



ONE-MINUTE ULTRARAPID EMBRYO WARMING: VALIDATION AND CLINICAL OUTCOMES IN FROZEN EMBRYO TRANSFERS

Patel, Krutibahen ¹, Khoury, Ghina ¹, Vasquez, Mirella ¹, Shrestha, Reena ¹, Khoury, Charlotte ¹

¹ HRC Fertility, Newport Beach, CA, USA 92660

Introduction

- Embryo vitrification is the standard of care in assisted reproductive technology (ART).
- Conventional blastocyst warming protocols are multi-step and time-dependent taking up to 13 minutes.
- Simplifying the warming process without compromising embryo viability or clinical outcomes could significantly improve laboratory efficiency and standardization.
- We assessed a 1-minute ultra rapid blastocyst warming protocol as a potential streamlined alternative to the conventional 13-minute method.

Objective

- To validate a simplified 1-minute blastocyst warming protocol using aneuploid embryos.
- To compare post-warming survival and clinical pregnancy rates (CPR) with a matched cohort using the conventional 13-minute protocol.

Materials and Methods

Validation Phase

- Samples:** 180 aneuploid blastocysts donated for research
- Protocol:** 1-minute ultra rapid warming of embryos in thawing solution (TS) followed by standard post-warming culture
- Assessment:**
 - Immediate post-warming survival
 - Developmental progression over 24 hours

Clinical Implementation (March–August 2025)

- Study Group:**
 - 354 FET patients
 - 407 embryos warmed using 1-minute protocol
- Historical Control (March–August 2024):**
 - 323 FET patients
 - 370 embryos warmed using conventional 13-minute protocol
- Primary Outcomes:**
 - Post-warming survival
 - Clinical pregnancy rate (CPR)

Results

Validation Phase

Embryo survival: **179/180 embryos (99.4%)**

Development: Normal re-expansion and progression to hatching observed within 24 hours

Clinical Phase (FET cycles):

Warming Protocol	Embryos Survived	Clinical Pregnancy Rate (CPR)
Conventional warming (2024)	370/370 (100%)	223/323 (69.0%)
Rapid warming (2025)	402/407 (98.8%)	239/354 (67.5%)
p-value	0.06	0.72

Conclusion

- The 1-minute ultra rapid blastocyst warming protocol demonstrated equivalent embryo survival and clinical pregnancy outcomes compared to the conventional 13-minute method.
- Validation using aneuploid embryos confirmed safety and preserved developmental competence.
- This protocol reduces warming time by over 90% while maintaining clinical integrity, supporting its adoption as a streamlined alternative in routine IVF practice.

References

- Martinez-Rodero, I., et al., *shorter protocols for vitrification and post-warming dilution of human oocytes and embryos: a narrative review*. Reproductive BioMedicine Online, 2025. **51** (2): p.104857.
- Parmegiani, L., et al., *Universal post-warming dilution of vitrified embryos: impact of different vitrification/warming kits, warming volume and rapid dilution/rehydration steps on survival and clinical outcomes*. Reproductive BioMedicine Online, 2025. **51**(3): p.104923.

Acknowledgement

- The authors thank the embryology laboratory team for their technical expertise and commitment to quality assurance.
- The authors declare no conflicts of interest.