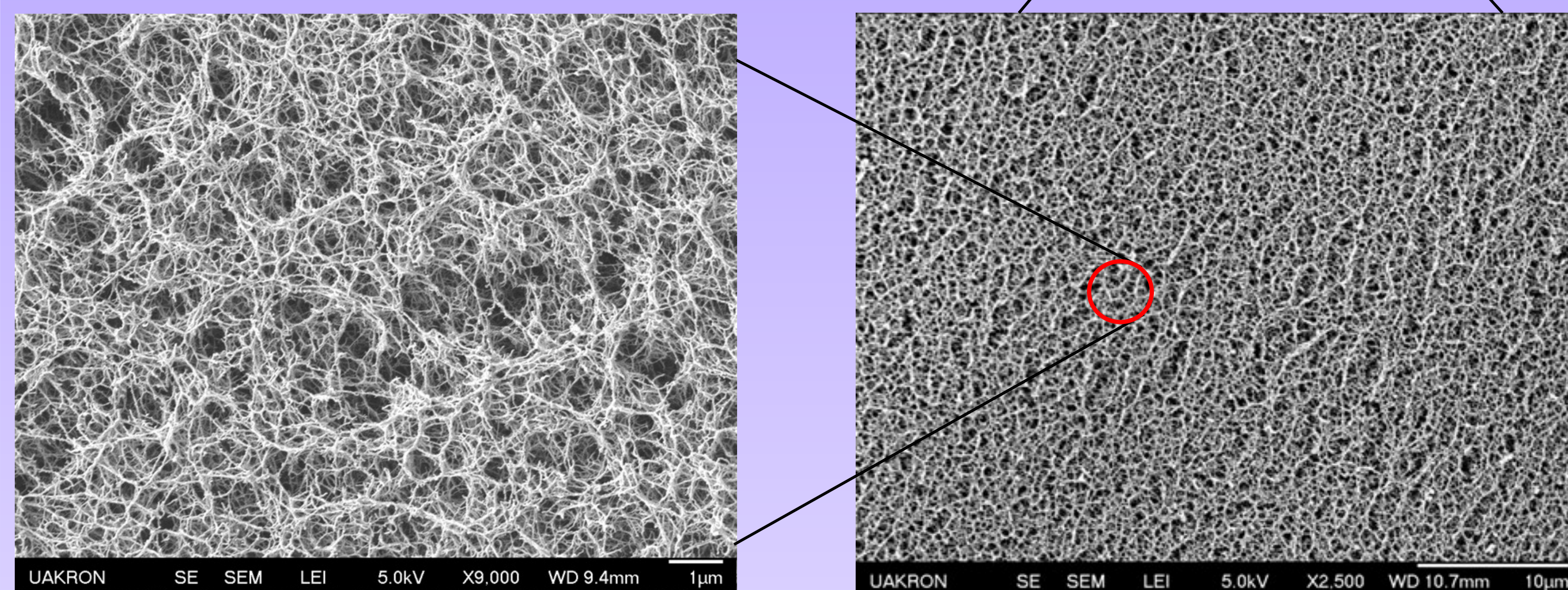
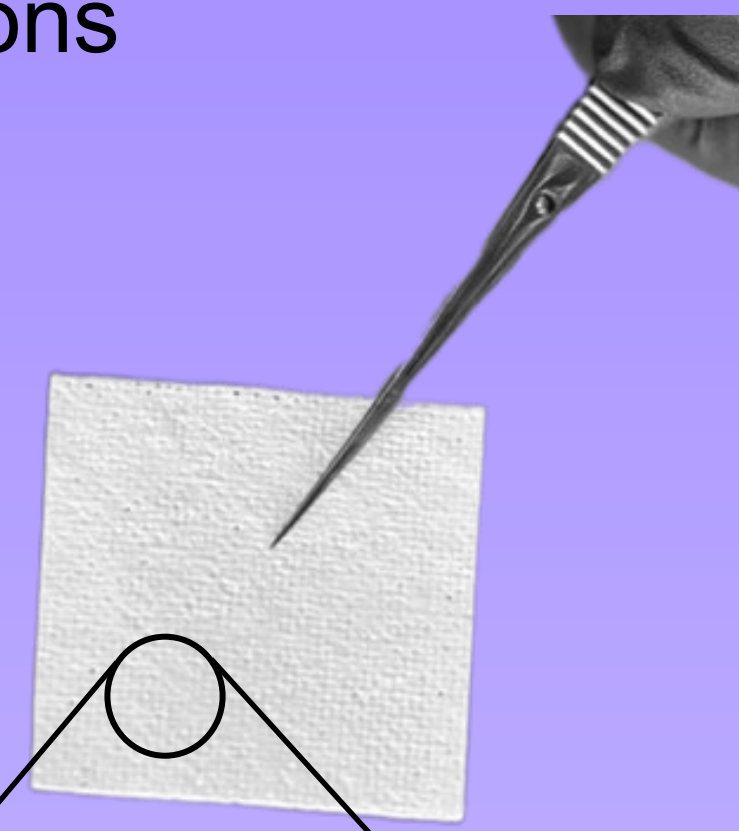


Bio-Aerogel Dressing with Functional Architecture

MATERIAL ARCHITECTURE

Porous aerogel platform for wound healing applications

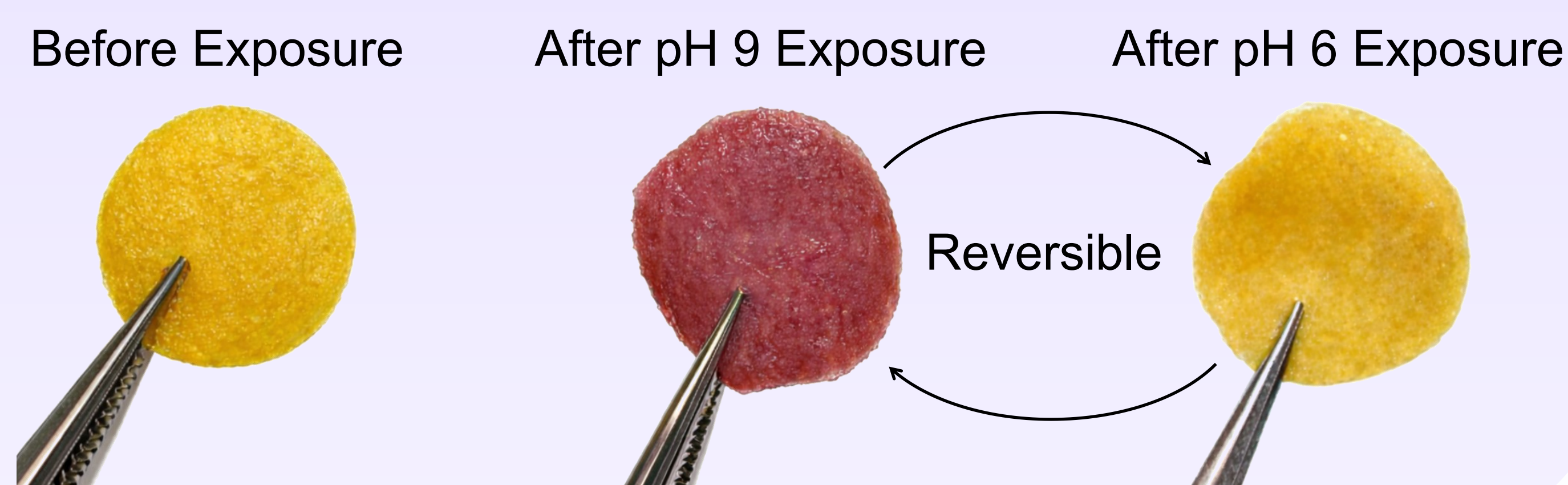
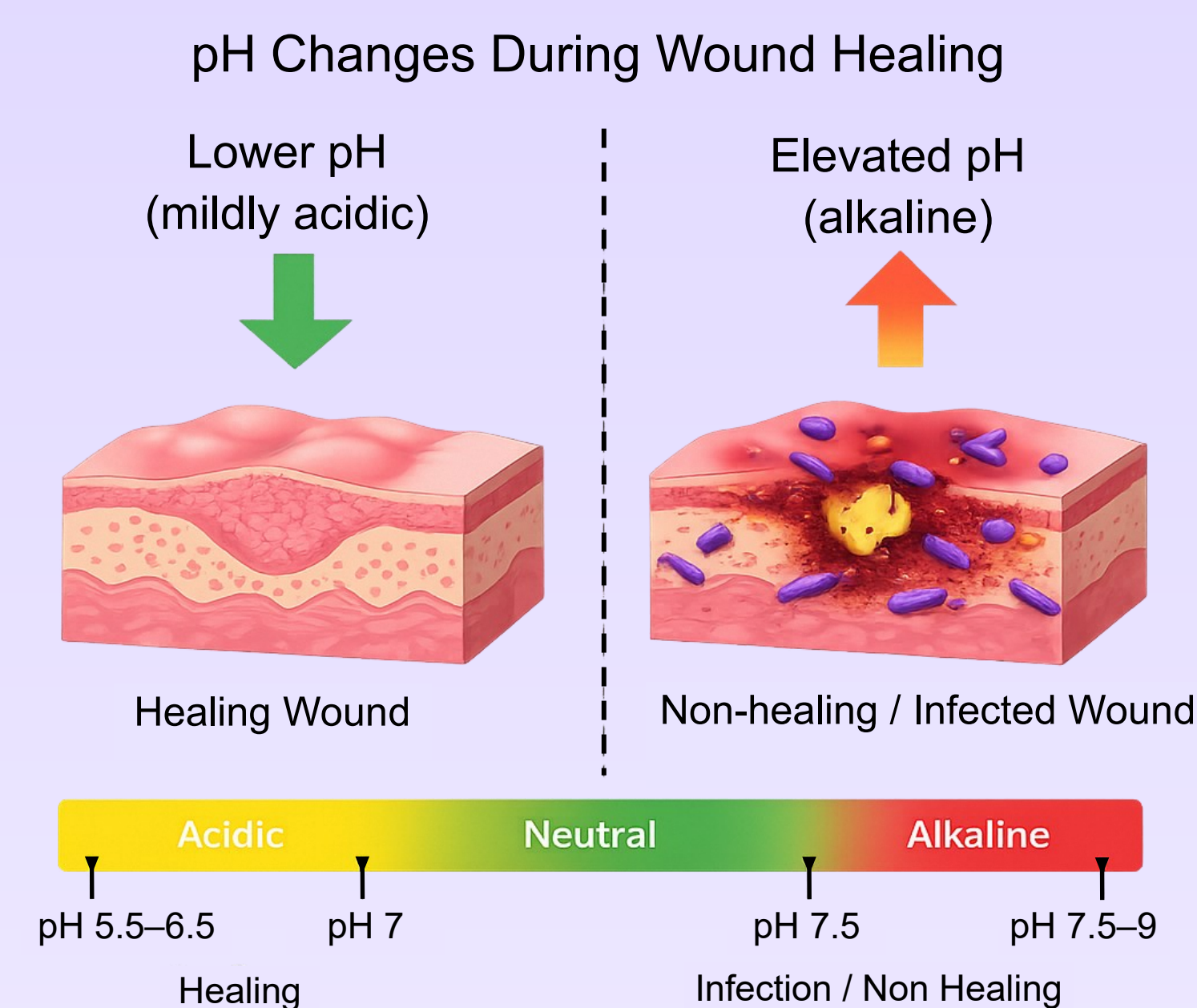
- ◆ High surface area with >90% air and 3D structure
- ◆ Lightweight, flexible, and structurally stable
- ◆ Efficient oxygen exchange
- ◆ Enhanced cell attachment and infiltration
- ◆ Limited surface area for bacterial adhesion
- ◆ Reduced potential for biofilm formation



SMART WOUND MONITORING

Bio-aerogel dressing enables detection of wound healing status

- ◆ Clear pH-dependent color change
- ◆ Reversible color switching enables visual monitoring of dynamic wound pH

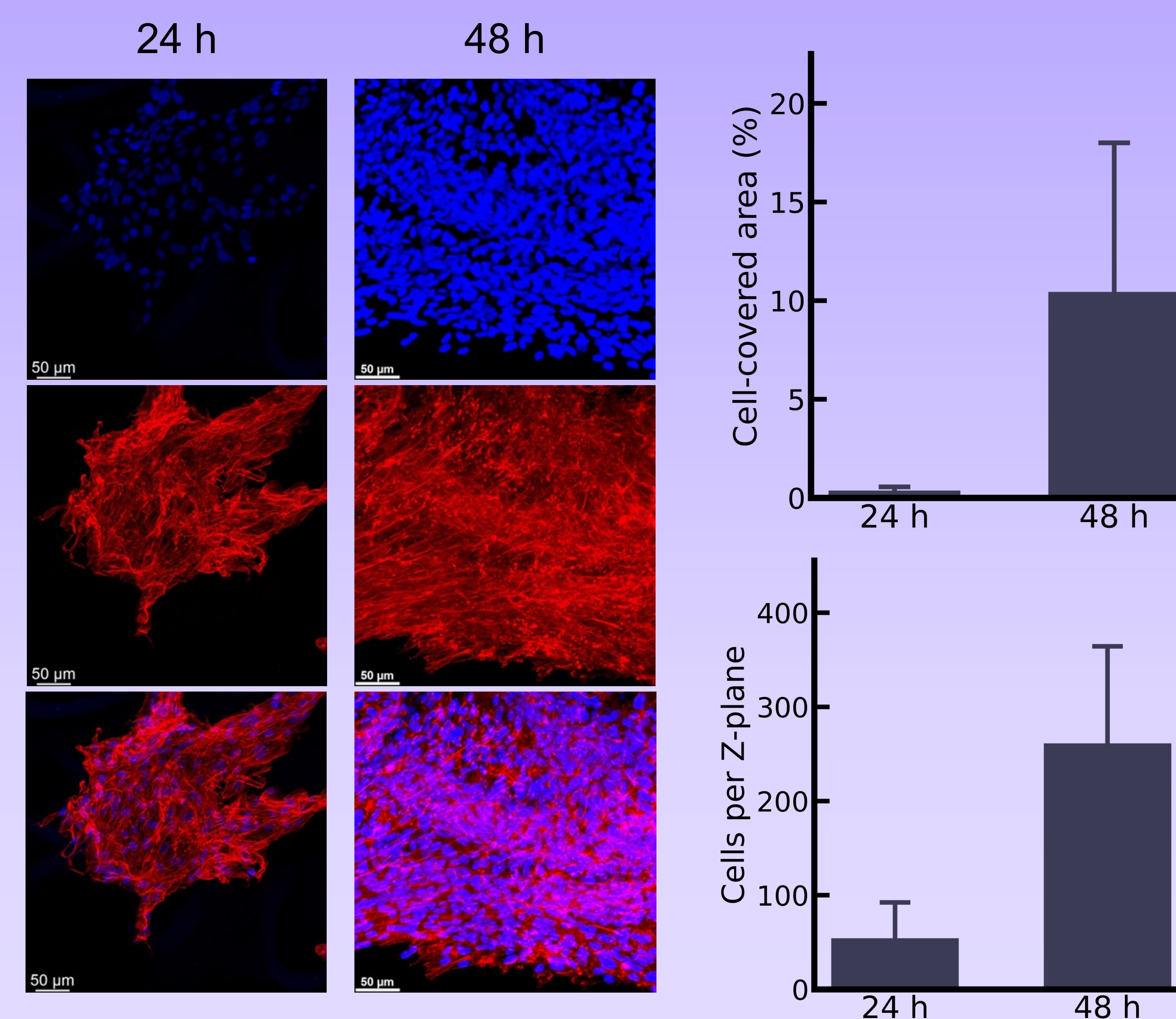


Promotes Cell Attachment and Proliferation

CELL ATTACHMENT

Bio-aerogel dressing supports fibroblast attachment and proliferation

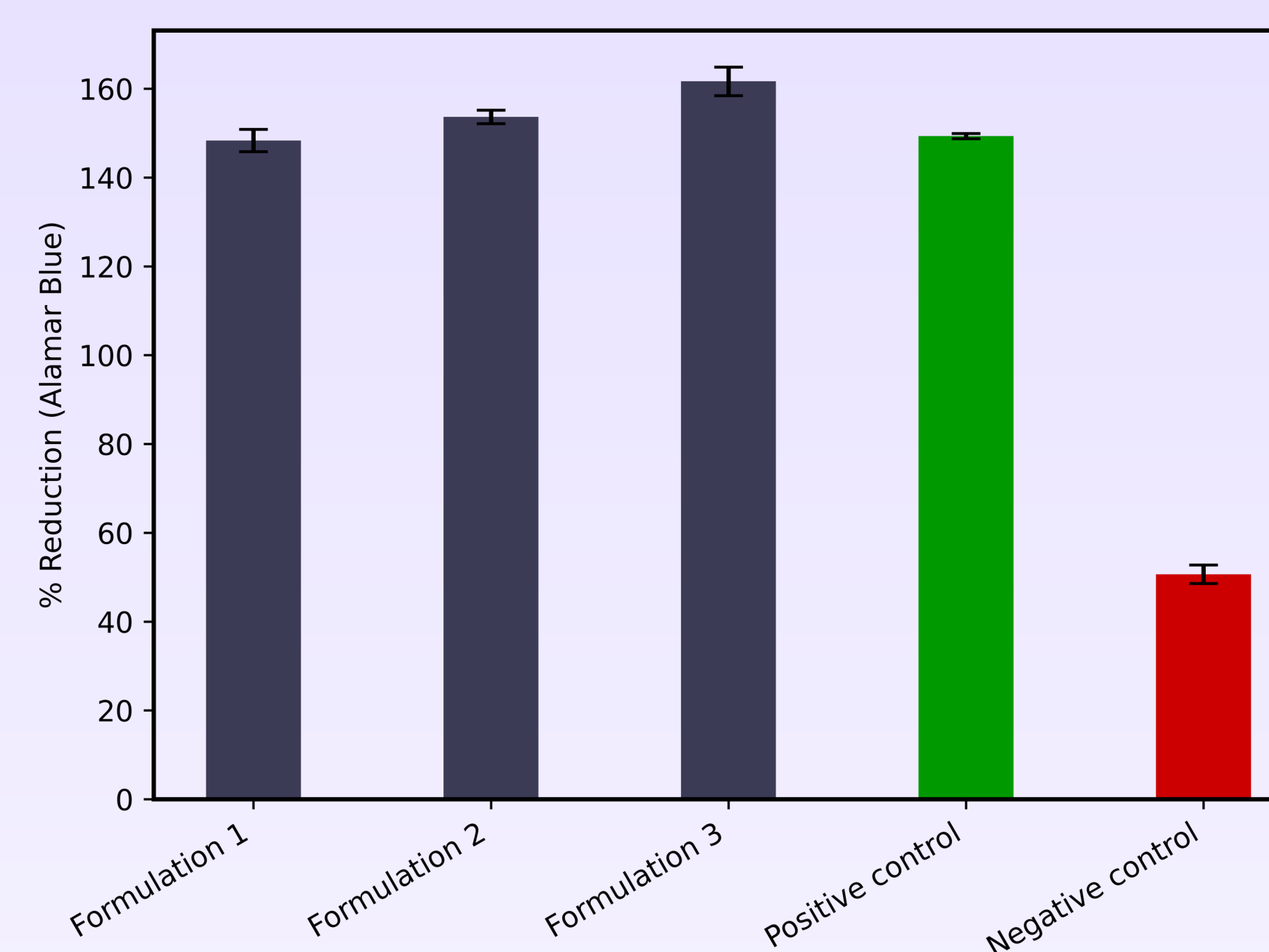
- ◆ Biocompatible scaffold enabling fibroblast attachment
- ◆ Time-dependent increase in cell density (24 h → 48 h)
- ◆ Increased cell spreading and surface coverage
- ◆ Evidence of 3D cellular integration within the scaffold



CELL VIABILITY

Bio-aerogel dressing supports fibroblast metabolic activity

- ◆ High fibroblast metabolic activity across all aerogel formulations
- ◆ No cytotoxic effects observed (comparable to positive control)

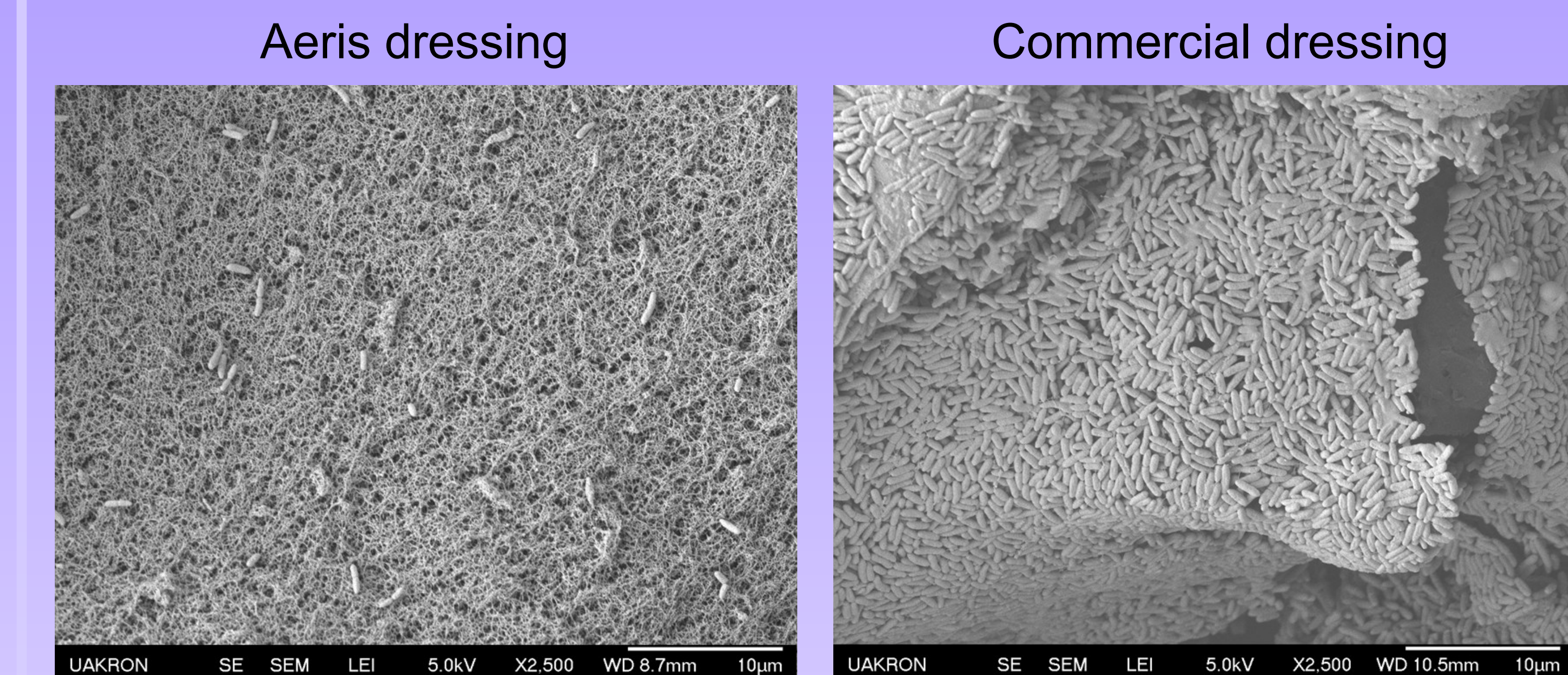


Prevents Bacterial Adhesion and Biofilm

BACTERIAL ADHESION

Bio-aerogel dressing prevents bacterial adhesion

- ◆ Surface chemistry and structure limit bacterial attachment
- ◆ 81% fewer attached bacteria vs. commercial dressing
- ◆ Reduced risk of early biofilm formation



BACTERIAL VIABILITY

Bio-aerogel dressing reduces bacterial viability

- ◆ Extremely limited bacterial coverage (~4%) vs ~88% on commercial dressing
- ◆ Reduced bacterial viability compared to commercial control

