HOW GENETICS AND EMBRYO TESTING IMPROVE TREATMENT OUTCOMES

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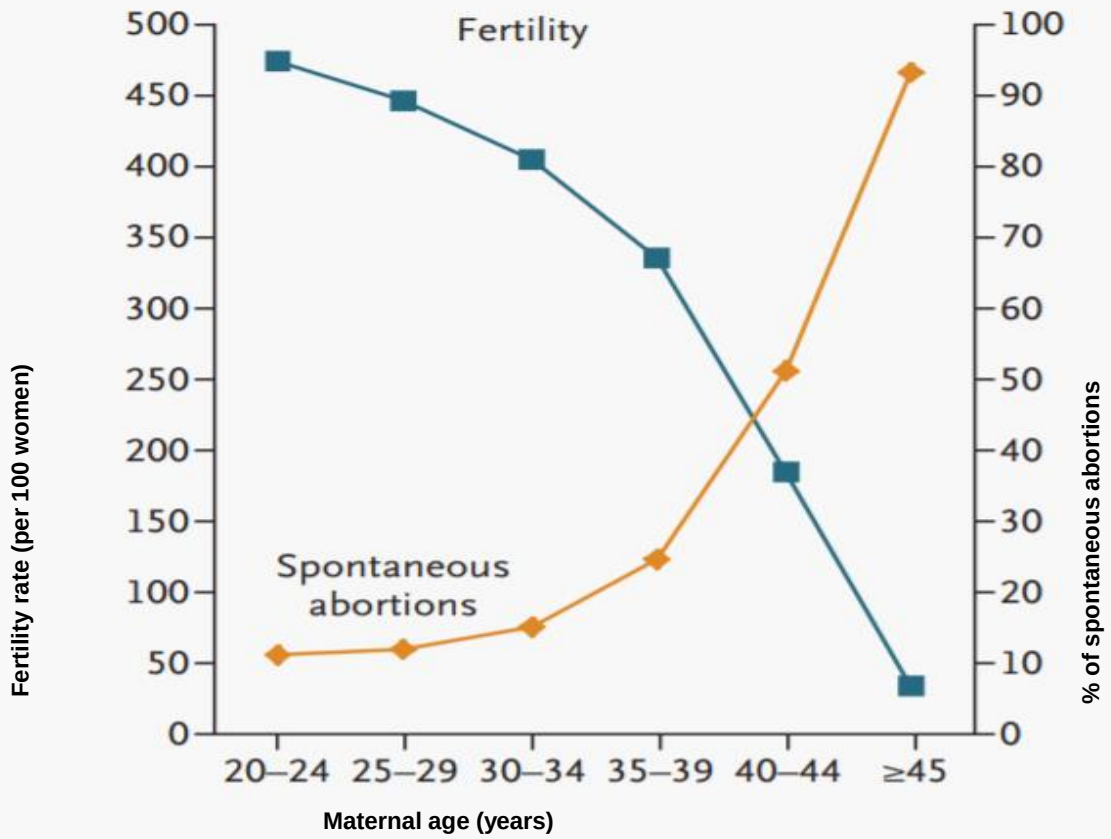
Science Assisting Nature

THE PROBLEM: FERTILITY AND MISCARRIAGE RATES AS A FUNCTION OF MATERNAL AGE.



Heffner, NEJM 2004.

- Advanced maternal age reduces fertility and increases spontaneous abortions exponentially.
- At 20 years of age, the miscarriage rate is about 10 percent. It increases to a high of more than 90 percent among women 45 years of age or older.
- The effect of advancing maternal age on the risk of chromosomal abnormalities is well known.

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Heffner, NEJM 2004. Rai & Regan Lancet 368:601-611, 2006.

THE SOLUTION: PGT-A can help overcome spontaneous miscarriages and at the same time ensure a healthy baby

- **Higher Pregnancy Rates** per transfer
- **Reduced Miscarriage Rates**
- **Reduced risk of abnormal offspring**
- Fewer wasted transfers (Implantation Faillure)
- Decreased time to pregnancy
- Optional **Single Embryo Transfer** (SET), reducing the likelihood of a multiple-gestation pregnancy.



Greater chance of having a healthy child in shorter time.

Indications	
Advanced maternal age (≥ 38 years)	Multiple implantation failures (≥ 2 failed IVFs)
Prior pregnancy/child chromosomally abnormal	Recurrent miscarriage (≥ 2 miscarriages)
	Severe male factor (≤ 2 million sperm/mL)

Tiegs et al, F&S 2020.

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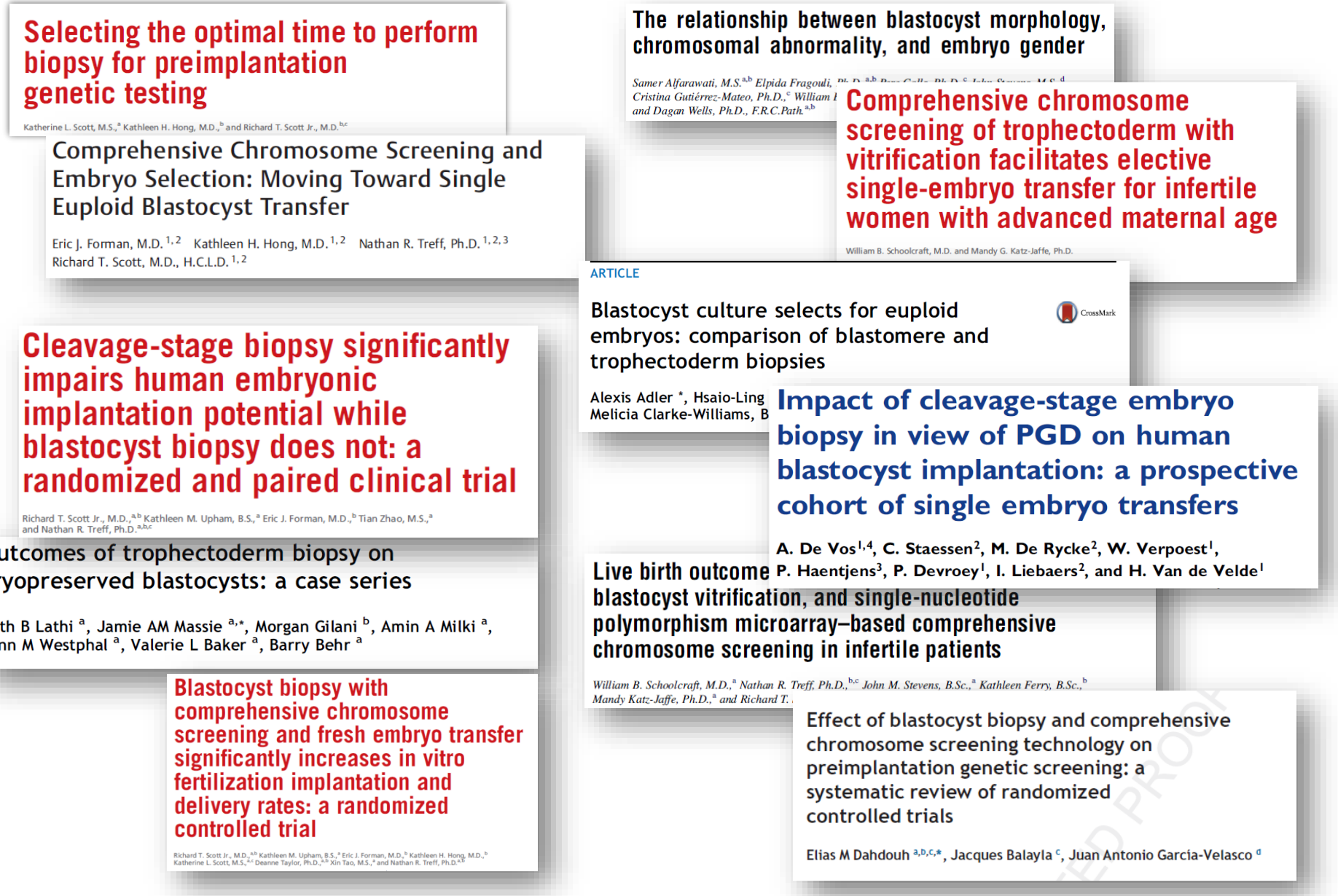
And the evidence for PGT-A improving pregnancy rates is OVERWHELMING!



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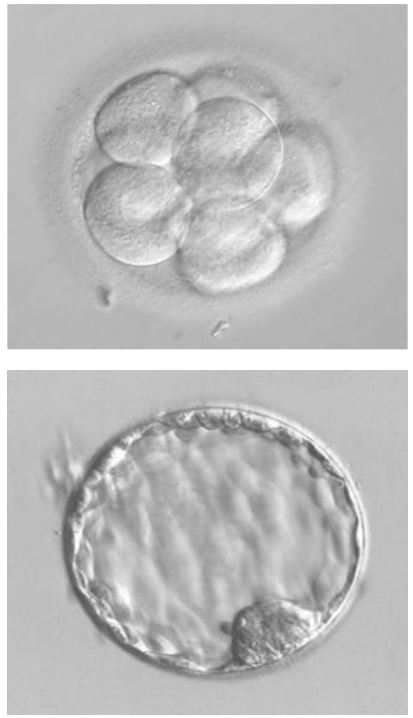
WHY?

Transference of "good morphology" embryos does not always means "good quality" embryos.





The morphological selection of embryos on day 3 or 5
DOESN'T discard the embryos with chromosomal abnormalities.
PGT-A does ensure their exclusion.

Sandalinas et al., 2001; Baltaci et al., 2005; Munné et al. 2007; Magli et al., 2007; Rubio et al., 2008

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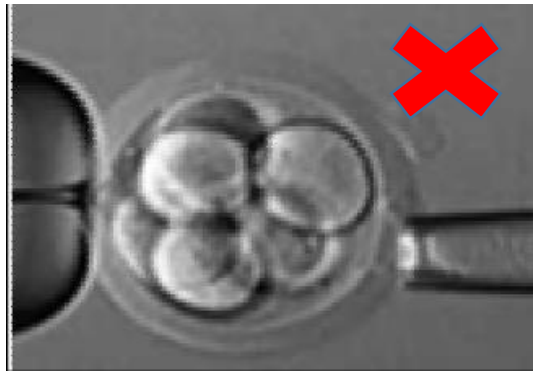
ART: PROVIDING THE BEST RESULTS





Performing the biopsy on Trophectoderm cells (Blastocyst embryo)

Scott et al, F&S 2013.

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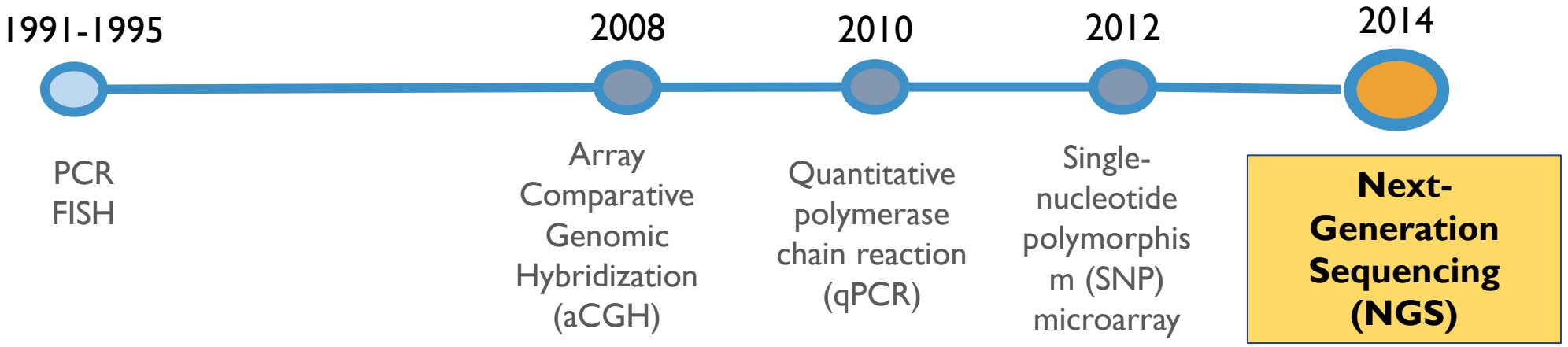
ART: PROVIDING THE BEST RESULTS with in-house PGT-A

Only methods that assess all 23 pairs are recommended for PGT-A.

Brezina et al, 2016. Geraedts et al, 2016. Viotti et al, 2020.



2-12 chromosomes	24 chromosomes	24 chromosomes

TECHNIQUE USED AT ART FERTILITY CLINICS

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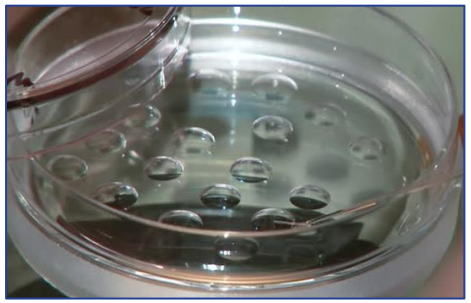
ART USES HIGHLY ADVANCED LAB TECHNOLOGY FOR OPTIMAL EMBRYO QUALITY AND BEST PGT-A OUTCOMES

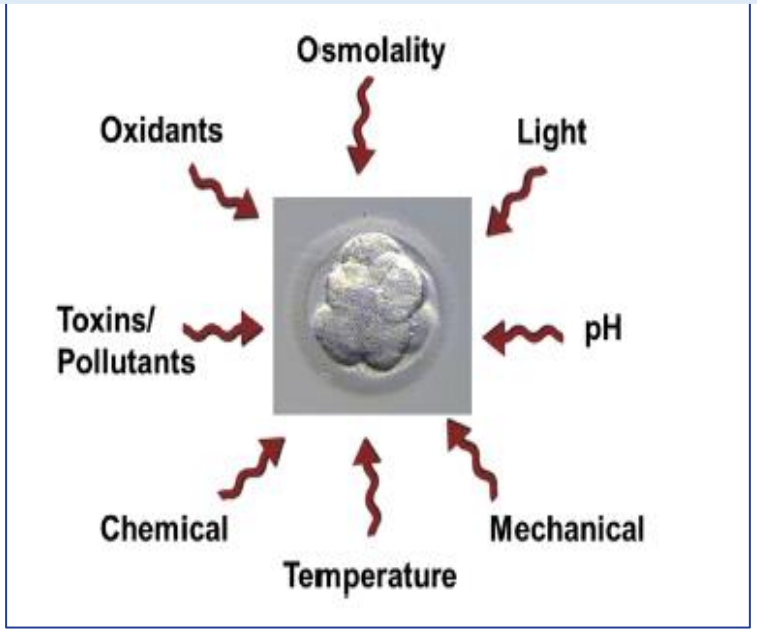


Embryo culture media



Time-lapse incubators

Variables impacting PGT-A outcomes





Vitrification

- Variances in methodology to obtain trophectoderm cells, number of cells taken, location of cells taken, rigour of washing cells before loading, time/temperature of holding cells between biopsy/cell loading, shipping conditions of cells impact DNA quality &fidelity of preimplantation genetic testing for aneuploidies (PGT-A) results.
- Cell stressors like pH, osmolality and temperature all play a role with fidelity of mitotic divisions and, if not well controlled, subtle stress from each may act in a cumulative fashion to negatively impact fidelity of chromosome separation/segregation.

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Capalbo et al, HR 2015. Fragouli et al, 2017. Swain et al, 2019.

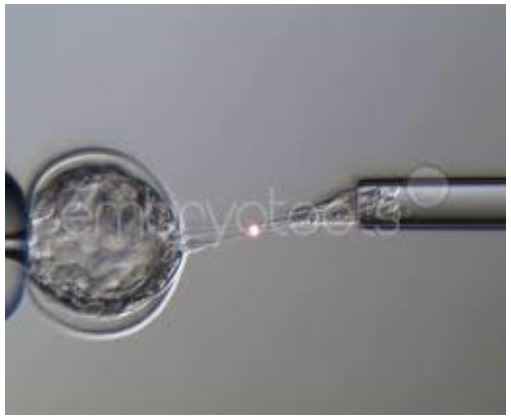
ART: Our experienced & trained embryologists use the most advanced lab techniques for delivering THE BEST RESULTS

Highly specific biospy techniques for maximum celular integrity and better outcomes.

Rubio et al, F&S, 2019. Xiong et al, JARG 2021. Herrero et al, ESHRE 2019. Guzman Masias et al, ESHRE 2019.

- Trophectoderm biopsy protocols can affect mosaicism and clinical outcomes.
- KPIs:
  - Time length to perfom the biopsy (3 min)
  - Percentage of blstocyst re-expansion after biopsy (90%)
  - Genetic lab outcomes – Successful ampliciation and diagnosis in 90% of samples

Capalbo et al, HR 2015





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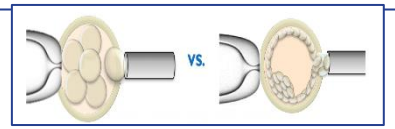
At ART: Our Continuous Research helps DELIVER THE BEST RESULTS

PLOS ONE

RESEARCH ARTICLE

Clinical reassessment of human embryo ploidy status between cleavage and blastocyst stage by Next Generation Sequencing

Alberto Liñán[1¤], Barbara Lawrenz[2,3¤*], Ibrahim El Khatib[1], Asina Bayram[1], Ana Arnanz[1], Carmen Rubio[4], Rupali Chopra[5], Human M. Fatemi[3]



human reproduction

ORIGINAL ARTICLE *Embryology*

The clinicians' dilemma with mosaicism—an insight from inner cell mass biopsies

B. Lawrenz[1,2,*], I. El Khatib[3], A. Liñán[3], A. Bayram[3], A. Arnanz[3], R. Chopra[4], N. De Munck[3], and H.M. Fatemi[1]

Human Reproduction, pp. 1–11, 2020
doi:10.1093/humrep/deaa002

human reproduction

ORIGINAL ARTICLE *Embryology*

Intracytoplasmic sperm injection is not superior to conventional IVF in couples with non-male factor infertility and preimplantation genetic testing for aneuploidies (PGT-A)

Neelke De Munck[1,*], Ibrahim El Khatib[1], Andrea Abdala[1], Ahmed El-Damen[1], Aşina Bayram[1], Ana Arnanz[1], Laura Melado[1], Barbara Lawrenz[1,2], and Human M. Fatemi[1]

119 RBMO VOLUME 41 ISSUE 1 2020

RBMO

ELSEVIER

ARTICLE

Anti-Müllerian hormone is an independent marker for oocyte survival after vitrification



BIOGRAPHY

Laura Melado graduated as an MD in 2002 at Universidad Autónoma, Madrid, Spain, where she completed her Habilitation Thesis on 'AMH during controlled ovarian stimulation: variability and correlation with outcomes' Cum Laude in 2015. She now works as an IVF Specialist at the IVI Middle East Fertility Clinic, Abu Dhabi, UAE.

Laura Melado[1,2,*], Ana Arnanz[1], Asina Bayram[1], Ibrahim Elkhatib[1], Neelke De Munck[1], Alfredo Tomás Navarro[2], Carol Coughlan[2], Barbara Lawrenz[1,4], Human Mousavi Fatemi[1]

Journal of Assisted Reproduction and Genetics
https://doi.org/10.1007/s10815-021-02187-0

EMBRYO BIOLOGY

Euploidy rates are not affected when embryos are cultured in a continuous (CCM) or sequential culture medium (SCM): a sibling oocyte study

Andrea Abdala[1] · Ibrahim Elkhatib[1] · Aşina Bayram[1] · Ana Arnanz[1] · Ahmed El-Damen[1] · Laura Melado[1] · Barbara Lawrenz[1,3] · Carol Coughlan[1] · Nicolas Garrido[2] · Human M. Fatemi[1] · Neelke De Munck[1]

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frontiers in Endocrinology

ORIGINAL RESEARCH

Vitamin D in Follicular Fluid Correlates With the Euploid Status of Blastocysts in a Vitamin D Deficient Population

Ana Arnanz[1*], Neelke De Munck[1], Ibrahim El Khatib[1], Aşina Bayram[1], Andrea Abdala[1], Laura Melado[1], Barbara Lawrenz[1,2], Carol Coughlan[1], Alberto Pacheco[3], Juan A. Garcia-Velasco[3,4] and Human M. Fatemi[1]

Journal of Assisted Reproduction and Genetics
https://doi.org/10.1007/s10815-021-02303-0

ASSISTED REPRODUCTION TECHNOLOGIES

Different CO_2 settings (6.0% vs 7.0%) do have an impact on extracellular pH of culture medium (pHe) and euploidy rates rather than on blastocyst development: a sibling oocyte study

Andrea Abdala[1] · Ibrahim Elkhatib[1] · Aşina Bayram[1] · Ana Arnanz[1] · Ahmed El-Damen[1] · Laura Melado[1] · Barbara Lawrenz[1,2] · Nicolás Garrido[2] · Human M. Fatemi[1] · Neelke De Munck[1]

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Journal of Assisted Reproduction and Genetics
https://doi.org/10.1007/s10815-020-01795-6

ASSISTED REPRODUCTION TECHNOLOGIES

Check for updates

Blastocyst mitochondrial DNA (mtDNA) is not affected by oocyte vitrification: a sibling oocyte study

Ana Arnanz[1] · Neelke De Munck[1] · Aşina Bayram[1] · Ahmed El-Damen[1] · Andrea Abdalla[1] · Ibrahim ElKhatib[1] · Laura Melado[1] · Barbara Lawrenz[1] · Human M. Fatemi[1]

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