

STATISTICALLY SIGNIFICANT IMPROVEMENTS IN CLINICAL OUTCOMES USING ENGINEERED MOLECULAR MEDIA AND GENOMICALLY MODELED ULTRAVIOLET LIGHT FOR COMPREHENSIVE CONTROL OF AMBIENT AIR (AA) QUALITY

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Objective: Successful preimplantation embryogenesis is critically dependent upon the culture environment and changing organic chemistry of the AA within the IVF laboratory. AA contains dynamic levels of embryotoxic viable particulates and volatile organic compounds which play a critical role in preimplantation toxicology. Our retrospective analysis examined the impact of comprehensive control of airborne pathogens on measures of embryogenesis in multiple IVF programs using a proprietary air purification system (Aire~IVF®) designed specifically to protect the human embryo.

Design: Retrospective analysis of AA and clinical outcome data.

Materials and Methods: Clinical outcome data from all non-donor IVF patients (n = 1245) cycling through 3 independent IVF programs were evaluated over a 24-month period. Data were collected for 692 patients cycling in an environment protected by existing means of air filtration and 553 patients after the installation of Aire~IVF® (LifeAire Systems). Blastocyst conversion rate (BCR) was defined by zygotes reaching the blastocyst stage by Day 5, clinical pregnancy rate (CPR) by an intrauterine gestational sac, ongoing pregnancy (OP) by positive fetal cardiac activity and loss rate (LR) as positive CPR without subsequent fetal cardiac activity. Statistical analyses included odds ratios calculated with 95% confidence intervals and $\alpha = 0.05$ using MedCalc Software 13.1.2, Ostend, Belgium.

Results: Patients whose embryos were cultured after installation of the Aire~IVF system demonstrated a significant increase in BCR (27.6% vs. 46.3% [p=0.001]), implantation rate (IR) (26.4% vs. 40.6%, [p=0.001]), CPR (57.1% vs. 67.6% [p=0.001]), and OP (36.4% vs. 51.2% [p=0.001]) for pre-Aire~IVF and post-Aire~IVF rates, respectively. The mean number of embryos transferred decreased from 2.39 to 2.08 post-Aire~IVF installation (p=0.053). Patients whose embryos were cultured in an Aire~IVF environment demonstrated a significant decrease in LR (36.2% vs. 24.3%, [p=0.001]).

Conclusions: Concomitant with an *in vitro* culture environment protected by the Aire~IVF system was a statistically significant increase in BCR, IR, CPR, OP and a decrease in LR. Removal of airborne pathogens and comprehensive control of the AA serving the *in vitro* culture environment is critical to successful preimplantation embryogenesis and clinical outcomes.

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