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EmbryoGlue™ as a Post-Thaw Culture Medium for Vitrified Oocytes: Improved Blastocyst Yield without Compromising Fertilization

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ABSTRACT

Background: EmbryoGlue™, a hyaluronan-enriched embryo transfer medium, may promote embryonic development through improved cell–matrix interaction. Its utility in the immediate post-thaw period for vitrified oocytes has not been thoroughly investigated.

Objective: To evaluate the impact of EmbryoGlue on oocyte survival, fertilization, and blastocyst formation when used as a post-thaw culture medium before ICSI.

Methods: This retrospective analysis included 500 vitrified oocytes thawed using either Irvine (n=200) or Kitazato (n=300) protocols. Within each group, oocytes were randomly assigned to post-thaw culture in either EmbryoGlue™ or Global® Total HP medium prior to ICSI. Fertilization and blastocyst development were compared across groups.

Results: Fertilization rates were similar in all groups (92.0–92.6%). Blastocyst formation rates were higher with EmbryoGlue compared to HP in both platforms: 59.3% vs 45.9% (Irvine, p=0.076) and 66.9% vs 50.8% (Kitazato, p=0.008). When pooled, EmbryoGlue conferred a 15.3 percentage-point increase in blastocyst yield (p=0.001). Degeneration rates were slightly lower with Kitazato, but unaffected by post-thaw medium.

Conclusion: EmbryoGlue™, when used as a short-term post-thaw culture medium, enhances blastocyst development following oocyte vitrification. Its use may be beneficial in clinical oocyte banking protocols to improve embryo yield.

Keywords: EmbryoGlue; Oocyte Vitrification; Post-Thaw Culture; ICSI; Blastocyst Development; Hyaluronan

Abbreviations: ART: Assisted Reproductive Technology

Introduction

Oocyte vitrification has become a cornerstone of assisted reproductive technology (ART), enabling fertility preservation and donor egg programs worldwide. Despite advances in cryopreservation, post-thaw oocyte competence remains a critical determinant of downstream outcomes, particularly blastocyst development and utilization. Hyaluronan, a glycosaminoglycan naturally present in the oviduct and uterus, has been proposed as a supportive additive in ART media. EmbryoGlue™, a commercially available embryo transfer medium enriched with hyaluronan, has demonstrated benefits in improving implantation and live birth rates when used at embryo transfer. However, its role in the earlier stages of post-thaw oocyte handling has not been systematically investigated. We hypothesized that exposing thawed oocytes to EmbryoGlue immediately before ICSI could improve embryonic competence by reducing stress and en-

hancing cell–matrix interactions. This study aimed to evaluate the effects of EmbryoGlue compared to standard Global® Total HP medium on oocyte survival, fertilization, and blastocyst yield after vitrification and warming.

Materials and Methods

Study Design

This was a retrospective cohort analysis conducted at a single IVF center between [insert years]. A total of 500 vitrified oocytes were included.

Ethics

This study was approved by the Institutional Review Board of [institution]. Written informed consent for clinical use of vitrified oocytes was obtained, and anonymized laboratory data were analyzed.

Oocyte Source and Vitrification Protocols

Two vitrification platforms were evaluated – Irvine Scientific system (200 oocytes) and Kitazato Cryotop system (300 oocytes).

Post-Thaw Culture Assignment

Within each platform, warmed oocytes were randomly assigned in equal proportions to post-thaw culture in either EmbryoGlue™ (Vitrolife, Sweden) or Global® Total HP (CooperSurgical, USA). Oocytes were cultured for 2–3 hours in the assigned medium prior to ICSI.

ICSI and Embryo Culture

ICSI was performed by a single senior embryologist using standardized protocols. Injected oocytes were cultured in Global® medium supplemented with appropriate oil overlay under tri-gas incubation.

Outcomes

Primary outcome – blastocyst utilization rate (usable blastocysts on Days 5–7 ÷ oocytes injected). Secondary outcomes – oocyte degeneration at warming, degeneration before ICSI, and normal fertilization rate (2PN zygotes ÷ oocytes injected).

Statistical Analysis

Pearson's χ^2 test was used for categorical comparisons; Fisher's exact test when expected counts <5. Absolute risk differences with 95% CI were calculated. Analyses were performed in R v4.3.0. Two-tailed $p < 0.05$ considered statistically significant.

Results

Oocyte Survival

500 oocytes were thawed. Immediate degeneration was lower in the Kitazato cohort (3.4%) than Irvine (5.5%) (p=0.26). Post-warming degeneration before ICSI was <2.5% in all groups and unaffected by post-thaw medium.

Fertilization

Normal fertilization rates were uniformly high (92.0–92.6%) across all groups, with no significant effect of post-thaw medium.

Blastocyst Development

EmbryoGlue significantly increased blastocyst utilization compared with Global HP:

- Irvine cohort – 59.3% vs 45.9% (absolute gain = 13.4 pp; p=0.076)
- Kitazato cohort – 66.9% vs 50.8% (gain = 16.1 pp; p=0.008)
- Pooled data – 64.2% (EmbryoGlue) vs 48.9% (HP); gain = 15.3 pp (p=0.001)

Summary

EmbryoGlue conferred a consistent improvement in blastocyst utilization across both vitrification systems, without adversely affecting fertilization or survival. Table 1 shows fertilization rates, blastocyst development, and degeneration at warming across groups. EmbryoGlue groups consistently outperformed HP controls, particularly in blastocyst yield (Figures 1-3).

Table 1: Summary of Oocyte Outcomes by Group.

Group	Oocytes Injected	Fertilization Rate (%)	Blastocyst Rate (%)	Degeneration at Warming (%)
Irvine + EmbryoGlue	100	92.2	59.3	5.5
Irvine + HP	100	92.0	45.9	5.5
Kitazato + EmbryoGlue	150	92.6	66.9	3.4
Kitazato + HP	150	92.2	50.8	3.4

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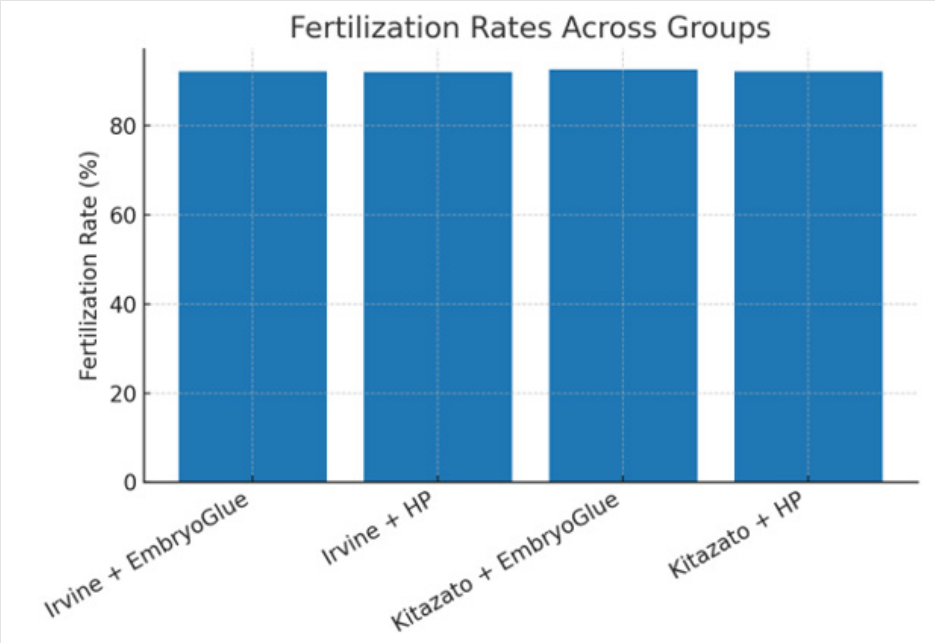

Figure 1: Fertilization Rates Across Groups.

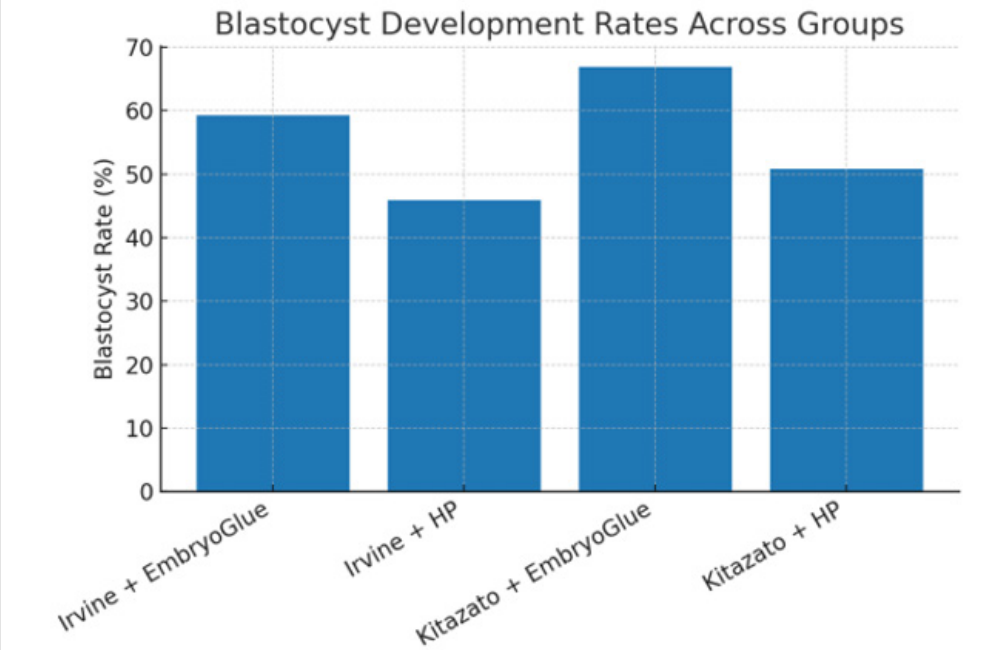

Figure 2: Blastocyst Development Rates Across Groups.

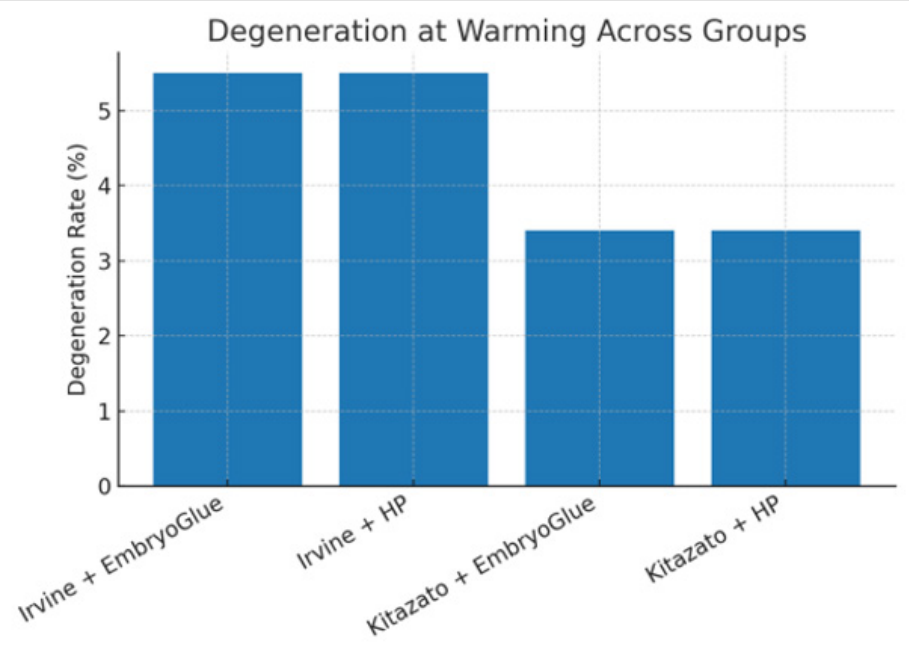

Figure 3: Degeneration at Warming Across Groups.

Discussion

This study provides evidence that EmbryoGlue™, when used briefly after warming vitrified oocytes, enhances blastocyst yield without compromising fertilization efficiency. The observed benefit was particularly pronounced in the Kitazato cohort, consistent with its reputation for superior oocyte cryosurvival. The potential mechanisms underlying this effect include hyaluronan-mediated enhancement of cell adhesion, stabilization of the zona pellucida, and reduction of oxidative stress during the vulnerable post-thaw period. These biological processes may translate into improved compaction and blastulation, as observed in our data.

Our findings align with prior literature showing benefits of hyaluronan-enriched media in embryo transfer settings, but extend the application of this compound to the pre-fertilization stage. Limitations include the retrospective design, absence of randomization at the patient level, and lack of clinical pregnancy or live birth outcomes. Prospective randomized controlled trials are warranted to validate these results and assess clinical impact [1-5].

Conclusion

EmbryoGlue™, when applied as a short-term post-thaw culture medium, significantly improves blastocyst development from vitrified oocytes. Its incorporation into clinical oocyte banking and fertility preservation workflows may maximize embryo yield and improve ART outcomes.

Acknowledgments

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Conflict of Interest Statement

The authors declare no conflict of interest.

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