# BLASTULATION DAY IS MORE PREDICTIVE OF LIVE BIRTH THAN MORPHOLOGIC GRADE IN SINGLE FROZEN EMBRYO TRANSFERS, REGARDLESS OF AGE OR PGT-A TESTING

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## BACKGROUND

- With the prevailing use of single embryo transfers, **embryo selection** is critical for **optimizing outcomes** and **minimizing time to pregnancy**.
- **Blastulation time** and **morphologic grade** are the main factors considered in embryo selection, but their **relative utilities in predicting live birth is not well understood**.
- This evidence gap becomes apparent when selecting between **embryos with discordant prognoses based on day of freeze vs. morphologic grade** (e.g. Day 6 AA vs. Day 5 BB).

## OBJECTIVE

Compare the effects of **blastulation day** (day of freeze) and **embryo morphology** on **live birth** after **single frozen embryo transfer (FET).**

## METHODS

- **Retrospective analysis** of **autologous single FET cycles** across a large fertility network, **2010-2023**.
- Primary outcome was **live birth**. **Generalized Estimating Equations (GEE)** were used to fit a **Poisson regression model** with **age** at retrieval, **day of freeze** (D5, D6, D7), and **simplified SART morphology** (Good, Fair, Poor).
- **Patient-level observation clustering** was used account for **multiple transfers per patient**.
- **Stratified analysis** was performed for **untested embryos** and **PGT-A-tested embryos**, and for **age < 35** and **≥ 35 at time of oocyte retrieval.**

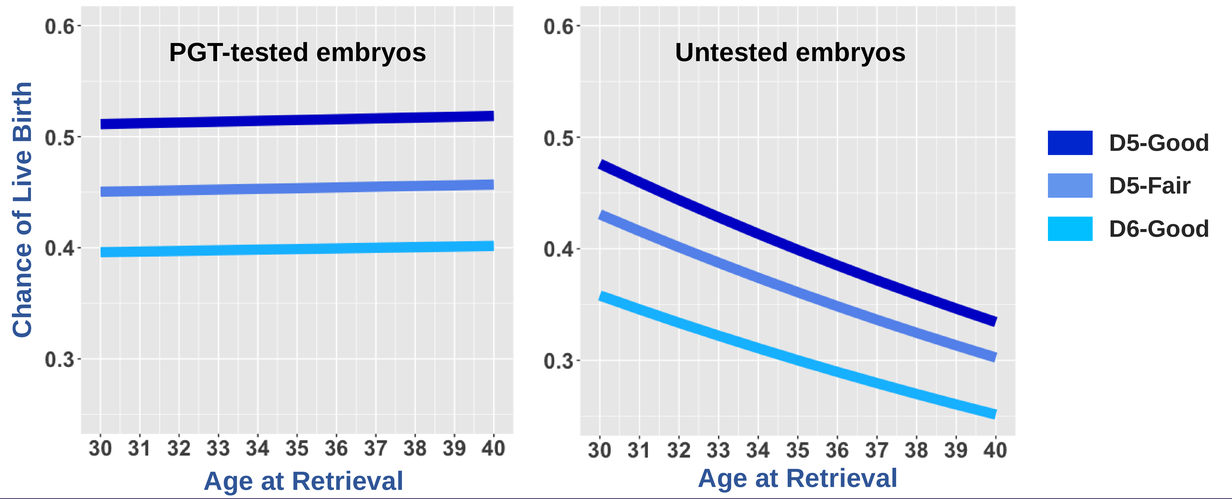
## RESULTS

**Table: Poisson Regression Analysis: Relative Risk of Live Birth by Age, Day of Freeze, and Embryo Morphology**

| | **All Cycles** (n = 67,037) | **Untested** (n = 26,201) | **PGT-tested** (n = 40,836) | **Age < 35** (n = 34,352) | **Age ≥ 35** (n = 32,685) |
|---|---|---|---|---|---|
| Age (y) | 0.997 (0.994 - 0.999) | 0.965 (0.961 - 0.969) | *1.001 (0.998 - 1.005)* | *1.002 (0.997 - 1.007)* | 0.991 (0.985 - 0.998) |
| Day of Freeze | | | | | |
| *D5* | Referent | Referent | Referent | Referent | Referent |
| *D6* | 0.772 (0.756 - 0.788) | 0.752 (0.724 - 0.781) | 0.774 (0.756 - 0.793) | 0.758 (0.736 - 0.781) | 0.787 (0.765 - 0.810) |
| *D7* | 0.395 (0.354 - 0.441) | 0.339 (0.273 - 0.420) | 0.428 (0.377 - 0.485) | 0.377 (0.315 - 0.450) | 0.411 (0.357 - 0.473) |
| Morphology | | | | | |
| *Good* | Referent | Referent | Referent | Referent | Referent |
| *Fair* | 0.877 (0.858 - 0.897) | 0.905 (0.872 - 0.939) | 0.881 (0.857 - 0.905) | 0.924 (0.897 - 0.952) | 0.830 (0.804 - 0.858) |
| *Poor* | 0.426 (0.312 - 0.582) | 0.294 (0.136 - 0.638) | 0.474 (0.338 - 0.663) | 0.505 (0.322 - 0.792) | 0.373 (0.242 - 0.575) |

- **67,037 FET cycles** included in the final analysis. **Live birth** occurred in **42.3% of all transfers**, **38.5% for untested embryos**, and **44.7% for PGT-A tested embryos**.
- Across all transfers**, live birth had a stronger association with blastulation day than morphology.**
- Analogous results were seen when stratifying by PGT-A testing and age at retrieval.
- In **marginal means analysis,** the relative risks of live birth associated with **D5-Fair and D6-Good embryos were significantly different (RR difference +0.13, p < 0.001).**
- **Modeled absolute risks of live birth for D5-Good, D5-Fair, and D6-Good embryos were 48.6%, 42.6%, and 37.5%,** respectively. Selecting a D5-Fair over a D6-Good embryo had an absolute risk difference of **+5.1% for live birth, with a number needed to treat (NNT) of 20 transfers.**

**Figure: Modeled chance of live birth by age & embryo quality (D5-Good, D5-Fair, D6-Good)**




## CONCLUSIONS

- **Blastulation day** was **superior to** embryo **morphology** in predicting **live birth** following single FET – **across all cycles**, and **in stratified analysis** of **untested vs. PGT-A-tested embryos**, and **age < 35 vs. age ≥35 at time of retrieval**.
- Specifically, a **D5-Fair embryo** has a **significantly greater (~5%) reproductive potential** compared to a **D6-Good embryo.**

*The expressed views are those of the authors and do not reflect the official policy of the National Institutes of Health, Department of Defense, or U.S. Government.*