



## Improving Process Understanding of an IVF Cell Culture Incubator via Response Surface Methodology

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Infertility affects approximately 15% of couples worldwide. Evolving from the early success of clinical in vitro fertilization in 1978, methods for preimplantation embryo culture have undergone dramatic changes. During the early years of basic IVF research, a culture method was developed that used microdrops of medium (~ 50 microliters) which were covered with oil to prevent evaporation. At that time, all cell culture incubators used a system to humidify the chamber, as all other cell culture systems did not utilize oil to cover the medium. A more recent change in incubator design has included the use of time lapse imaging systems. These incubators were designed to be used without added humidification. It was assumed that, due to the use of mineral oil covering the medium, added humidity would not be necessary. However, over the past few years, studies have shown that medium osmolality increases over time in a non-humidified system at a rate that is of concern to the successful culture of preimplantation embryos.

Several variables have been shown, independently, to contribute to the rate of osmolality increase under such settings. However, until the present study, no thorough, robust study was executed to determine the interactive nature of several of these variables. The present study used a multifactor response surface design executed with Design-Expert software to assess this interaction and determine how the three variables of oil density, oil thickness, and medium surface area-to-volume ratio contribute to this phenomenon. This presentation will discuss the design, execution, and resulting model from this study. The results can guide embryologists to making improvements in their current methods for culturing preimplantation embryos.