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A low lactate undisturbed culture medium protocol provides an increase in usable blastocysts on day 5 vs. day 6

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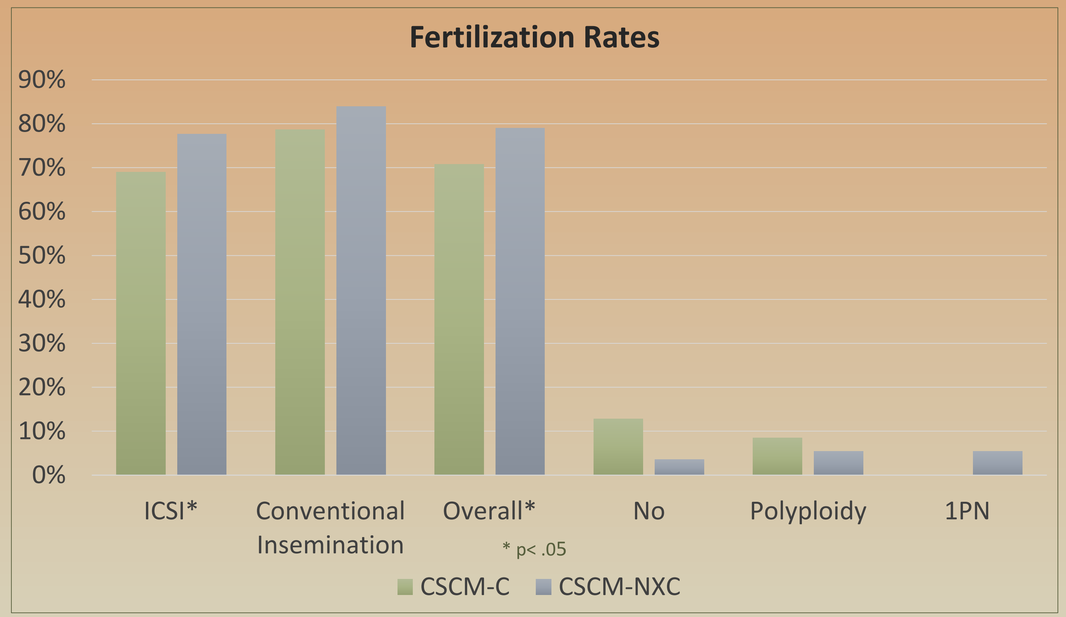
Introduction

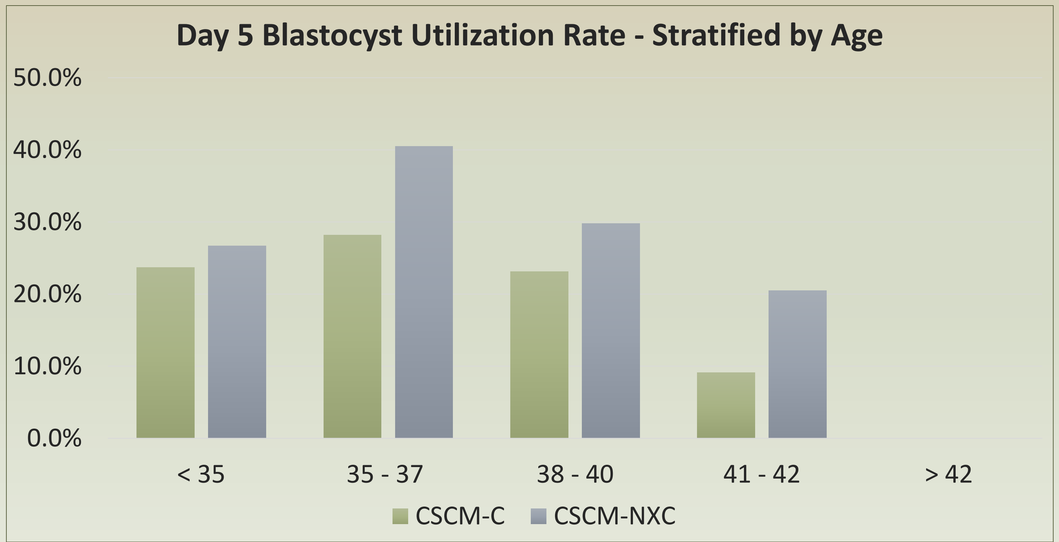
Previous studies have shown that blastocyst utilization and normal embryo ploidy are more significant when a low lactate (1mM) culture medium is utilized in the laboratory compared to higher lactate (5-10mM) concentrations. It is presumed that a lactate gradient (from high to low) provides a more optimal embryo growth environment; However, it can be debated that lower lactate concentrations are more physiological and less disruptive to embryo metabolism, particularly at the blastocyst stage.

Study Design and Methods

From January through March 2020, a split sibling oocyte study was performed on 50 patient cycles, each with a minimum of 9 oocytes retrieved. Oocytes were divided between low-lactate Continuous Single Culture Medium-NX and the laboratory's current culture system of higher lactate Continuous Single Culture Medium following aspiration, thus resulting in 276 oocytes and 257 oocytes, respectively. The resulting zygotes were subsequently cultured from fertilization events to the blastocyst stage in their corresponding medium.

The study was undertaken in a private IVF laboratory. No consideration was given to the patient age, stimulation protocol, or diagnosis indication. Comparative parameters for analysis included fertilization success and usable blastocysts through day 6 culture. Usable blastocysts were defined as any blastocyst transferred in a fresh cycle, or vitrified for future use. The denominator for such determination was the total normal 2PNs at fertilization check.





Main Results

Our data demonstrates the potential advantages of culturing embryos in an undisturbed culture medium with a 1mM lactate concentration as opposed to a more traditional, higher lactate concentration. The overall blastocyst utilization rate (BUR) on day 5 was 27% in low lactate vs. 20% in high lactate and 12% vs 15% for day 6, thus resulting in more usable blastocysts on day 5, as well as overall, in low lactate culture. When stratified by patient age, embryos cultured in low lactate showed an increase in BUR on day 5 across all age groups. In patients 35-37 years old, a 13% increase in usable blastocysts on day 5 was observed, followed by patients 41-42 which had a 12% BUR increase in low lactate versus higher lactate. 38-40 year olds had a 7% increase in low lactate and <35 increased by 3% on day 5. Interestingly, our data also shows a significant increase in normal fertilization outcomes, both by ICSI and overall with conventional insemination, in low lactate vs higher lactate (79% vs 71% respectively at $p<0.05$).

Limitations

Need for increased n to determine significance along with further studies to understand the metabolic pathways which lead to earlier blastocyst development on day 5 vs. day 6. Additionally, there needs to be more investigative studies into the role a lower lactate concentration plays in normal fertilization outcome improvement.

Wider Implications

A low lactate culture medium supports an increase in the availability of usable blastocysts on day 5. This finding can improve laboratory workflow efficiency through patient scheduling for fresh day 5 embryo transfers as well as allocate resources to accommodate more embryo vitrification on the 5th day of embryo culture.