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CONSISTENCY OF EMBRYO CELL-FREE DNA RESULTS WITH PAIRED TROPHECTODERM BIOPSIES AND WHOLE DAY-6 BLASTOCYSTS IN DIFFERENT CULTURE CONDITIONS

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PURPOSE & OBJECTIVES

The objective of this study is to determine the robustness of the results obtained by cell-free DNA (cfDNA) released into the culture media compared to paired trophectoderm biopsies (TE) and whole blastocysts (WB) using two different incubator systems.

MATERIAL & METHODS

The study was performed from August 2020 to March 2023, using 317 paired samples of embryos cultured in two different conditions: Group A, which used bench-top incubators (embryo culture in 10-15µl microdroplets), and Group B, which used time-lapse incubators with narrow well shape (embryo culture in 20-25µl microdroplets).

In all cases, embryos were thoughtfully washed in individual drops on day 4 and changed to a new dish with fresh media up to day 6. The media samples were collected on day 6 of embryo development, frozen at -20°C and analyzed using next-generation sequencing (NGS). A total of 240 media were included in group A and 77 in group B. Concordance of the cfDNA with the paired TE or WB was estimated as follows: ploidy concordance was considered as the overall agreement between the cfDNA and the paired blastocyst sample considering them euploid or aneuploid. Ploidy concordance included both full concordance (when the chromosomal status for all the chromosomes in both samples is the same) and partial concordance (the chromosomal status for some chromosomes might differ between samples, but they are both aneuploid).

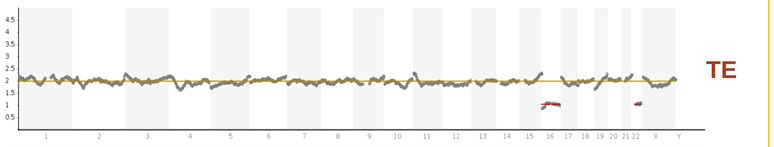
RESULTS

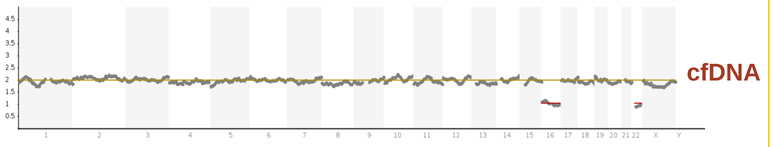
High concordance rate of the cfDNA analysis with either TE or WB was observed in both groups. A summary of the results is shown in Table 1.

Table 1	Bench-top incubators (Group A)			Time-lapse incubators (Group B)		
	TE	WB	Overall	TE	WB	Overall
Mean female age (SD)	39.1 (5.0)	36.5 (4.8)	37.6 (5.0)	38.1 (3.2)	37.0 (2.4)	37.6 (2.9)
No. informative pairs	60	180	240	24	53	77
Ploidy concordance (%)	52 (86.7)	158 (87.8)	**210 (87.5)**	24 (100)	46 (86.8)	**70 (90.9)**
Full concordance (%)	36 (60.0)	123 (68.3)	159 (66.3)	17 (70.8)	35 (66.0)	52 (67.5)
Partial concordance (%)	16 (26.7)	35 (19.4)	51 (21.3)	7 (29.2)	11 (20.8)	18 (23.4)
Euploid sex discordance (%)	0	2 (1.1)	2 (0.8)	0	0	0
Presence of contamination (%)	1 (1.7)	12 (6.7)	13 (5.4)	1 (4.2)	1 (1.9)	2 (2.6)

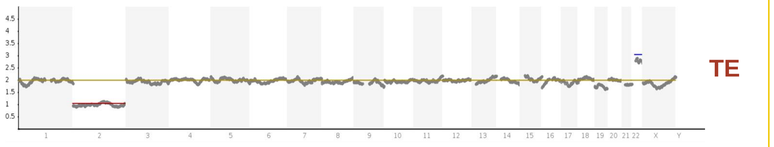
**NS differences among groups*

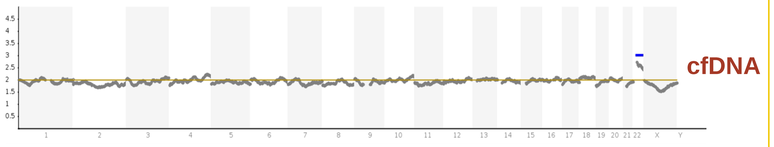
Full Concordance





Partial Concordance





CONCLUSIONS

The study supports the robustness of the analysis of embryo cfDNA compared to TE and WB in different laboratory settings and culture conditions. Further studies are needed to confirm whether specific culture conditions, such as time-lapse, can optimize test performance and show higher concordance and lower contamination rates.

The study's findings provide important insights about the consistency of non-invasive preimplantation genetic testing for aneuploidy (niPGT-A), in different culture conditions supporting its applicability in different IVF settings.

REFERENCES

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2. Navarro-Sánchez L, García-Pascual C et al. "Non-invasive preimplantation genetic testing for aneuploidies: an update." *Reprod Biomed Online*. 2022; **44**(5):817-828.

CONTACT INFORMATION