

Validation of a Temperature Controlled Airflow Ventilation System

The article "Validation of a Temperature Controlled Airflow Ventilation System" (ASHRAE Journal, June 2025, [ashrae.org](https://www.ashrae.org)) presents a study validating the efficacy of temperature controlled airflow (TcAF) systems in minimizing airborne contamination both inside and outside the sterile field in operating rooms through dynamic, real-world testing.^[1]

Article Overview

Authored by Jennifer Wagner, Ph.D., Kathy Warye, and Damon Greeley, P.E., this technical feature investigates the performance of a TcAF ventilation system, which utilizes temperature gradients to deliver cooler air over the sterile field and warmer air to the room periphery. The study employs the Environmental Quality Indicator (EQI) method during scripted mock procedures and live orthopedic surgeries, measuring key variables such as microbial and particle counts, air velocity, temperature, humidity, and carbon dioxide clearance.^[1]

Key Findings

- The TcAF system effectively maintained **ultraclean conditions** (less than 10 CFU/m³) both within the sterile field and at the periphery of the operating room during procedures, meeting or exceeding rigorous European ultraclean standards.^[1]
- Measurements showed significantly fewer airborne microbes, cooler temperature, and optimized air movement within the TcAF footprint compared to zones outside the sterile area, supporting the system's design principle of moving contamination away from critical zones toward air returns.^[1]
- Using CO₂ as a controlled tracer contaminant, the study demonstrated the TcAF system's ability to rapidly clear airborne substances from the sterile field area.^[1]

Conclusion

This research demonstrates that temperature-controlled airflow ventilation successfully provides a consistently ultraclean environment not only at the surgical site but also where surgical instruments and implants are staged, highlighting the potential for broader adoption in operating room settings. To explore the full article and supporting references, visit the ASHRAE Journal at [ashrae.org](https://www.ashrae.org).^[1]