

An interpretable artificial intelligence approach to differentiate between blastocysts with similar or same morphological grades

VITROLIFE GROUP™

Romualdo Sciorio MSc BSc (Hons)

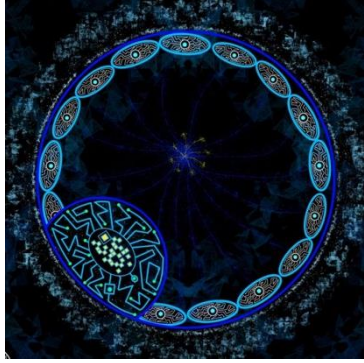
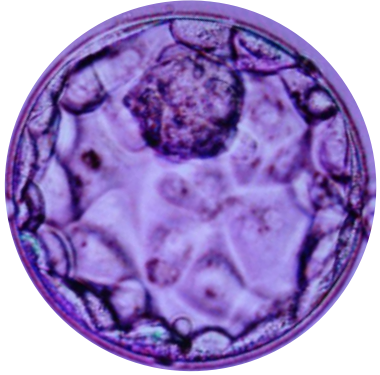
Senior Clinical Support EMEIA- Vitrolife Group- Sweden

CONFLICT OF INTEREST DISCLOSURE

I have no financial relationships to disclose

I am currently employed by the Vitrolife Group, Sweden

CONTENTS



Introduction/Sign of embryo development

Embryo culture using Time-Lapse technology

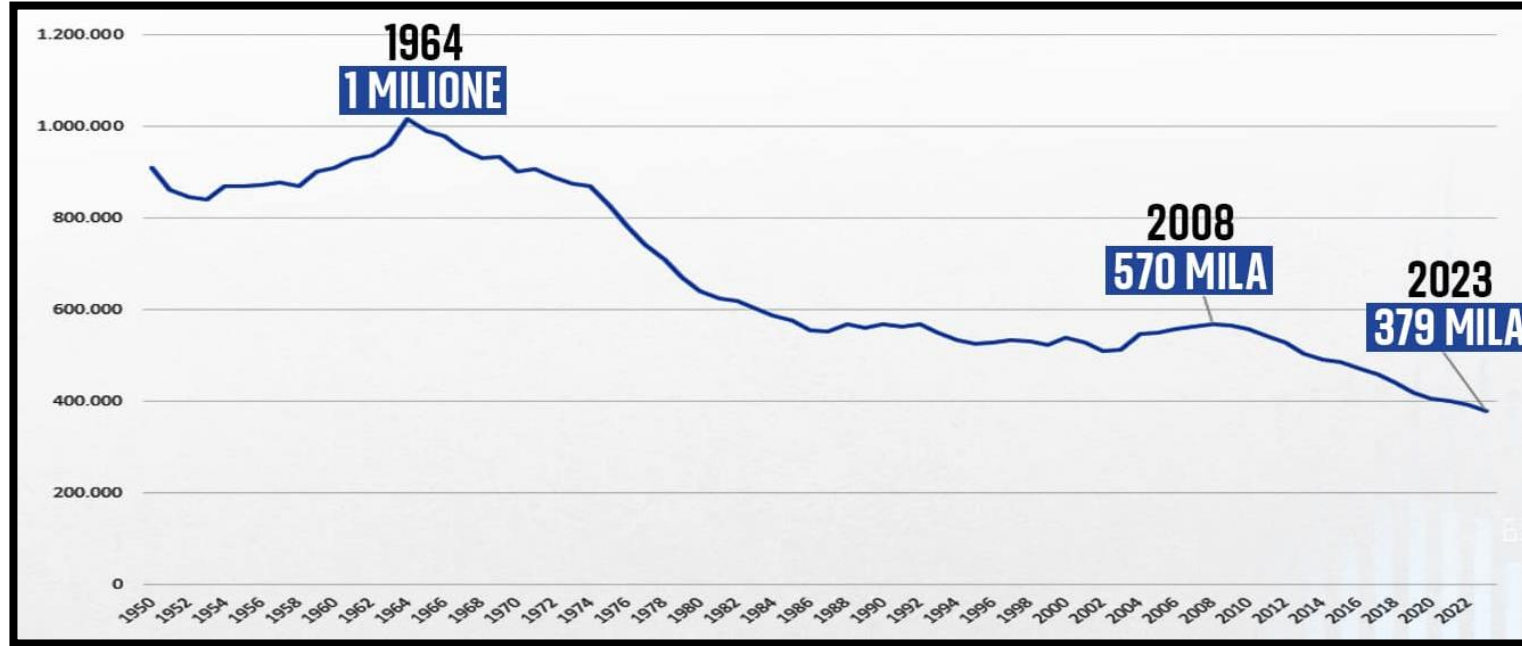
Benefits of AI softwares

AI: Improving the selection process with iDAScore®

Conclusions



Nativity in Italy since 1950



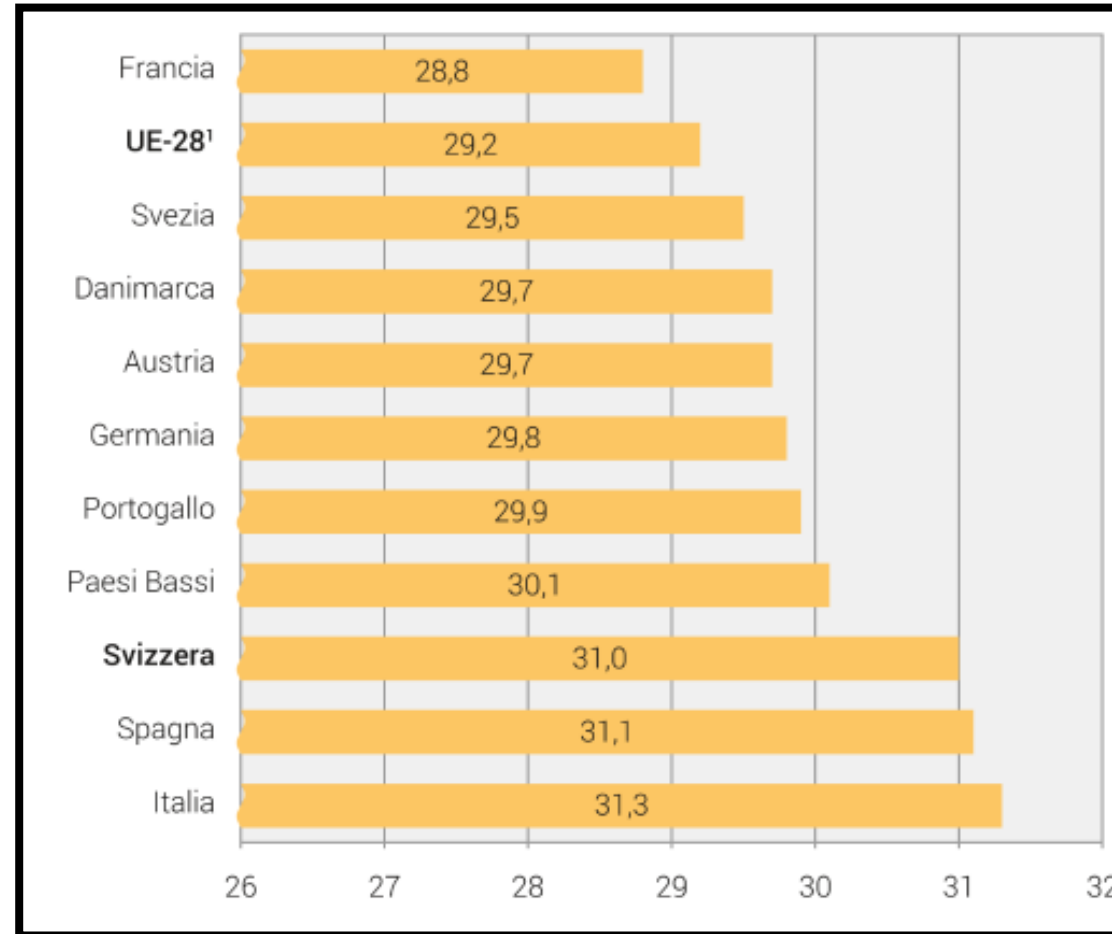
INFERTILITY

Infertility is defined as the failure to establish a pregnancy after 12 months of regular unprotected sexual intercourse

ITALY: 2023 – 86,000 Couples treated
- 108,000 Cycles
- 16,625 babies born using ART (4.3%)

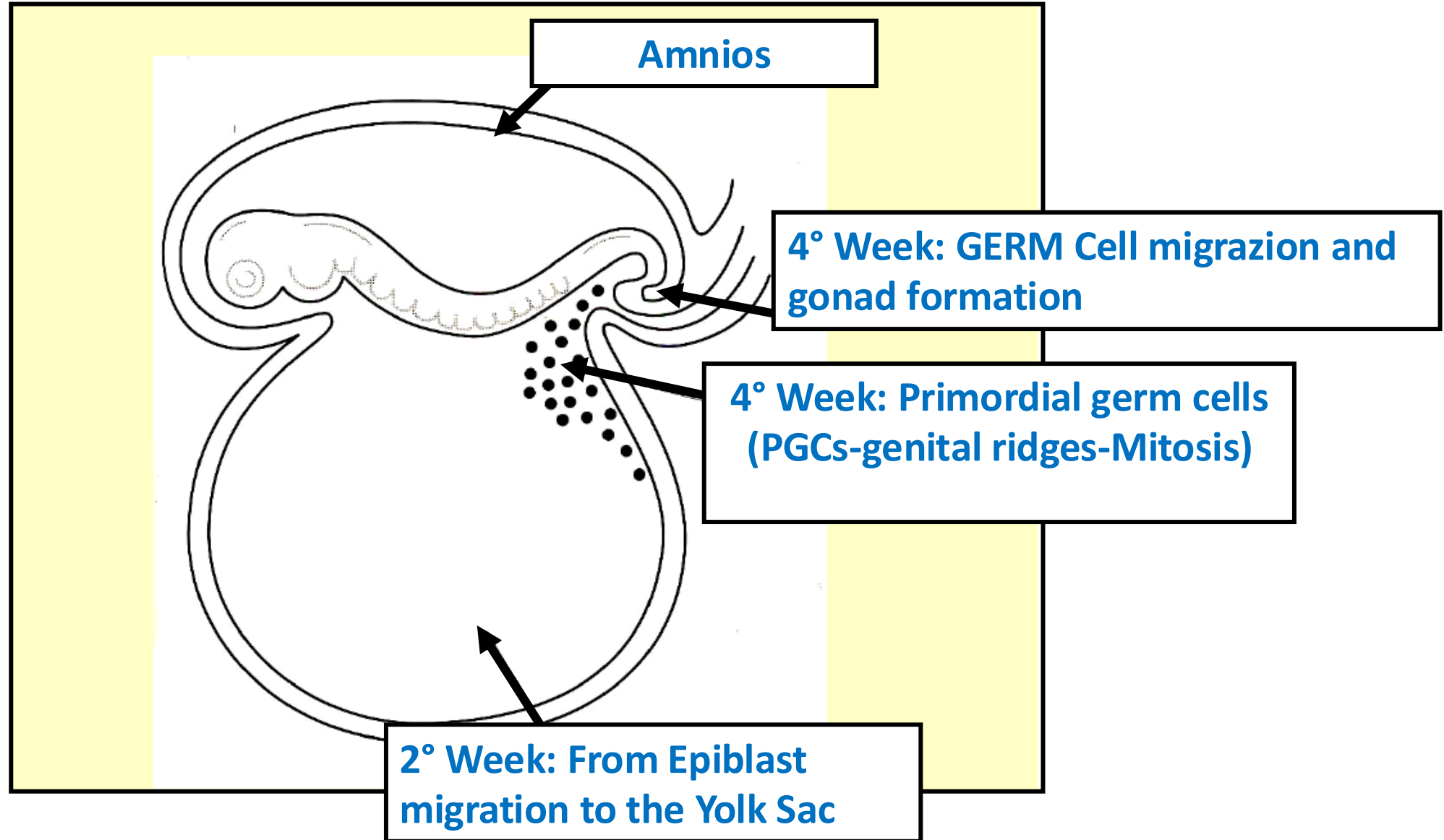
Age for women at first delivery in Europe

- Every decade age of women delivering first baby is increasing for 2 years
- In 2021, the average age of mothers who gave birth in England and Wales increased to 30.9 years
- One in 25 UK birth are to women over 40

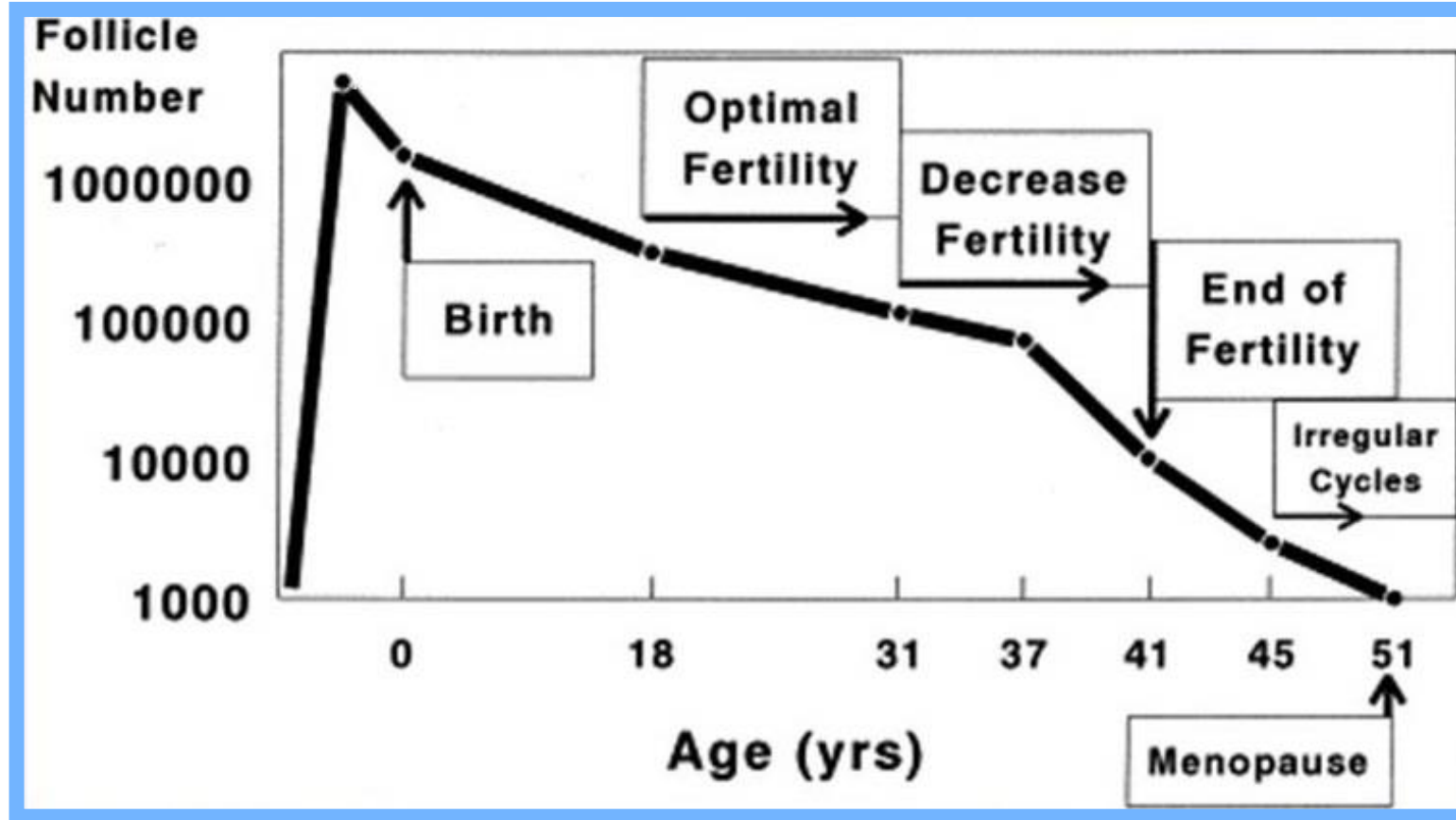


Women Age

Primordial germ cells (PGCs): formation and migration



Ovarian Reserve: Changes in Germ Cell number

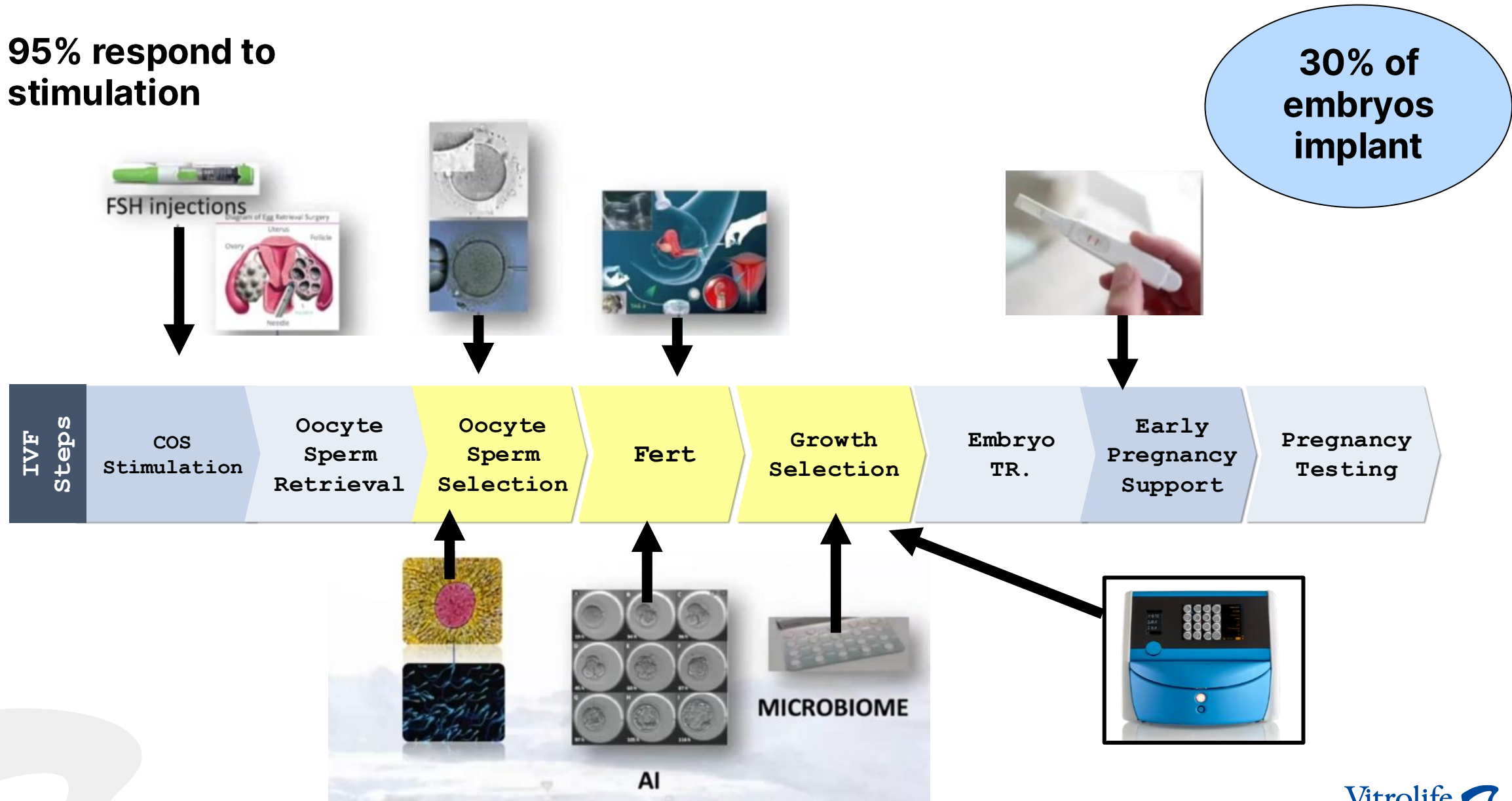


Early days of IVF



IVF: Multi-steps process and variables

95% respond to stimulation



MAIN RESULTS AND THE ROLE OF CHANCE: In 24 countries (21 in 2019) in which all ART clinics reported to the registry 356 427 treatment cycles were registered for a total population of approximately 268 million inhabitants in these countries, allowing the best estimate of a mean of 1330 cycles performed per million inhabitants (range: 142–3230). Among the reporting countries, for IVF, the clinical pregnancy rates (PR) per aspiration were similar to that in 2019 (22.1% versus 21.8% in 2019). For ICSI, the corresponding PRs showed similar trends (20.0% in 2020 versus 20.2% in 2019). When freeze-all cycles were excluded from the calculations, the clinical PRs per aspiration were 26.4% (28.5% in 2019) and 25.6% (26.2% in 2019) for IVF and ICSI, respectively. After oocyte donation, the PR per embryo transfer was 51.3% (50.5% in 2019) with freshly donated oocytes and 45.7% (44.8% in 2019) with thawed oocytes. After FET, the PR per thawing was 34.9% (versus 35.1% in 2019). In fresh cycles of both IVF and ICSI, the trend towards the transfer of fewer embryos continued with the transfer of 1, 2, 3, and ≥4 embryos in 57.2%, 37.8%, 4.8%, and 0.2%, of all treatments, respectively









Human Reproduction, 2025, 40(11), 2038–2055

<https://doi.org/10.1093/humrep/deaf179>

Advance Access Publication Date: September 23, 2025

ESHRE Pages

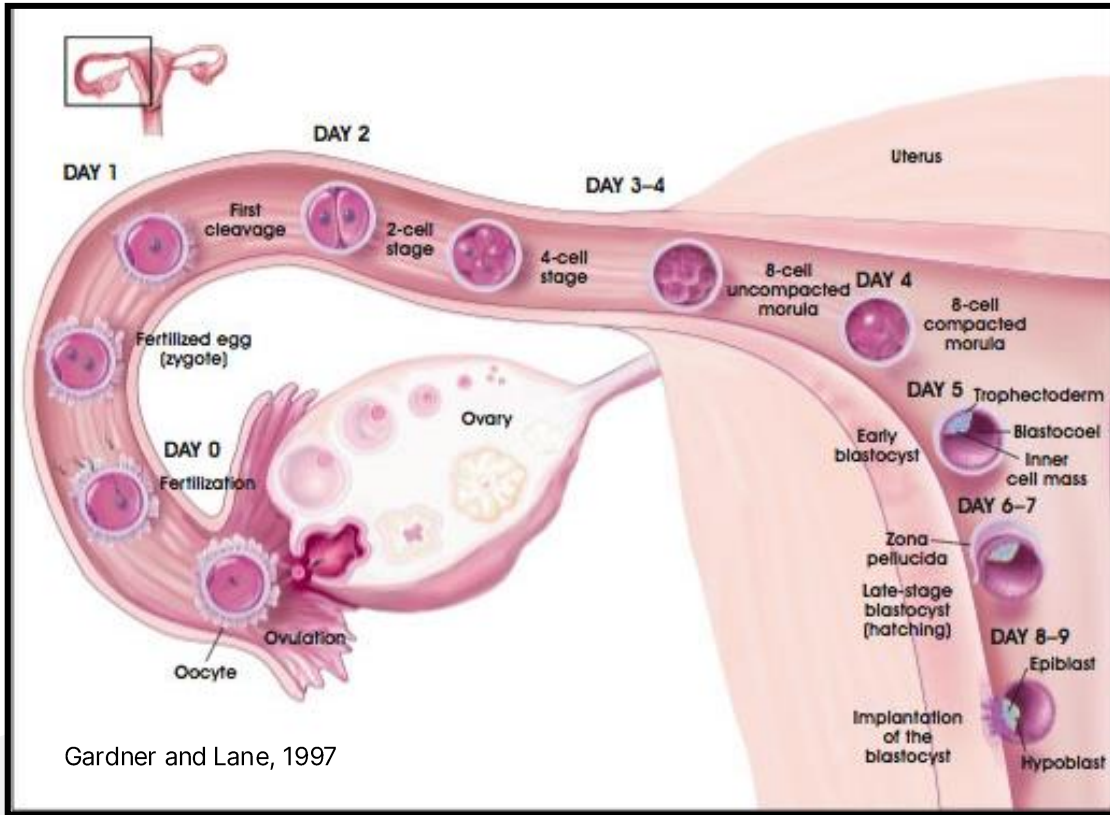
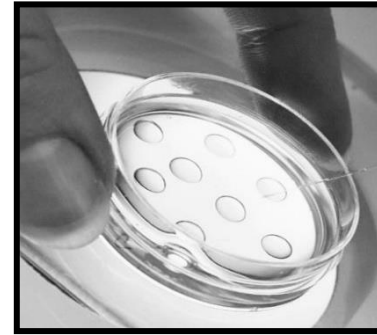
ART in Europe, 2020: results generated from European registries by ESHRE†

The European IVF Monitoring Consortium (EIM) for the European Society of Human Reproduction and Embryology (ESHRE)†, J. Smeenk ^{1,*}, C. Wyns², Ch. De Geyter ³, M.S. Kupka⁴, C. Bergh ⁵, I. Cuevas Saiz⁶, D. De Neubourg ⁷, K. Rezabek ⁸, A. Tandler-Schneider⁹, I. Rugescu¹⁰, and V. Goossens ¹¹

"In-vitro" versus "In-vivo"

Oviduct
Low glucose
High pyruvate
High lactate

Uterus
High glucose
Low pyruvate
Low lactate



The artificial IVF laboratory leads to stress

Osmolality

Oxidants

VOCs

Temperature

Light

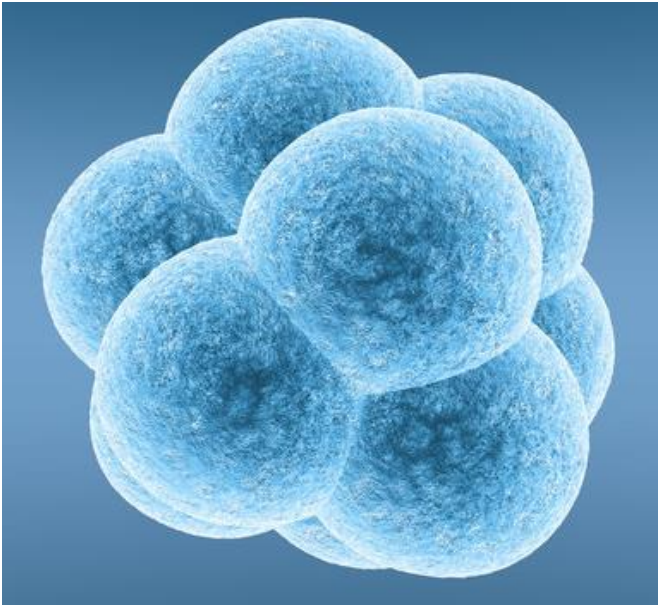
Aldehydes

Toxins

Air Quality

pH shift

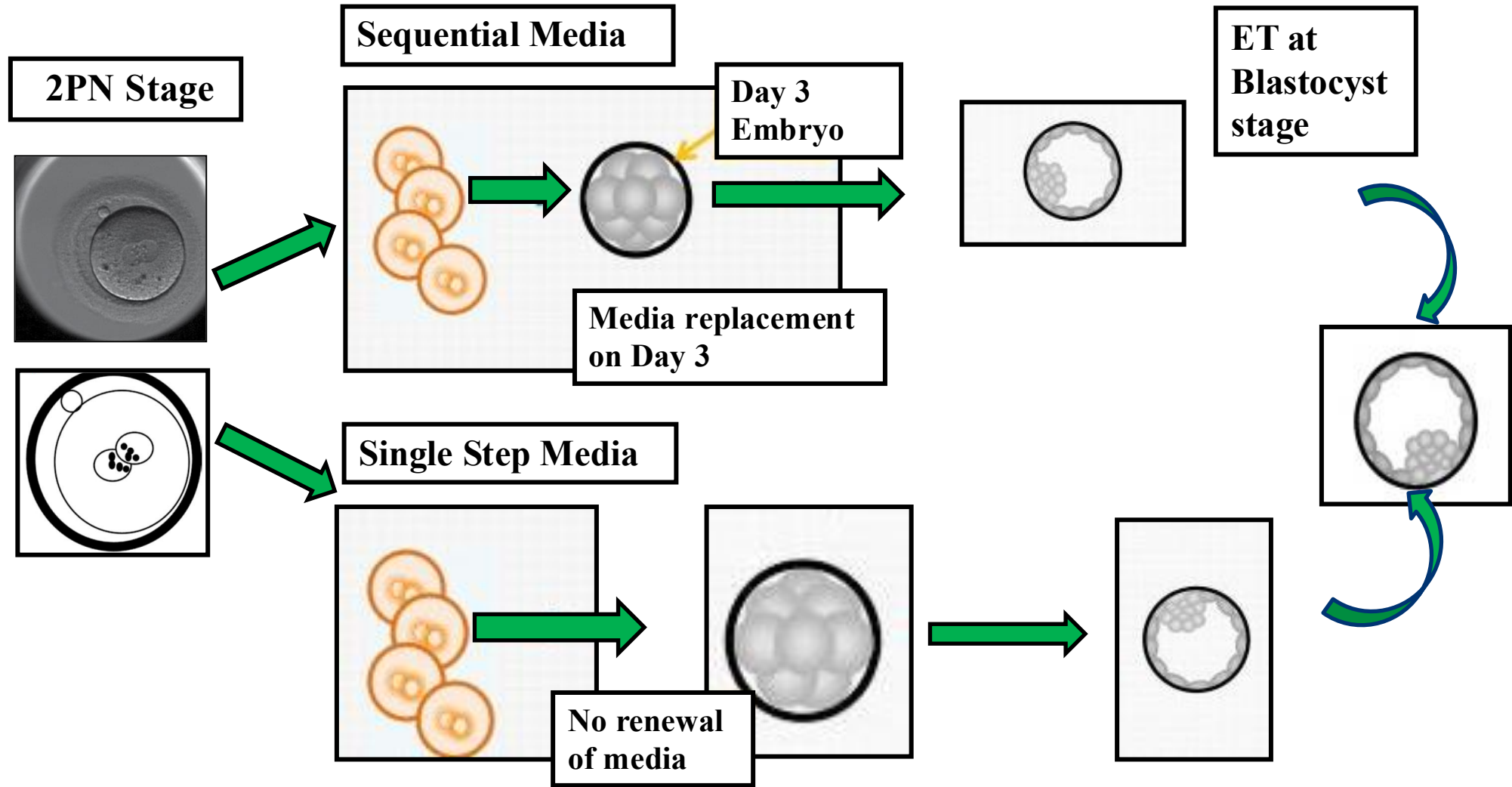
ROS



Oxygen

It is crucial to minimize perturbations in the atmosphere around the embryo

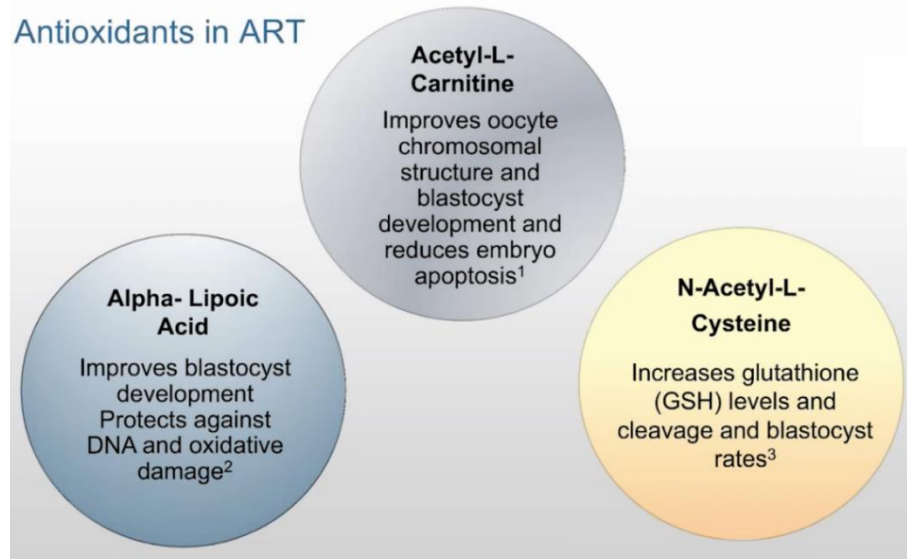
Culture media: "single versus sequential"



Sciorio and Rinaudo: JARG 2023

Triple antioxidants protection and *in-vitro* embryo development

Antioxidants in ART



Three antioxidants have been added to our gamete-handling, fertilisation, and culture media to form a protective barrier against oxidative stress.

- Acetyl-L-Carnitine improves oocyte chromosomal structure and blastocyst development while reducing apoptosis.

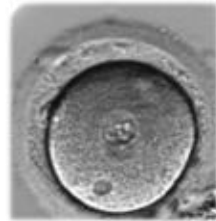
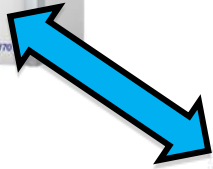
- Alpha-Lipoic Acid significantly improves embryo development and cell numbers at 20% oxygen.

- N-Acetyl-L-Cysteine increases glutathione (GSH) levels, cleavage and blastocyst rates.

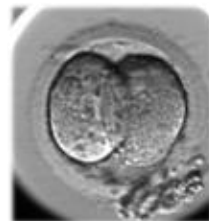


Abdelrazik et al, 2007; Linck et al., 2007; Furnus et al 2008; Truong et al., 2016

Time-lapse: a breakthrough in embryology



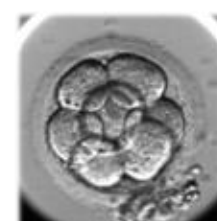
17-19 hrs



26 hrs



44 hrs

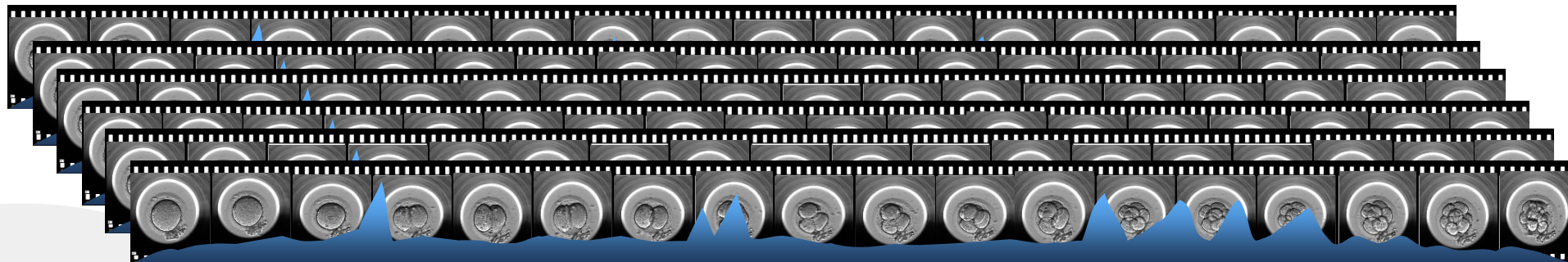


68 hrs

More
Observations
Better Selection

Less Disturbance
Better
Development

- Undisturbed embryo culture
- More embryo information
- Embryo selection/de-selection
- Tool for quality control
- Valid for research




Time-Lapse: thousands of images over 3/5 days


EmbryoScope overview


No matter the size or patient profile of your clinic, Vitrolife Group has the system that suits your IVF laboratory



EmbryoScope 8
Clinics that require a lower capacity or wish to complement their current set-up with more capacity.

 **128** Embryos

 **8** Culture dish positions per incubator

 **>400** Blastocyst cycles per year



EmbryoScope+
Clinics that wish to provide time-lapse as a standard of care to more patients.

 **240** Embryos


 **15** Culture dish positions per incubator


 **>700** Blastocyst cycles per year



EmbryoScope Flex
Clinics that wish to utilise time-lapse in mild stimulation cycles and for low responder patients.

 **144** Embryos

 **24** Culture dish positions per incubator

 **1200** Blastocyst cycles per year

Early PN fading in IVF

Campbell, *et al*, 2018

18h post insemination

0.35% of IVF embryos observed by timelapse PN had faded

(ICSI 3.9%)

19h post insemination

1.64% of IVF embryos observed by timelapse PN had faded

(ICSI 9.2%)

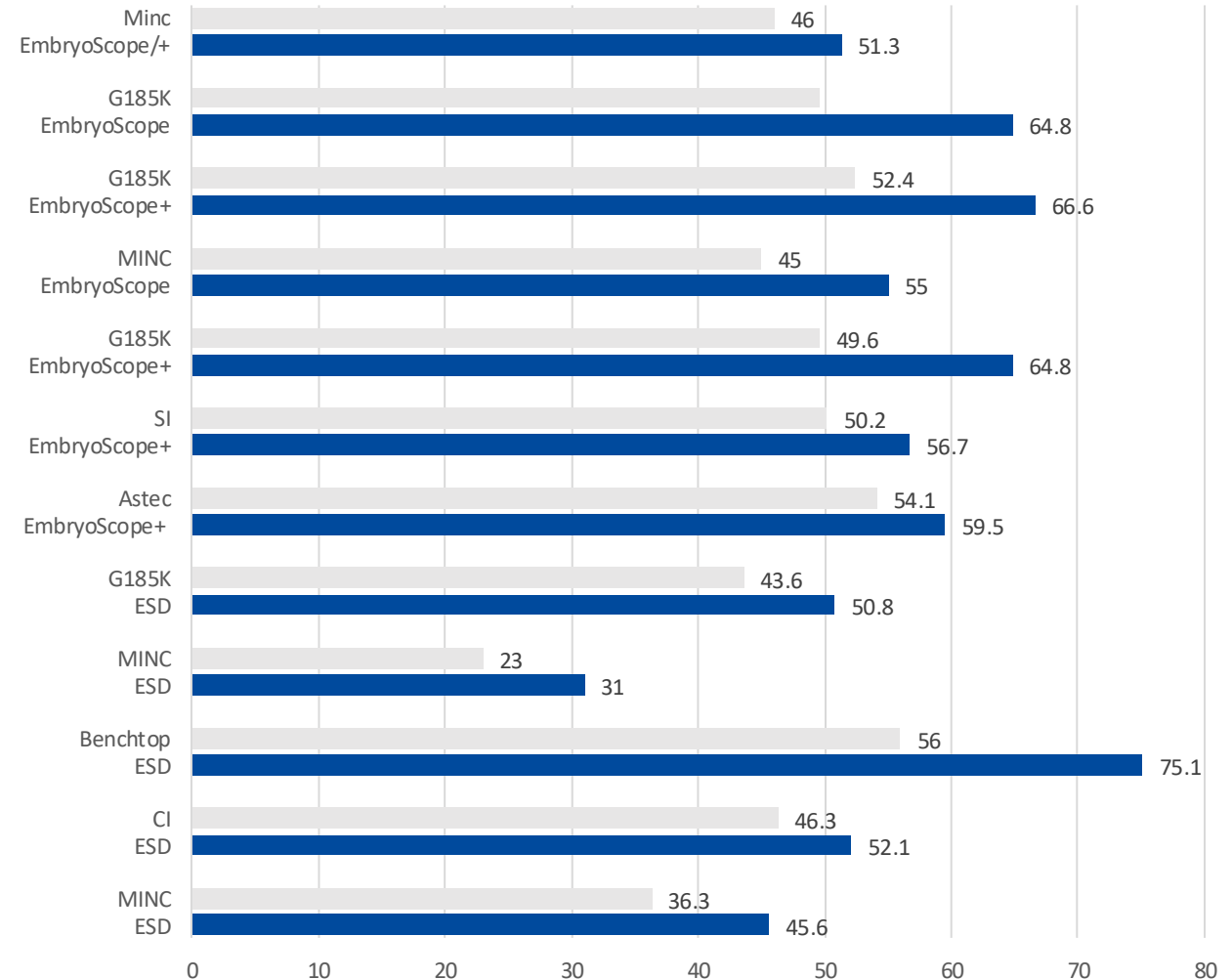
RBM Online 2018, 37 Sup 1

Abnormal features observed with EmbryoScope

Feature	Description	Reference
Pronuclei (PN) formation; PN size	Wrong PN movement in the cytoplasm	Coticchio <i>et al.</i> , 2018; Otsuki <i>et al.</i> , 2017
Appearance of two PN	Asynchronous appearance and disappearance of PN; Pronuclei fading and reappearance	Coticchio <i>et al.</i> , 2018
PN fragmentation and fusion	Formation of micronuclei; A pronucleus formed by the fusion of two preexisting pronuclei	Mio and Maeda, 2008; Coticchio <i>et al.</i> , 2018
Unipolar cleavage furrow; Tripolar cleavage furrow	Appearance of cleavage furrow on one site of the zygote; Appearance of three cleavage furrows; Zygote presenting oolemma ruffling before cytokinesis	Wong <i>et al.</i> , 2010; Athayde Wirka <i>et al.</i> , 2014
Absent cleavage; Reverse cleavage	Arrest at zygote stage; Fusion of two cells into one blastomere	Barrie <i>et al.</i> , 2017; Desai <i>et al.</i> , 2014
Direct cleavage	Cleavage of zygote to three cells or one; blastomere divides to three cells	Athayde Wirka <i>et al.</i> , 2014; Barrie <i>et al.</i> , 2017; Meseguer <i>et al.</i> , 2011
Irregular chaotic division	Disordered cleavage behaviour with uneven cleavages and fragmentation	Athayde Wirka <i>et al.</i> , 2014; Barrie <i>et al.</i> , 2017
Blastomere movement	Blastomere and cytoplasm movement before division	Ezoe <i>et al.</i> , 2019
Multinucleation	Blastomere with more than one nucleus	Hashimoto <i>et al.</i> , 2016
Internalization of cellular fragments	Fragments reabsorbed into one blastomere	Mio and Maeda, 2008
Cell exclusion	Exclusion of one or more blastomeres from the morula formation	Coticchio <i>et al.</i> , 2019
Spontaneous blastocyst collapse	Collapse of blastocyst with complete disappearance of blastocoel cavity	Marcos <i>et al.</i> , 2015; Sciorio <i>et al.</i> , 2020a, 2020b

Summary of studies showing better embryo development

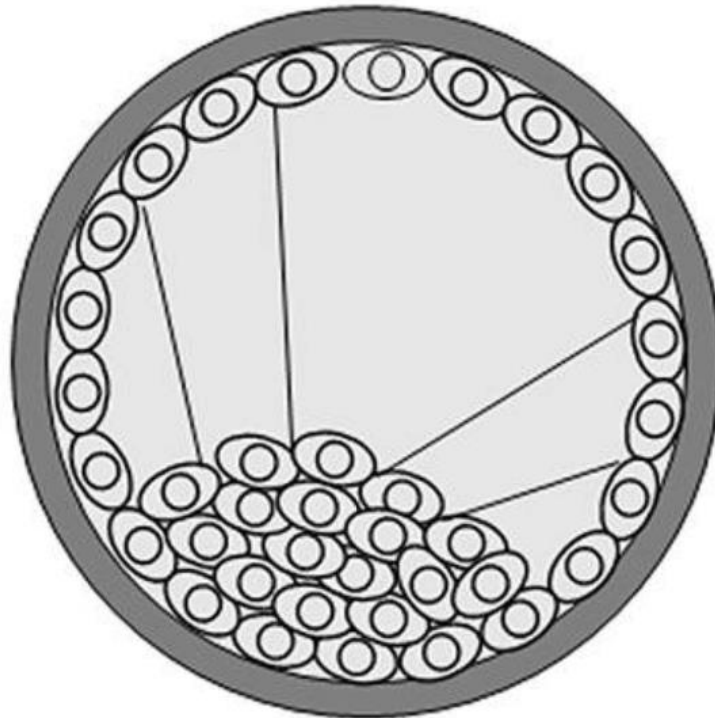
Study	n=	Criterion
Lee et al. ESHRE 2023 P.263	1189 EmbryoScope/+ 1381 Minc	Utilization rate p<0.0001
Nobrega et al. Zygote 1-8 doi:10.1017/S0967199423000242	503 Embryoscope 293 G185K sibling	Mean useable blast/2PN p>0.001
Setti et al. 2022 Zygote	71 within-subject consecutive treatment	Embryo utilization rate P<0.0001
Kermack et al. 2022 Hum. Rep. 37(12) 2757-2767	RCT 586 sibling oocytes	Blastulation rate P=0.013
Munck et al. 2021 Hum. Repr. 36(1) supp. i208	796 sibling oocytes	Useable blastocyst rate p<0.001
Nicoliea et al 2019 Fert. Sert.112(3)S1 e125-e126	1276 cycles	Number of blastocysts p<0.05
Ueno et al. Reprod. Biol 2019 19(2) 139-144	1402 cycles	Utilized blast/2PN p<0.05
Barberet et al 2018 Fert.Sert 109(2), 302-309.	286 patients	Viable D5s/patient P=0.001
Lowen et al.Human Reproduction; 32(suppl 1)i210	51 patients sibling study	cryopreservable blasts p<0.05
Sciorio et al. 2018 JARG 35(3) 515-522	47 patients sibling study	top quality D3 p=0.006
Aheloua 2018 Reprod Biol. 18(1):40-45	2783 2PN	Blastocysts rate p<0.01
Wale et al. ASRM 2014	2253 2PN	Usable blast/2PN p<0.05



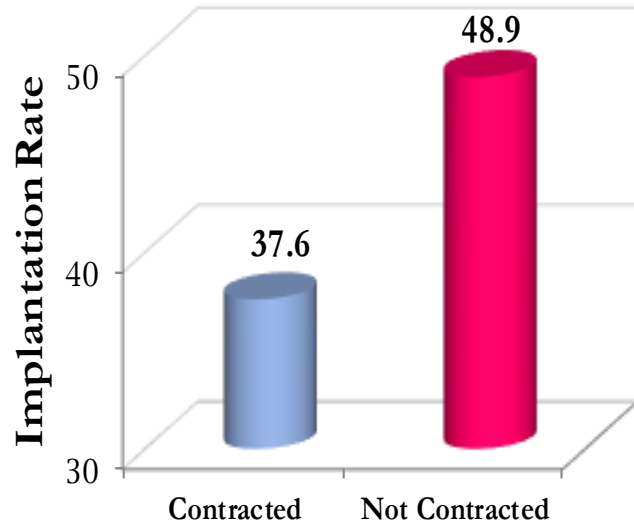
> Hum Reprod. 2024 Nov 1;39(11):2453-2465. doi: 10.1093/humrep/deae226.

Cytoplasmic strings in human blastocysts: hypotheses of their role and implications for embryo selection

Anabella Marconetto ¹, Federica Innocenti ², Gaia Saturno ², Marilena Taggi ²,
Viviana Chiappetta ², Samuele Trio ³, Felicia De Falco ³, Laura Albricci ², Giovanni Coticchio ⁴,
Aisling Ahlström ⁵, Giulia Fiorentino ⁶, Roberta Maggiulli ², Alberto Vaiarelli ², Maurizio Zuccotti ⁶,
Laura Rienzi ^{2 7}, Danilo Cimadomo ²



Identify atypical phenotypes: Blastocyst Collapse



Incidence: 19,1% of blastocyst collapse

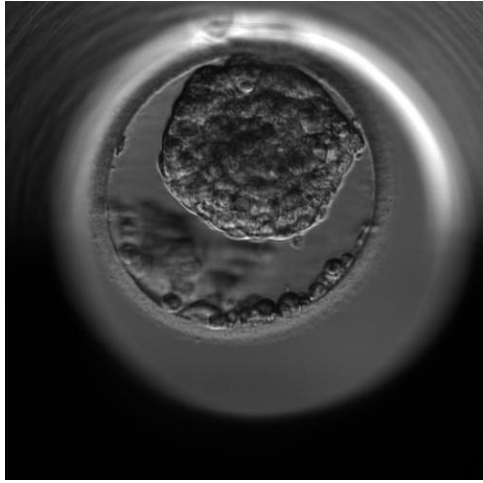


Table VI Logistic regression analysis of embryo implantation (presence of gestational sac and fetal heart beat) as affected by blastocyst collapse, type of cycle, oocyte source, age (of the woman who produced the eggs), number of oocytes metaphase II and blastocyst morphology and blastocyst hatching.

Model effect	Values	OR	P-value
Blastocyst collapse	Yes versus No	0.55 (0.32–0.94)	0.028
Number of MII oocytes	<i>n</i>	1.01 (0.96–1.07)	NS
Type of cycle	Donation versus autologous	2.19 (1.19–4.01)	0.011
Oocyte source	Fresh versus warmed	1.21 (0.72–2.04)	NS
Age	Years	0.93 (0.88–0.98)	0.006
Blastocyst morphology	Optimal versus not	1.20 (0.73–1.99)	NS
Blastocyst Hatching	Yes versus No	1.22 (0.77–1.95)	NS

OR is the odds ratio with 95% confidence intervals in brackets.

Hum. Reprod. Advance Access published September 9, 2015

Human Reproduction, Vol.0, No.0 pp. 1–8, 2015

doi:10.1093/humrep/dev216

human reproduction ORIGINAL ARTICLE Embryology

Collapse of blastocysts is strongly related to lower implantation success: a time-lapse study

Julian Marcos¹, Sonia Pérez-Albalá², Amparo Mifsud², Marta Molla¹, Jose Landeras¹, and Marcos Meseguer^{2,*}

¹IVI Murcia, Murcia, Spain ²IVI Valencia, Instituto Valenciano de Infertilidad, Universidad de Valencia, Plaza de la Policía Local, 3, Valencia 46015, Spain

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Focus on time-lapse analysis: blastocyst collapse and morphometric assessment as new features of embryo viability



BIOGRAPHY

Romualdo holds a BSc in biology and a master's degree in biotechnology. Since 1996, he has worked within research and clinical embryology across Europe, Australia, Canada and the Middle East. His current interests include embryo culture to the blastocyst stage, time-lapse technology and vitrification. He has published 25 peer-reviewed papers.

Romualdo Sciorio^{1,*}, Marcos Meseguer²

Spontaneous blastocyst collapse


Zygote

cambridge.org/zyg

Research Article

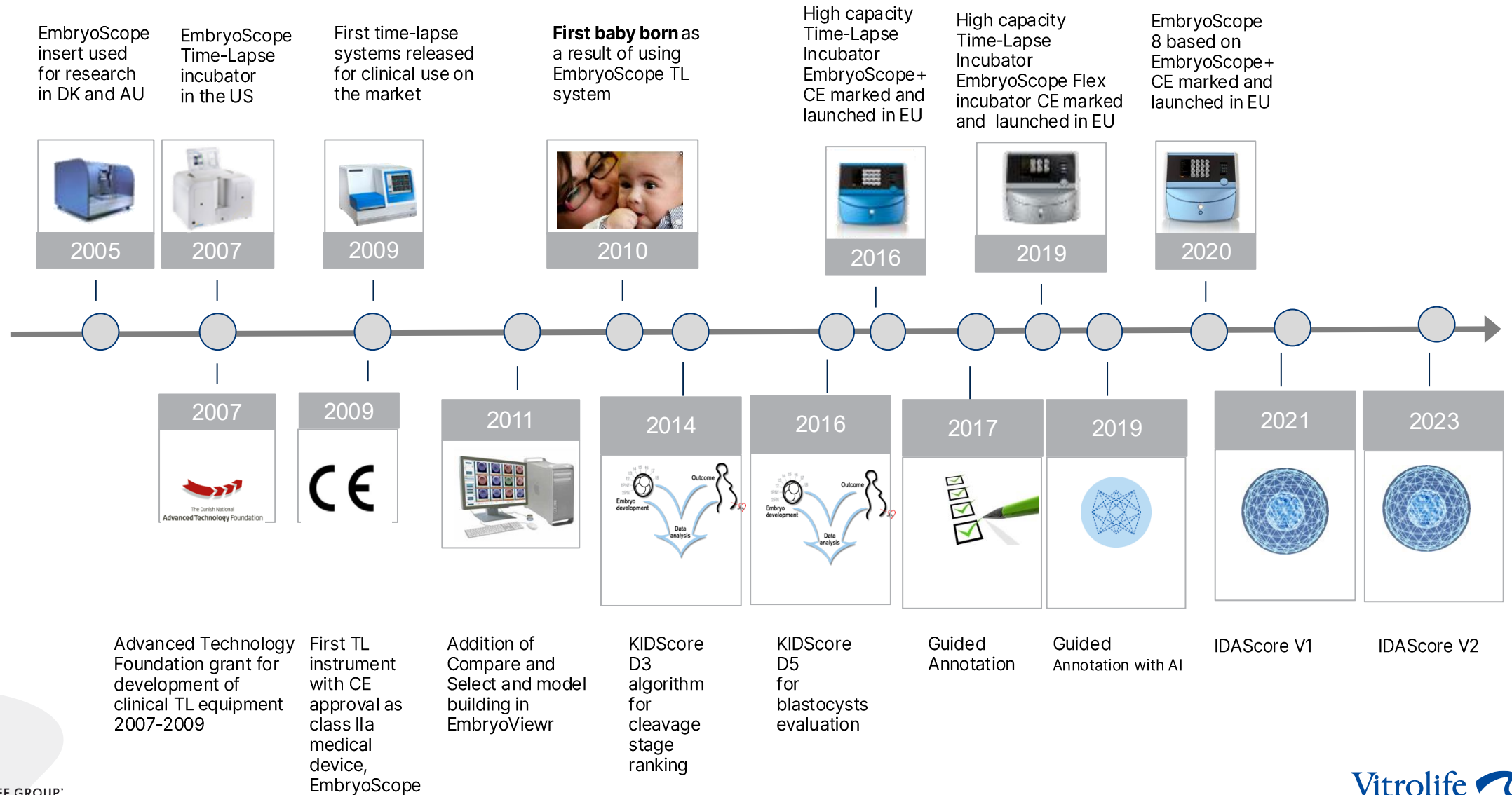
Cite this article: Sciorio R *et al.* (2020) Blastocyst collapse as an embryo marker of low implantation potential: a time-lapse multicentre study. *Zygote* page 1 of 9. doi: [10.1017/S0967199419000819](https://doi.org/10.1017/S0967199419000819)

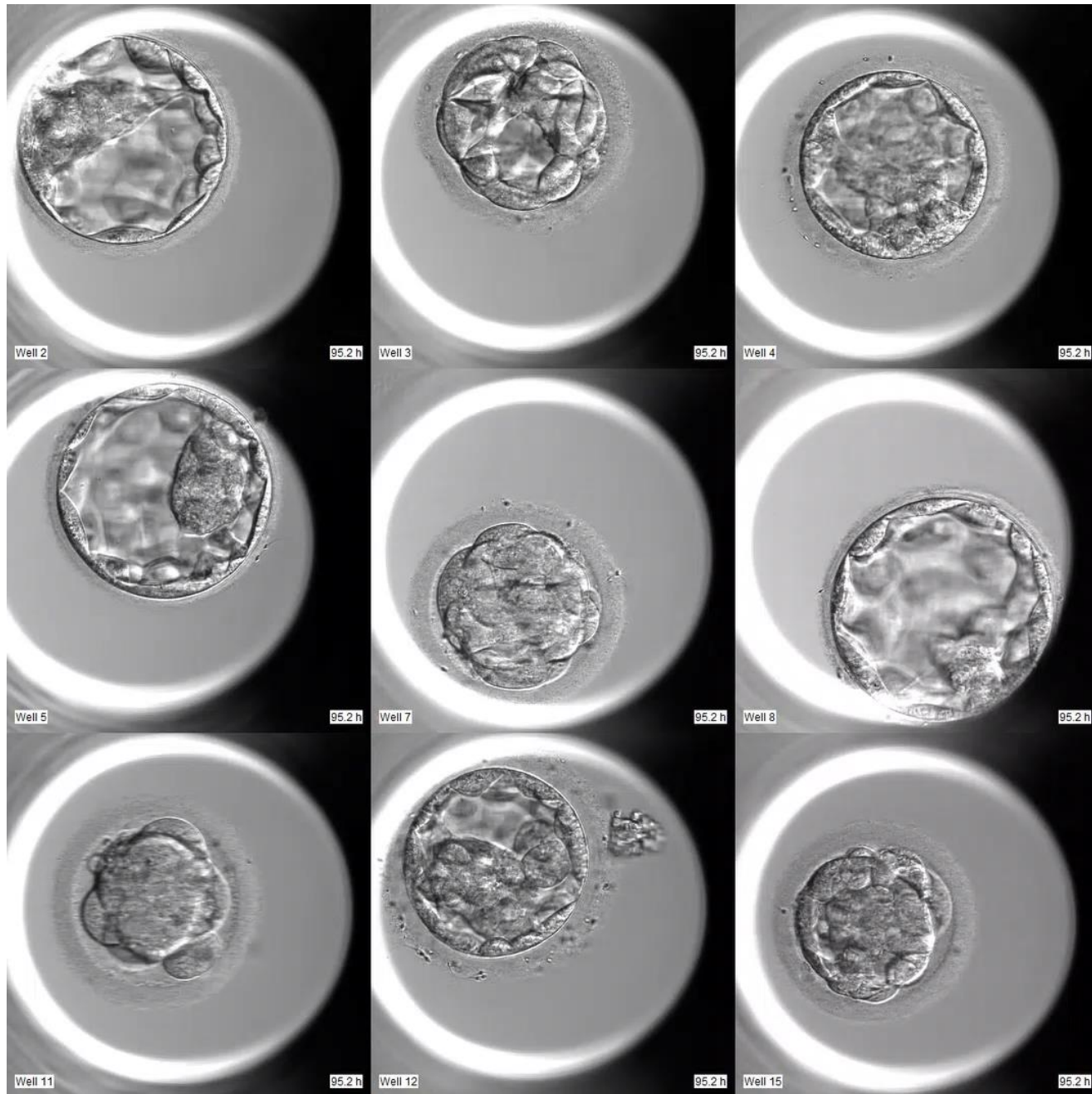
Blastocyst collapse as an embryo marker of low implantation potential: a time-lapse multicentre study

Romualdo Sciorio¹ , Raquel Herrer Saura², K. Joo Thong¹, Marga Esbert Algam³, Susan Jane Pickering¹ and Marcos Meseguer⁴

¹Edinburgh Assisted Conception Programme, EFREC, Royal Infirmary of Edinburgh, UK; ²IVIRMA Zaragoza, Poetisa María Zambrano, 31, 50018, Zaragoza, Spain; ³IVIRMA Barcelona, Ronda Gral. Mitre, 17, 08017 Barcelona, Spain and ⁴IVIRMA Valencia, Valencia, Spain

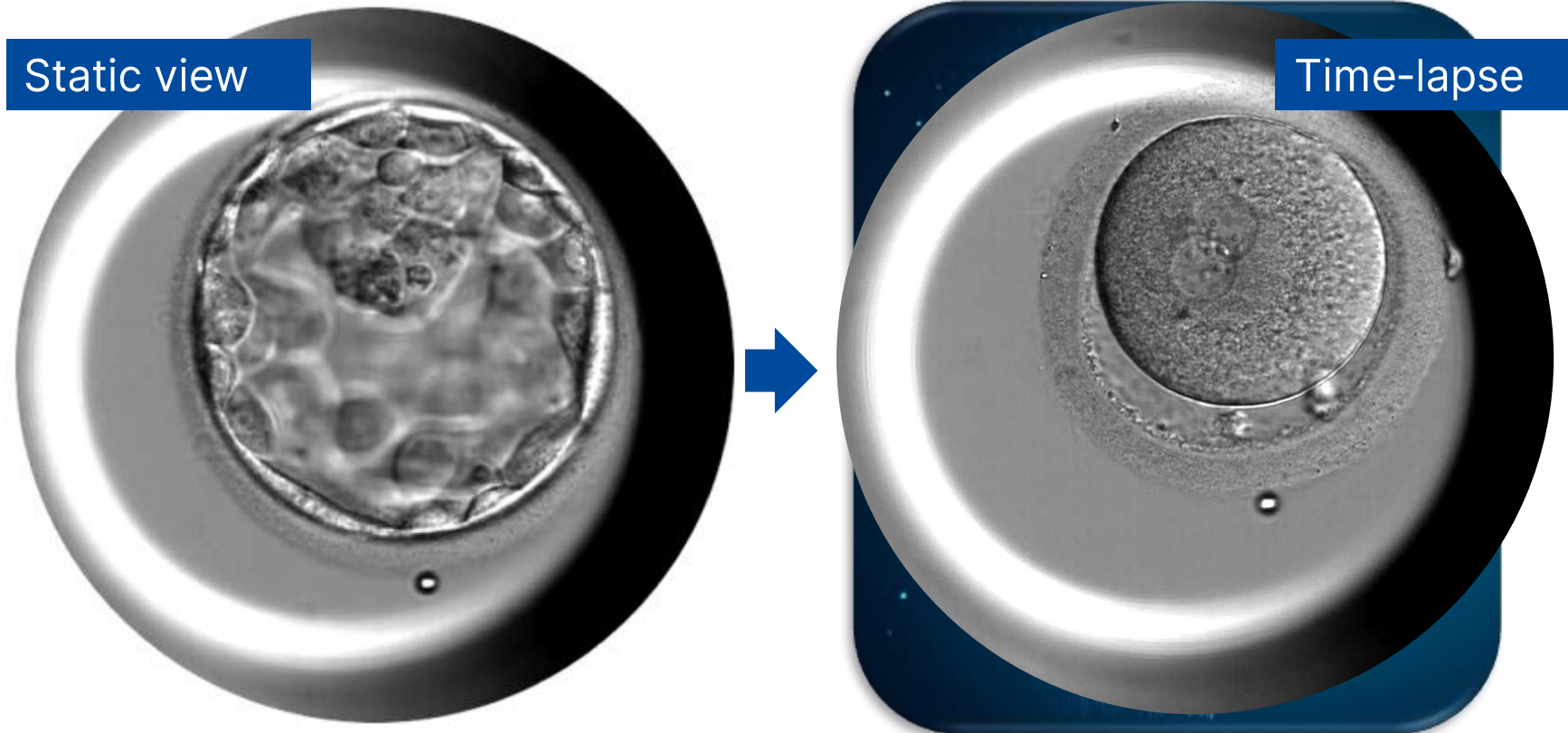
Vitrolife: Experience in time-lapse





Dynamic evaluation –
Observe entire development history

Time-lapse reveals embryo development



...and empowers AI-based embryo evaluation with application of deep learning and convolutional neural network (CNN)

Principles of iDAScore®



Time-lapse sequences are generated by EmbryoScope+ family of instruments



The iDAScore algorithm generates a score correlating with the likelihood of implantation



The embryologist may further inspect the embryos to make the final decision



Improving the evaluation process

- Consistent
- Objective
- Fully automated
- Reliable

iDAScore® : AI software developed with application of deep learning and convolutional neural network(CNN)

iDAScore® produces scores for blastocyst stage embryos (1-9.9)

Improved workflow efficiency

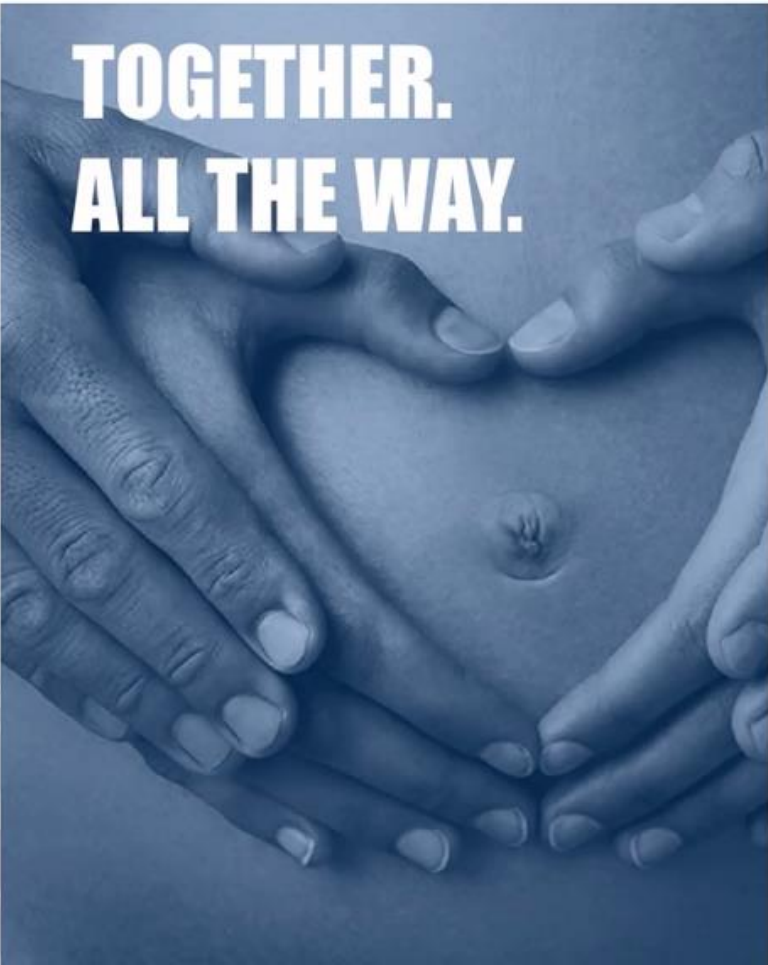
Improving the evaluation process with iDAScore®.

iDAScore provides a reliable ranking of all embryos, allowing you to use your time more efficiently in hands-on procedures.

- **Consistent**
- **Fully automated**
- **Objective**
- **Reliable**
- **No manual annotations needed**
- **Scoring is comparable across days and linearly reflect FHB likelihood.**
- **Decision support tool.**



TOGETHER.
ALL THE WAY.



Login

User name
admin I

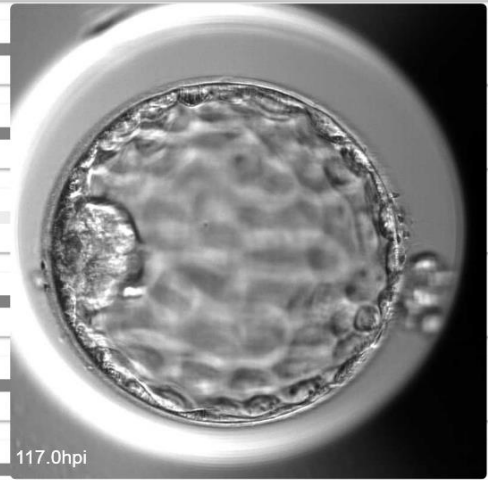
Password

Log in

Embryos

Make a Decision
Finalise

Embryo ↓	Score ↓	Fresh <input type="radio"/> All <input checked="" type="radio"/>	Pronuclei ↓	Decision ↓
AE-5	9.0	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-2	8.9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-4	8.8	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-8	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-10	8.6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-16	8.6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-5	8.5	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AE-2	8.4	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-3	8.3	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AA-15	7.9	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Why use AI to evaluate embryos?

- Subjectivity of embryologists
- Consistency between embryologists
- Time resource allocation
- Training



Workload



Fatigue



Emotions



Illness



Human error



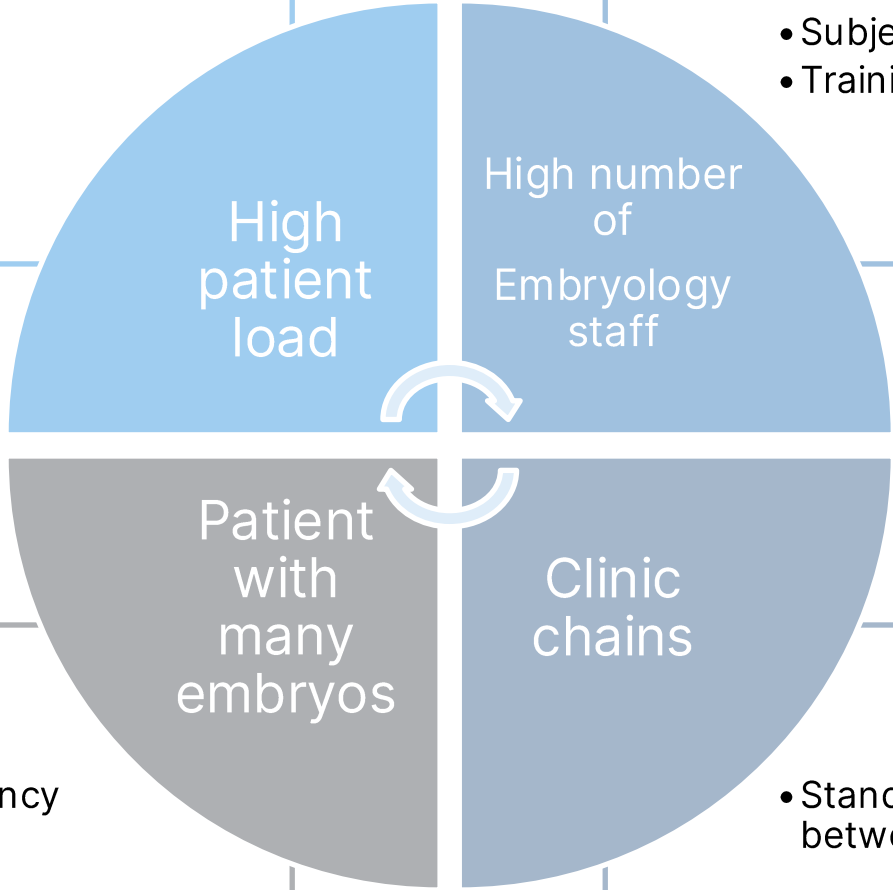
Experience
level

When is AI particularly useful?



- Resources and staffing

- Consistency
- Subjectivity
- Training level

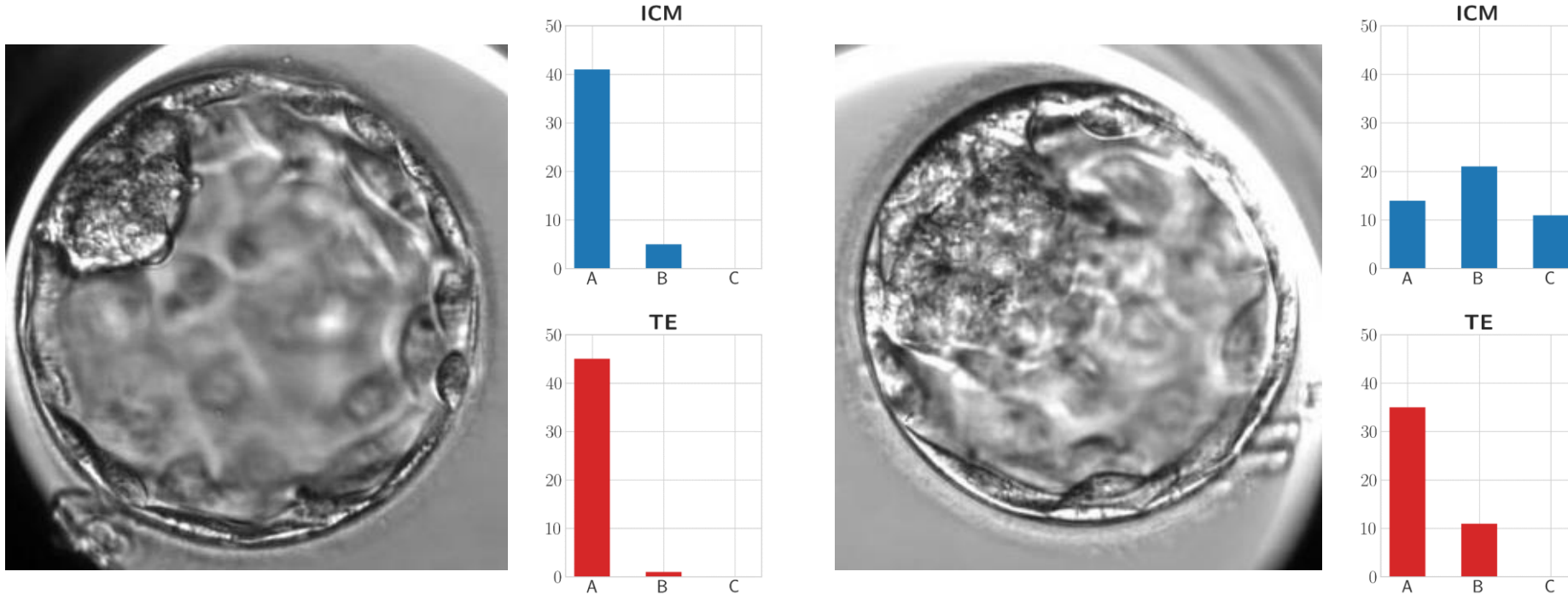


- Time
- Consistency

- Standardization between sites



Inter- and intra-observer variation



Similar studies: Richardson et al. (2015), Adolfsson et al. (2018)

Measuring the time assessing embryos

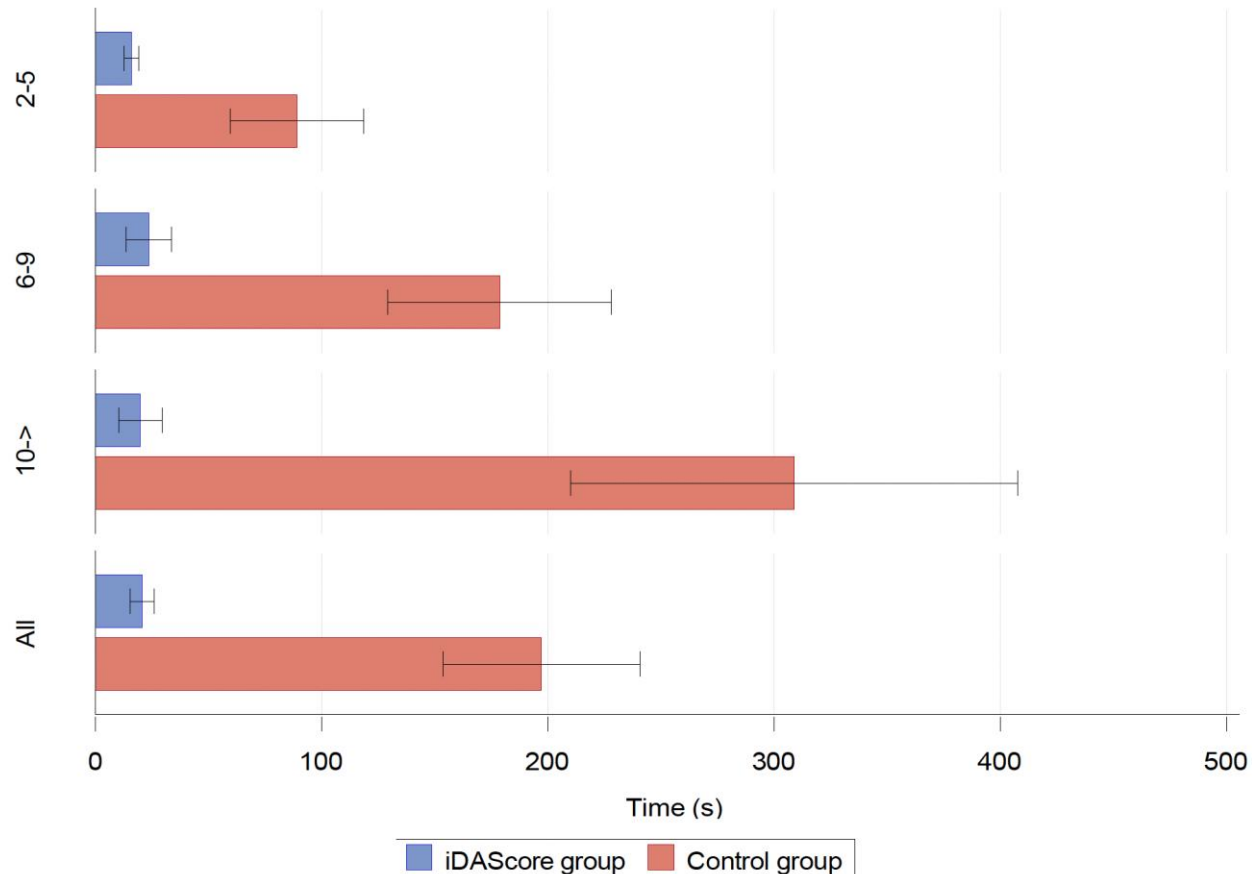
nature medicine

Article

<https://doi.org/10.1038/s41591-024-03>

Deep learning versus manual morphology-based embryo selection in IVF: a randomized, double-blind noninferiority trial

~10-fold
reduction in time required



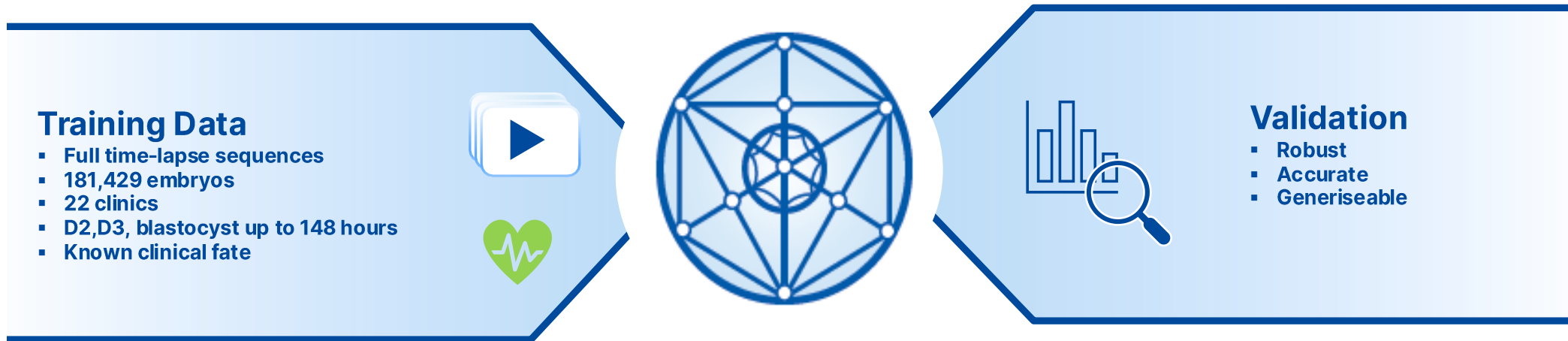
Illingworth PJ, Gardner DK, Berntsen J, Larman MG, et al. Nat Med 2024 Nov 30(11): 3114-20

Time use for day 5 evaluation in the iDAScore group and control group

iDAScore® development



Trained on a large database of full time-lapse sequences



181,429
Embryos



22
Clinics



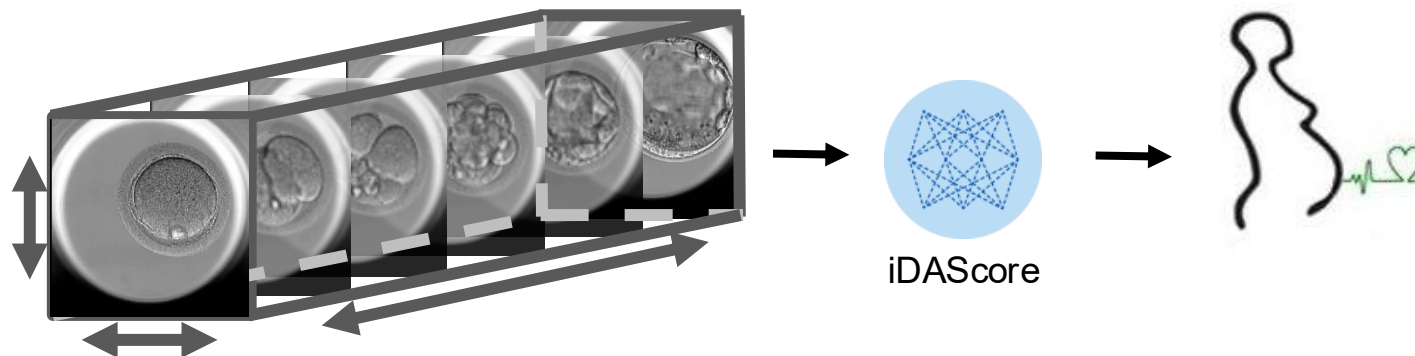
33,688
KID embryos*



INTERNATIONAL
Data

Data Foundation – iDAScore® v2

	iDAScore v1	iDAScore v2			
	Day 5	Day 2	Day 3	Day 5	Total
Clinics	18	9	10	21	22
Embryos	115,832	24,627	23,566	133,235	181,429
FHB+	4,337	1,711	1,269	5,485	8,465
FHB-	10,307	8,260	5,685	11,277	25,223
Discards	101,188	14,656	16,612	116,473	147,741



Data diversity



Frozen and fresh transfers



ICSI and regular IVF



Gamete origin



Different ages



Day of transfer



Different media protocols



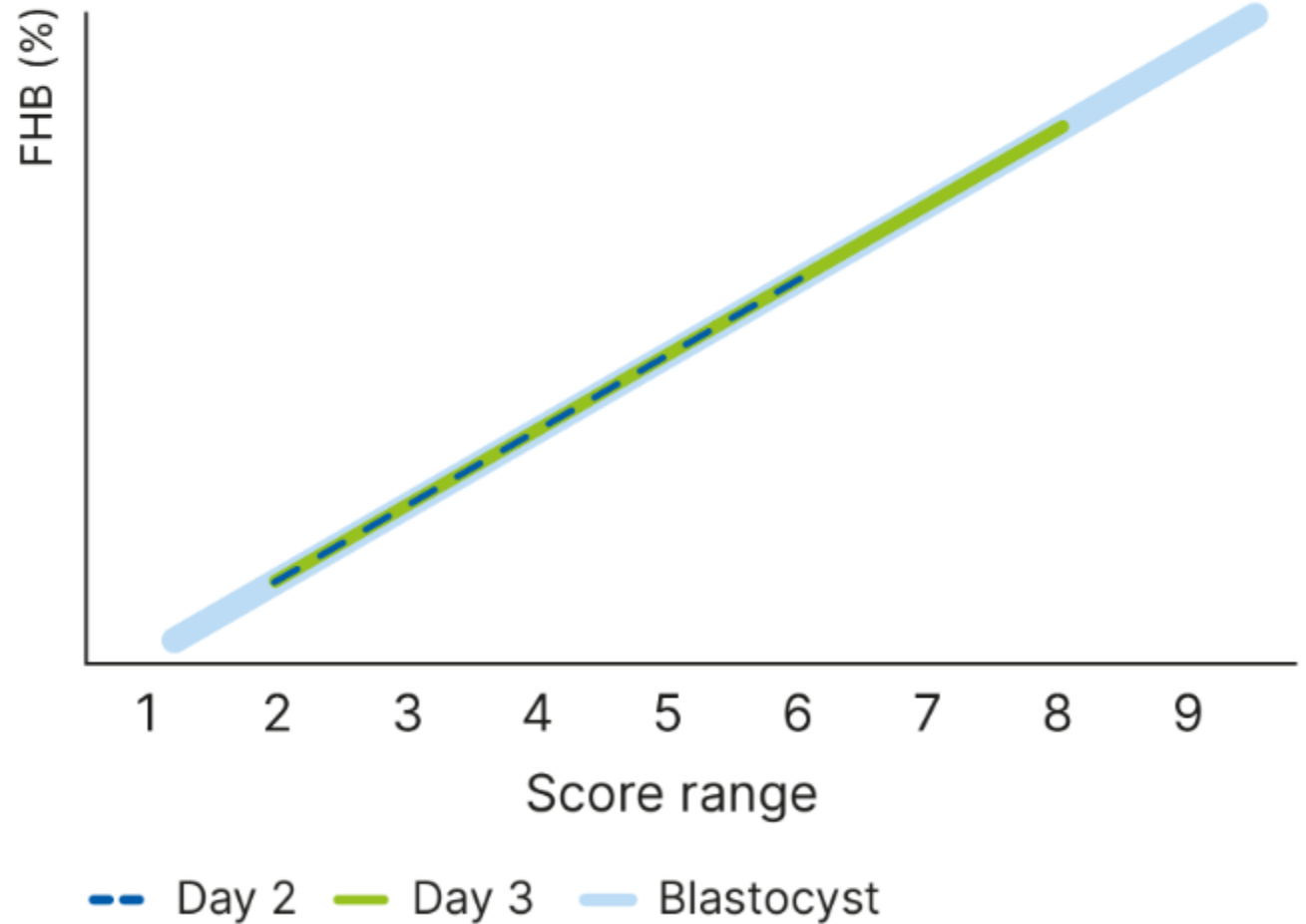
International data

Note

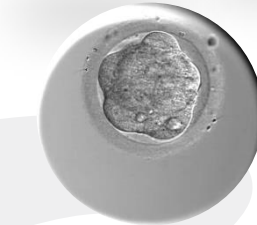
With iDAScore v2, embryos evaluated on day 2 and day 3 will generally not reach scores above 6 and 8, respectively.

Scores reflect the fact that transfer at cleavage stage has lower success rates.

Score Distribution iDAScore



Conceptualized idea of how it works



Validation



Internal Validation

PLOS ONE

RESEARCH ARTICLE

Robust and generalizable embryo selection based on artificial intelligence and time-lapse image sequences

Jørgen Berntsen^{1*}, Jens Rimestad¹, Jacob Theilgaard Lassen¹, Dang Tran², Mikkel Fly Kragh^{1,3}

scientific reports

OPEN

Development and validation of deep learning based embryo selection across multiple days of transfer

Jacob Theilgaard Lassen¹, Mikkel Fly Kragh, Jens Rimestad, Martin Nygård Johansen & Jørgen Berntsen

External Validation

Fertility and Sterility
Available online 15 October 2024
In Press, Corrected Proof

Cohort study

External validation of a fully automated evaluation tool: a retrospective analysis of 68,471 scored embryos

Lorena Bori Ph.D., Marco Toschi Ph.D., Rebeca Esteve M.Sc., Arantxa Delgado Ph.D., Antonio Pellicer M.D., Marcos Meseguer Ph.D.

Journal of Assisted Reproduction and Genetics
<https://doi.org/10.1007/s10815-023-02871-3>

ASSISTED REPRODUCTION TECHNOLOGIES

Comparing performance between clinics of an embryo evaluation algorithm based on time-lapse images and machine learning

Martin N. Johansen¹, Erik T. Parner², Mikkel F. Kragh^{1,3}, Keiichi Kato⁴, Satoshi Ueno⁴, Stefan Palm⁵, Manuel Kernbach⁵, Başak Balaban⁶, İpek Keleş⁷, Anette V. Gabrielsen⁸, Lea H. Iversen⁸, Jørgen Berntsen¹

RESEARCH **Open Access**

Associations between the artificial intelligence scoring system and live birth outcomes in preimplantation genetic testing for aneuploidy cycles

Chun-I Lee^{1,2,3,4}, Chun-Chia Huang^{1,4}, Tsung-Hsien Lee^{1,2,3}, Hsiu-Hui Chen^{1,4}, En-Hui Cheng^{1,4}, Pin-Yao Lin^{1,4}, Tzu-Ning Yu¹, Chung-I Chen¹, Chien-Hong Chen^{1,4,1} and Maw-Sheng Lee^{1,2,3,4}

RBMO

ARTICLE

Association between a deep learning-based scoring system with morphokinetics and morphological alterations in human embryos

BIOGRAPHY
Kenji Ezen is a senior scientist at the R&D laboratory of the Kato Ladies Clinic in Tokyo, Japan. He obtained his PhD degree in agriculture from the Tokyo University of Agriculture and Technology in 2016. His research interests include embryology, cryopreservation and endometrial receptivity during the implantation process.

Kenji Ezen, Kiyoe Shimazaki, Tetsuya Maki, Tsubasa Takahashi, Yoko Tanemura, Ayumi Awagiri, Ayano Sawada, Hikari Akaike, Mai Megi, Shigeru Kaneko, Tadashi Okimura, Keiichi Kato

Journal of Assisted Reproduction and Genetics
<https://doi.org/10.1007/s10815-021-02254-6>

EMBRYO BIOLOGY

Embryo selection with artificial intelligence: how to evaluate and compare methods?

Mikkel Fly Kragh^{1,2} · Henrik Karstoft¹

RBMO

ARTICLE

External validation of a model for selecting day 3 embryos for transfer based upon deep learning and time-lapse imaging

BIOGRAPHY
Jiahong Zhu graduated from Chongqing Medical University, Chongqing, China. She has been engaged in reproductive medicine for more than 5 years at Chongqing Health Centre for Women and Children, mainly responsible for embryo selection, and embryo freezing and thawing procedures. Her current research interests include artificial intelligence in reproductive medicine and embryo evaluation.

Jiahong Zhu^{1,2}, Lihong Wu^{1,2}, Junzhi Liu^{1,2}, Yanyang Liang^{1,2}, Jinyi Zou^{1,2}, Xiangwei Hao^{1,2}, Guoning Huang^{1,2,3}, Wei Hua^{1,2,3}

RBMO

ARTICLE

Does embryo categorization by existing artificial intelligence, morphokinetic or morphological embryo selection models correlate with blastocyst ploidy rates?

BIOGRAPHY
Dr. Keiichi Kato, MD, PhD, is General Director at the Kato Ladies Clinic in Tokyo, Japan. Dr. Kato earned his MD and PhD from the University of Kanazawa. His main research interests are natural cycle and minimal stimulation IVF to deliver safe, effective and patient-friendly ART.

Keiichi Kato^{1*}, Satoshi Ueno¹, Jørgen Berntsen¹, Mikkel Fly Kragh¹, Tadashi Okimura¹, Tomoko Kurachi

Journal of Assisted Reproduction and Genetics
<https://doi.org/10.1007/s10815-022-02562-5>

ASSISTED REPRODUCTION TECHNOLOGIES

Correlation between an annotation-free embryo scoring system based on deep learning and live birth/neonatal outcomes after single vitrified-warmed blastocyst transfer: a single-centre, large-cohort retrospective study

Satoshi Ueno¹ · Jørgen Berntsen² · Motoki Ito¹ · Tadashi Okimura¹ · Keiichi Kato¹

Journal of Clinical Medicine

Article

Towards Automation in IVF: Pre-Clinical Validation of a Deep Learning-Based Embryo Grading System during PGT-A Cycles

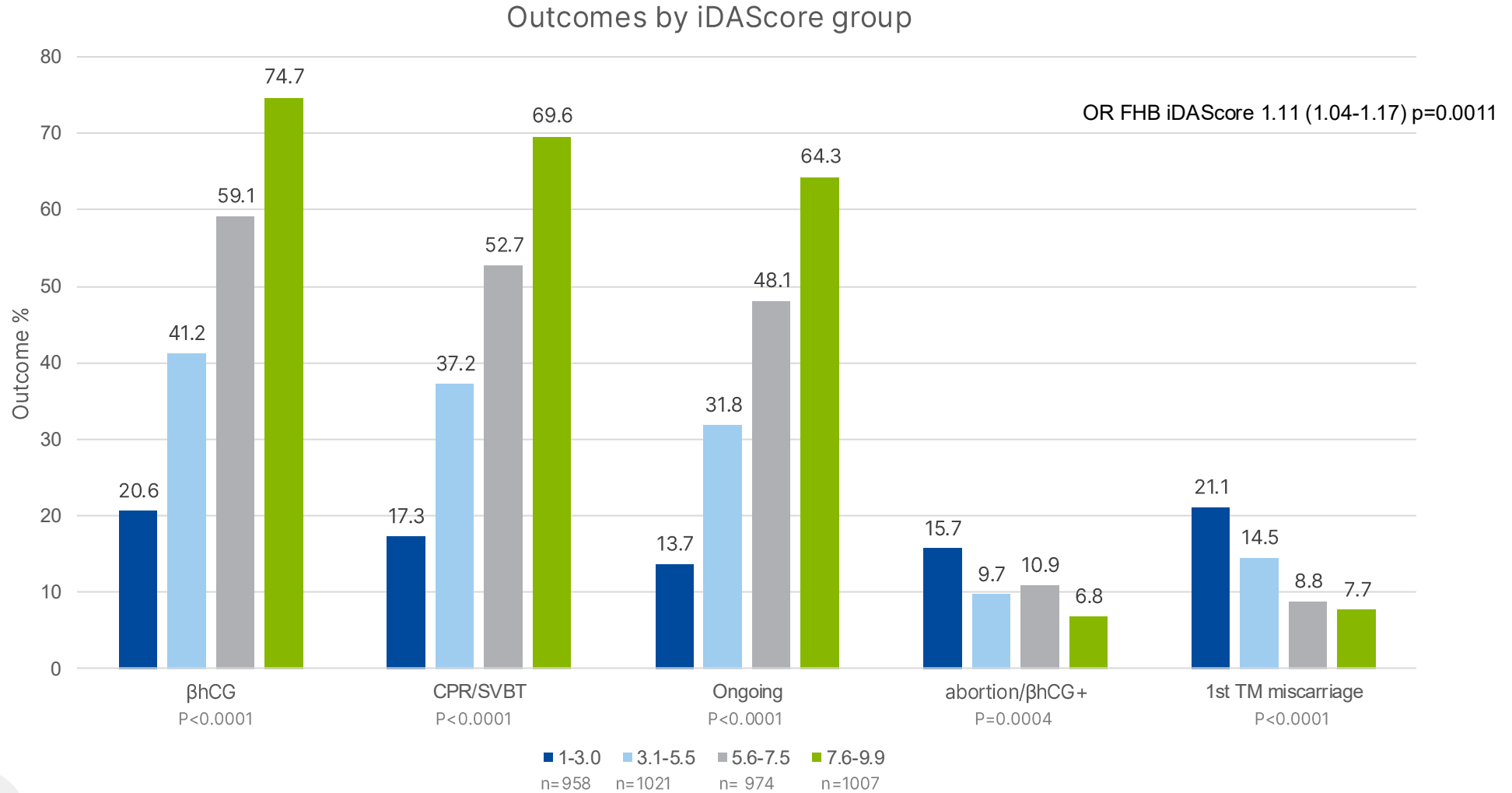
Danilo Cimadomo^{1,*}, Viviana Chiappetta¹, Federica Innocenti¹, Gaia Saturno², Marilena Taggi², Anabella Marconetto³, Valentina Casciani¹, Laura Albricci¹, Roberta Maggialli¹, Giovanni Cotichio⁴, Aisling Ahlström⁵, Jørgen Berntsen⁶, Mark Larman⁷, Andrea Borini⁴, Alberto Vaiarelli¹, Filippo Maria Ubaldi¹ and Laura Rienzi^{1,8}

Pregnancy prediction performance of an annotation-free embryo scoring system on the basis of deep learning after single vitrified-warmed blastocyst transfer: a single-center large cohort retrospective study

Satoshi Ueno, Ph.D., Jørgen Berntsen, M.Sc., Motoki Ito, M.Sc., Kazuo Uchiyama, M.T., Tadashi Okimura, B.Sc., Akiko Yabuuchi, Ph.D., and Keiichi Kato, M.D., Ph.D.*

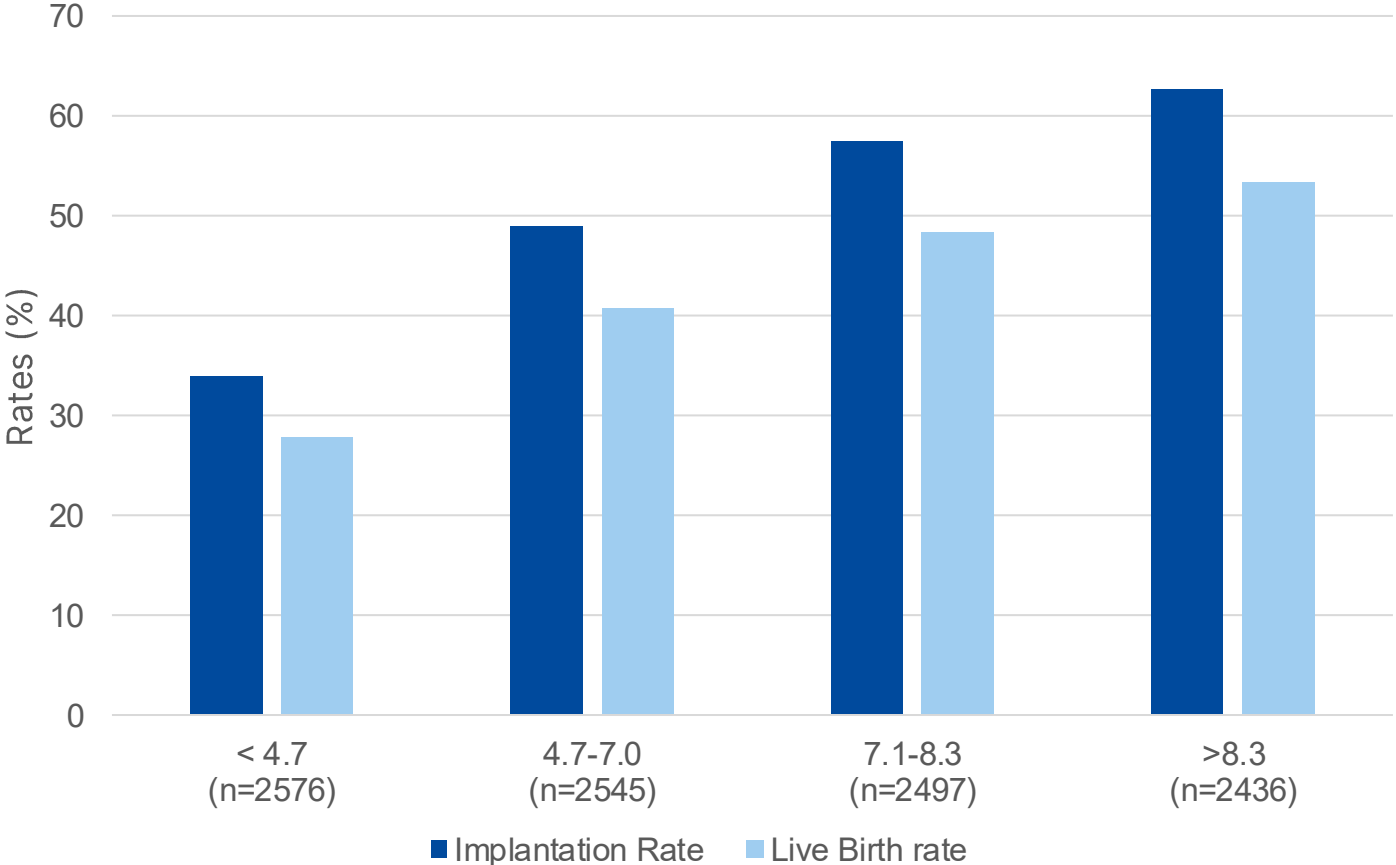
*Kato Ladies Clinic, Tokyo, Japan, and Vitrolife, Aarhus, Denmark

iDAScore[®] correlates with clinical outcomes



External validation iDAScore®, IVI Valencia, Spain

Clinical outcome day 5 transfers (n=10,054)



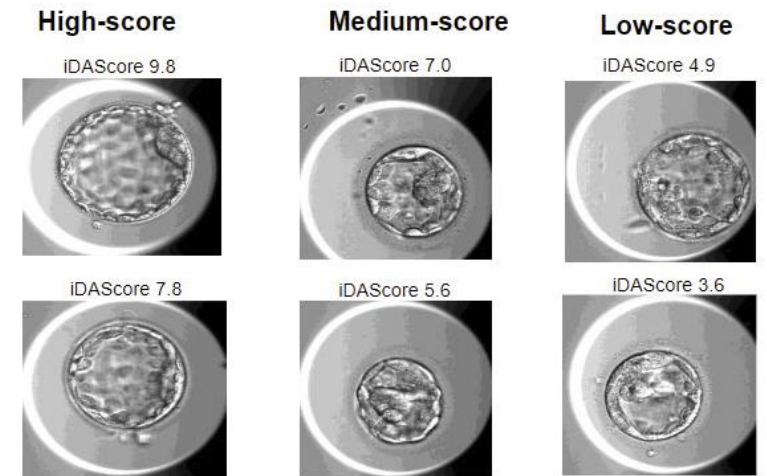
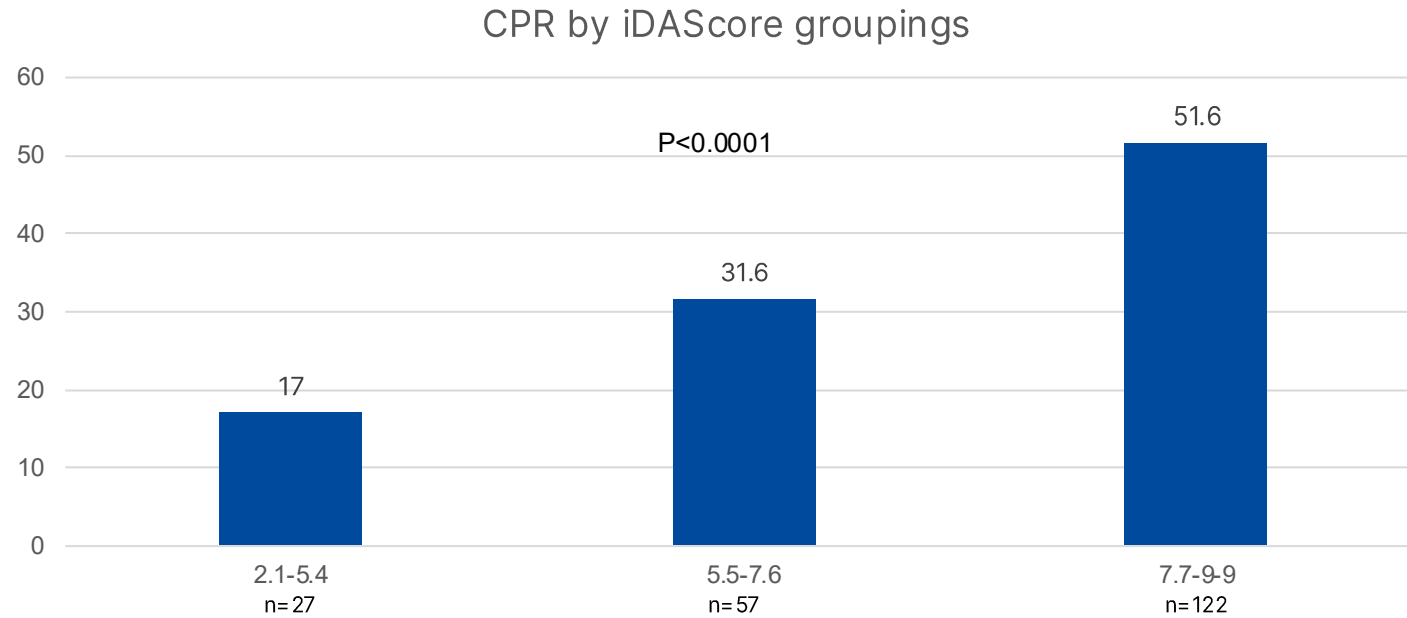
Journal Pre-proof

External validation of a fully automated evaluation tool: a retrospective analysis on 68,471 scored embryos.

Lorena Bori, PhD, Marco Toschi, MSc, Rebeca Esteve, MSc, Arantza Delgado, PhD, Antonio Pellicer, M.D, Marcos Meseguer, PhD



Correlation between iDAScore[®] and clinical pregnancy rate in SVBT*



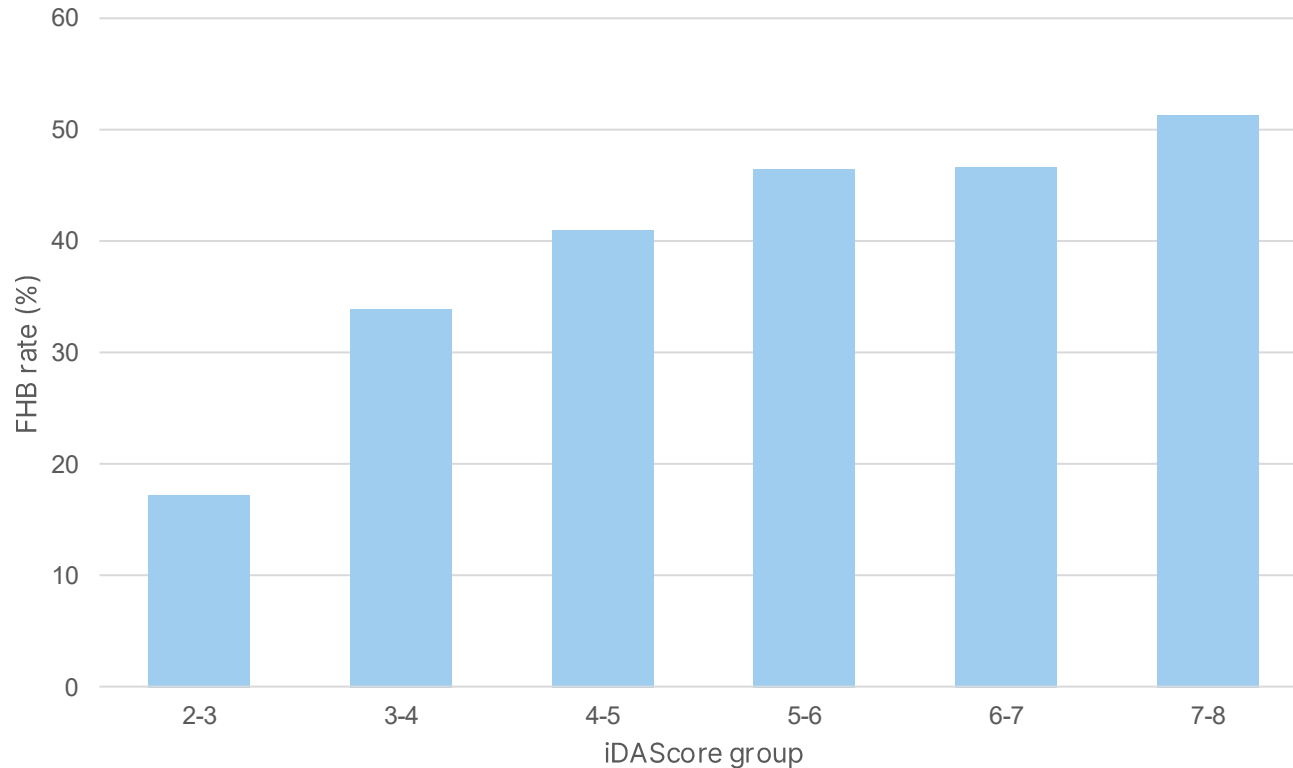
Wider implications of the findings:

Our results indicate that iDAScore may be a strong predictor of pregnancy and could be used as a complementary tool to the Gardner embryo grading system in the decision-making process of which blastocyst to transfer.




*single vitrified blastocyst transfer

External Validation iDAScore® v2, Chongqing, China

FHB with day 3 transfers by score (n=7,786)




Included 870 SET and 6916 DET with KID



ARTICLE

External validation of a model for selecting day 3 embryos for transfer based upon deep learning and time-lapse imaging



BIOGRAPHY
Jiahong Zhu graduated from Chongqing Medical University, Chongqing, China. She has been engaged in reproductive medicine for more than 8 years at Chongqing Health Centre for Women and Children, mainly responsible for embryo selection, and embryo freezing and thawing procedures. Her current research interests include artificial intelligence in reproductive medicine and embryo evaluation.

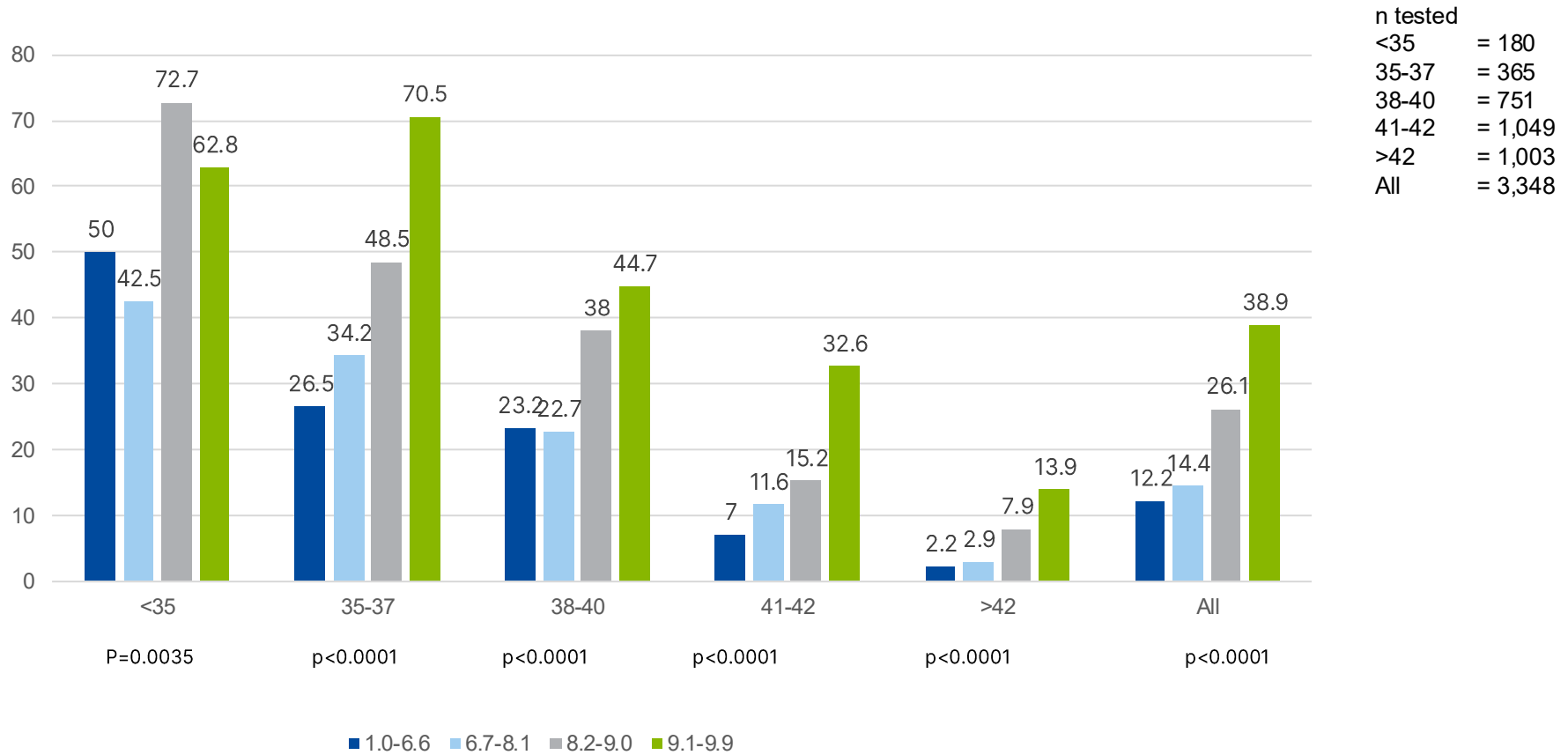
Jiahong Zhu^{1,2}, Lihong Wu^{1,2}, Junxia Liu^{1,2}, Yanfeng Liang^{1,2}, Jiayi Zou^{1,2}, Xiangwei Hao^{1,2}, Guoning Huang^{1,2,*}, Wei Han^{1,2,*}

Correlation with morphology- morphokinetic and ploidy



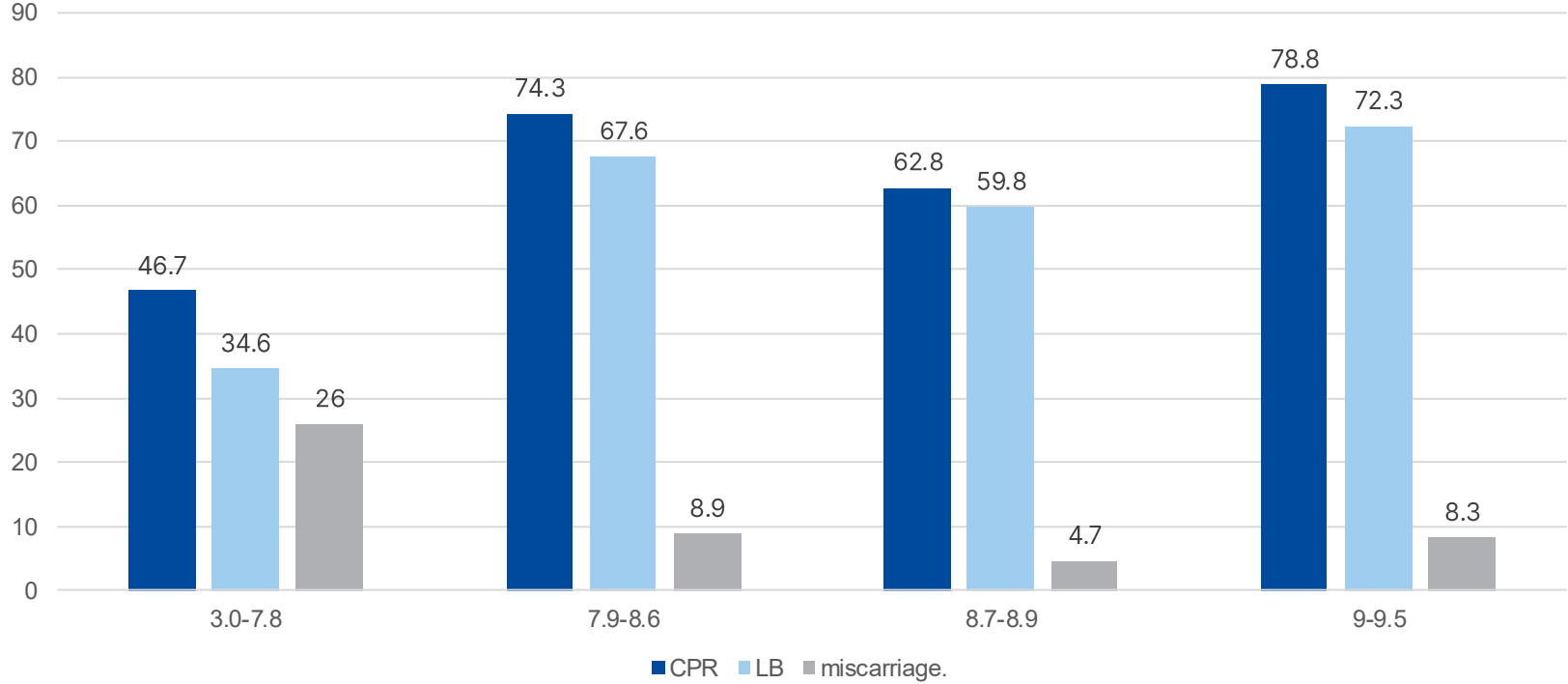
iDAScore[®] groupings are correlated with euploidy rate

iDAScore group and euploidy% stratified by age

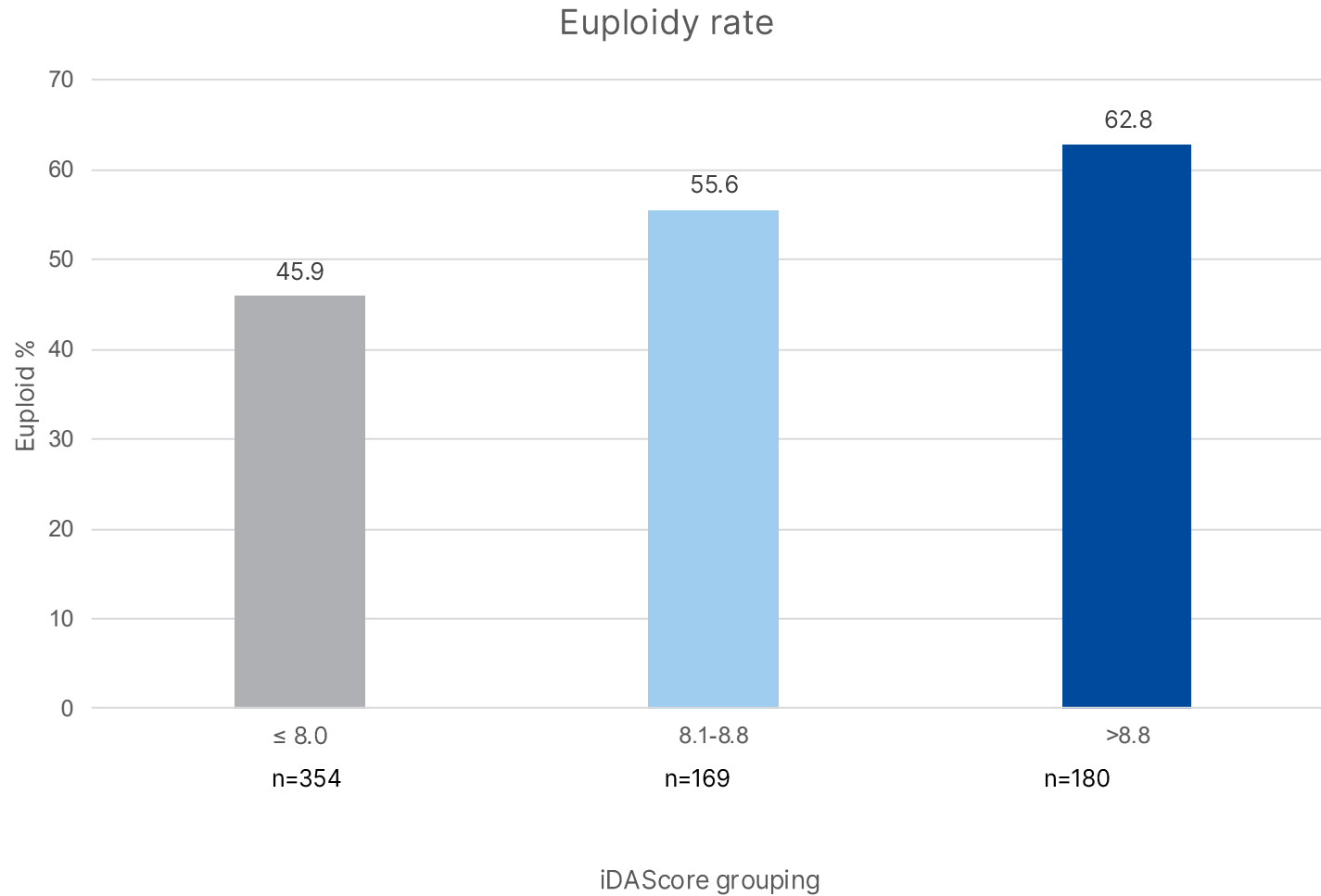


iDAScore® for selecting among euploid embryos

Clinical outcomes by iDAScore group of PGT tested transferred embryos

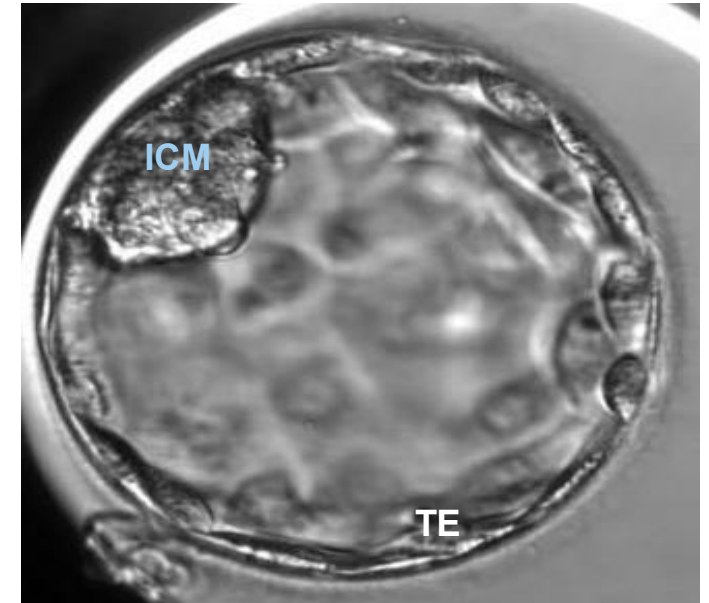
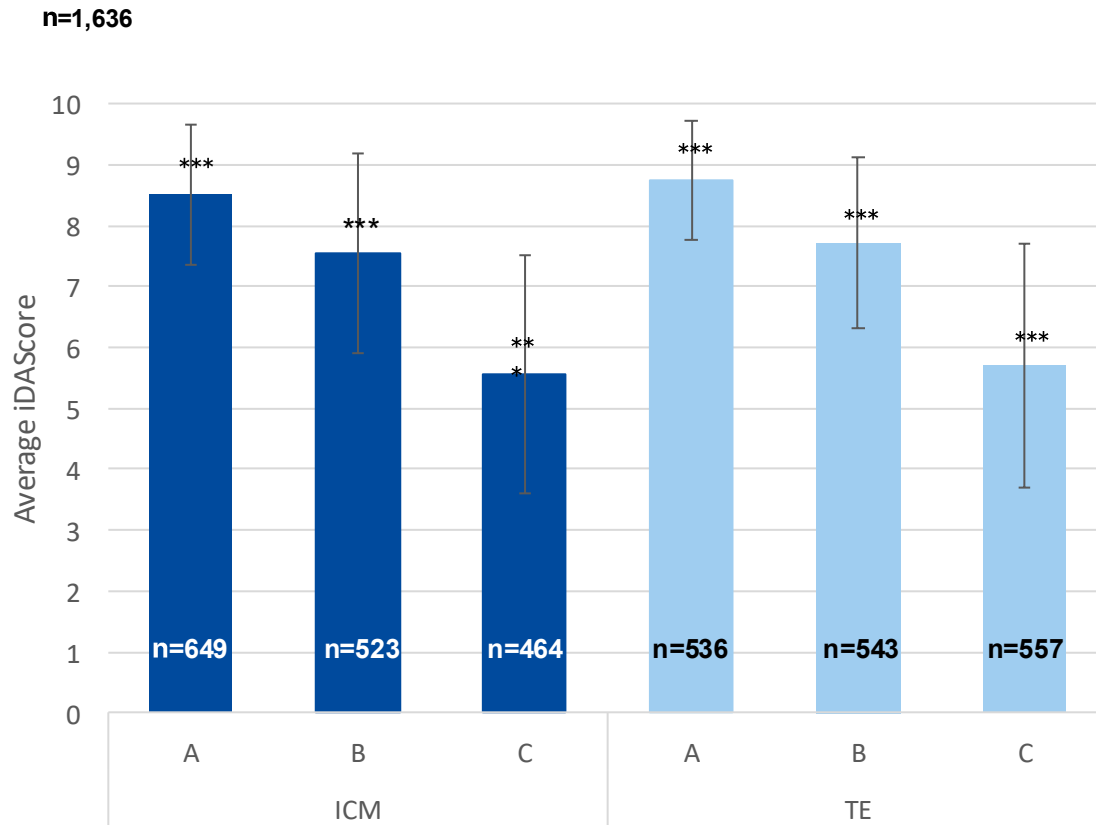


Euploidy rate increases with higher iDAScore®



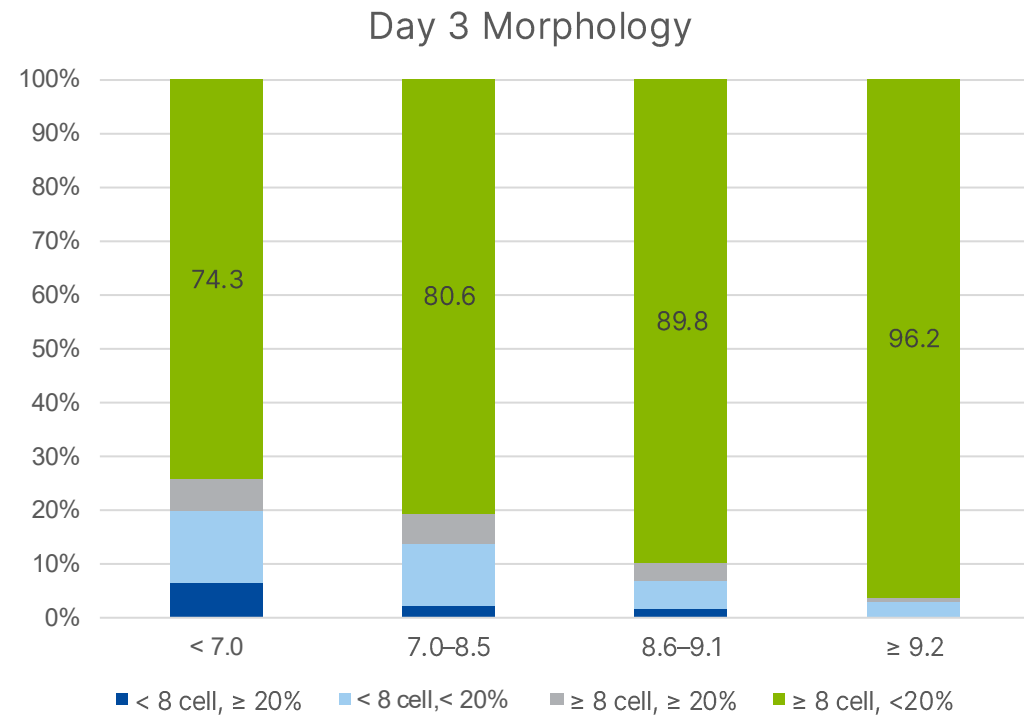
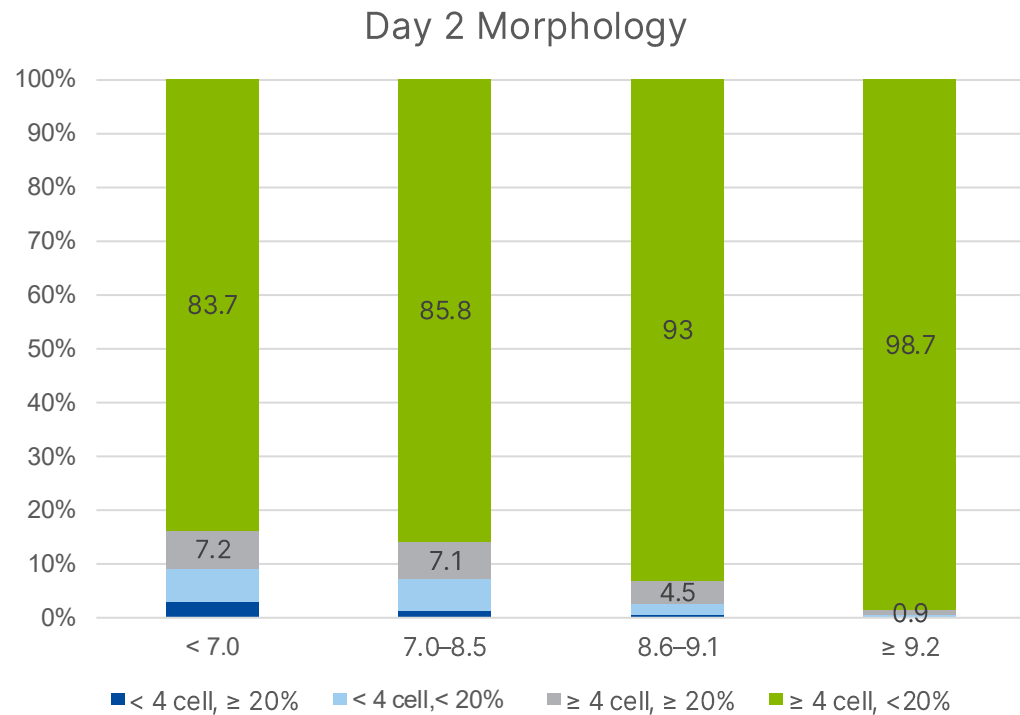
Bori et al. (2022) Embryo assessment at the click of a button is now possible: evaluation of a deep-learning algorithm integrated directly with the time-lapse platform *Human Reproduction*, Volume 37, Issue Supplement_1, July 2022, deac107.201,

iDAScore[®] is related to blastocyst quality Gardner score



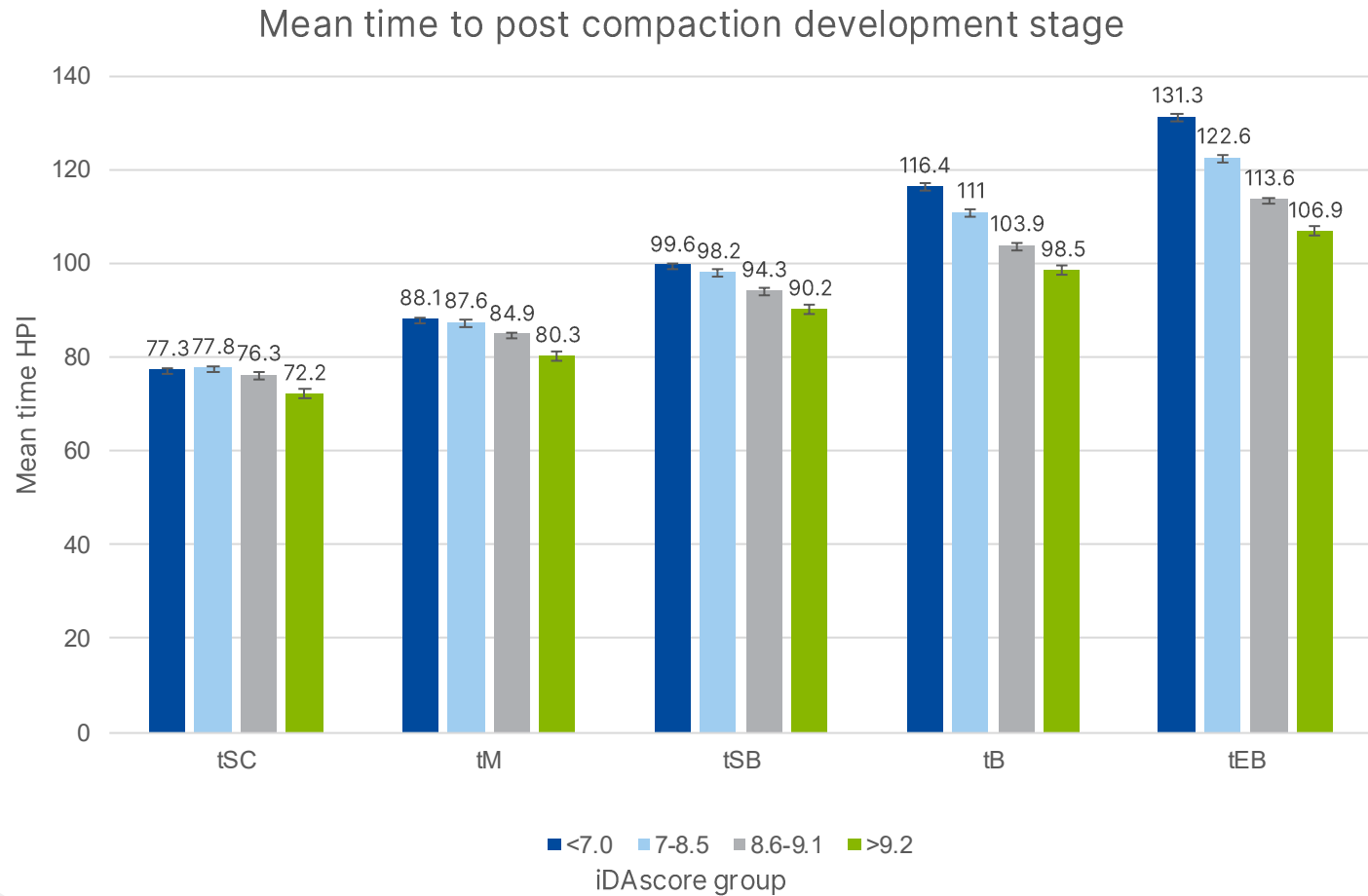
Berntsen et al. (2022) Robust and generalizable embryo selection based on artificial intelligence and time-lapse image sequences PLoS ONE 17(2): e0262661

iDAScore[®] correlated to cleavage stage and fragmentation



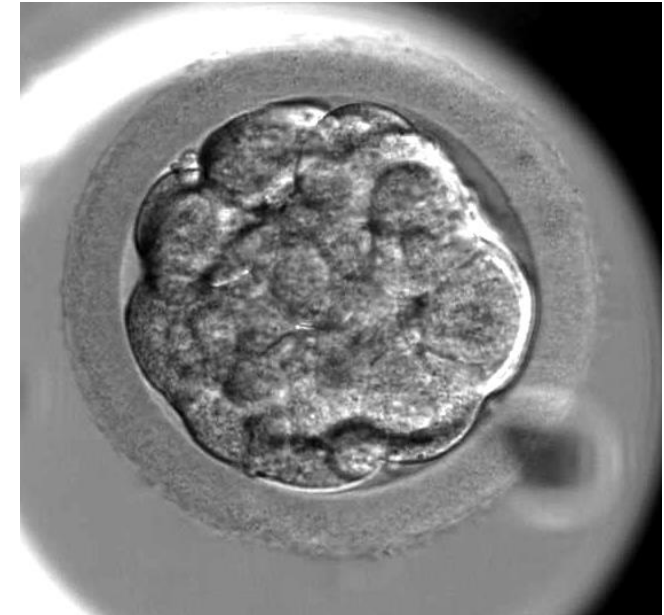
Ezoe et al. Association of a deep learning-based scoring system with morphokinetics and morphological alterations in human embryos. RBMOnline 2022, 45(6) 1124-1132

Higher iDAScore® blastocysts have a faster development

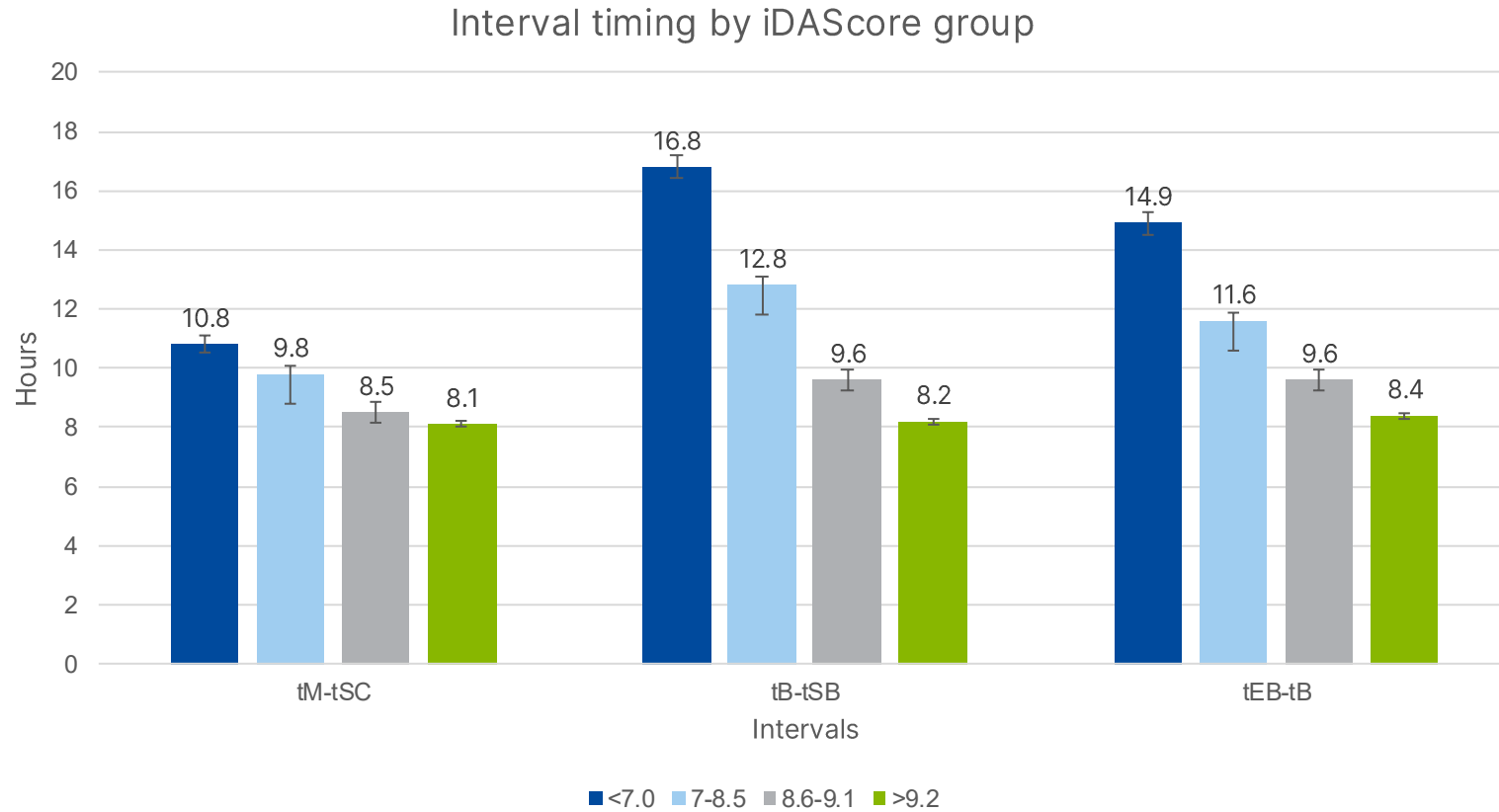


n=1,503 blastocysts analyzed

p<0.0001 for each morphokinetic variable
 n=1,503 blastocysts analyzed



iDAScore[®] correlates with morphokinetic intervals



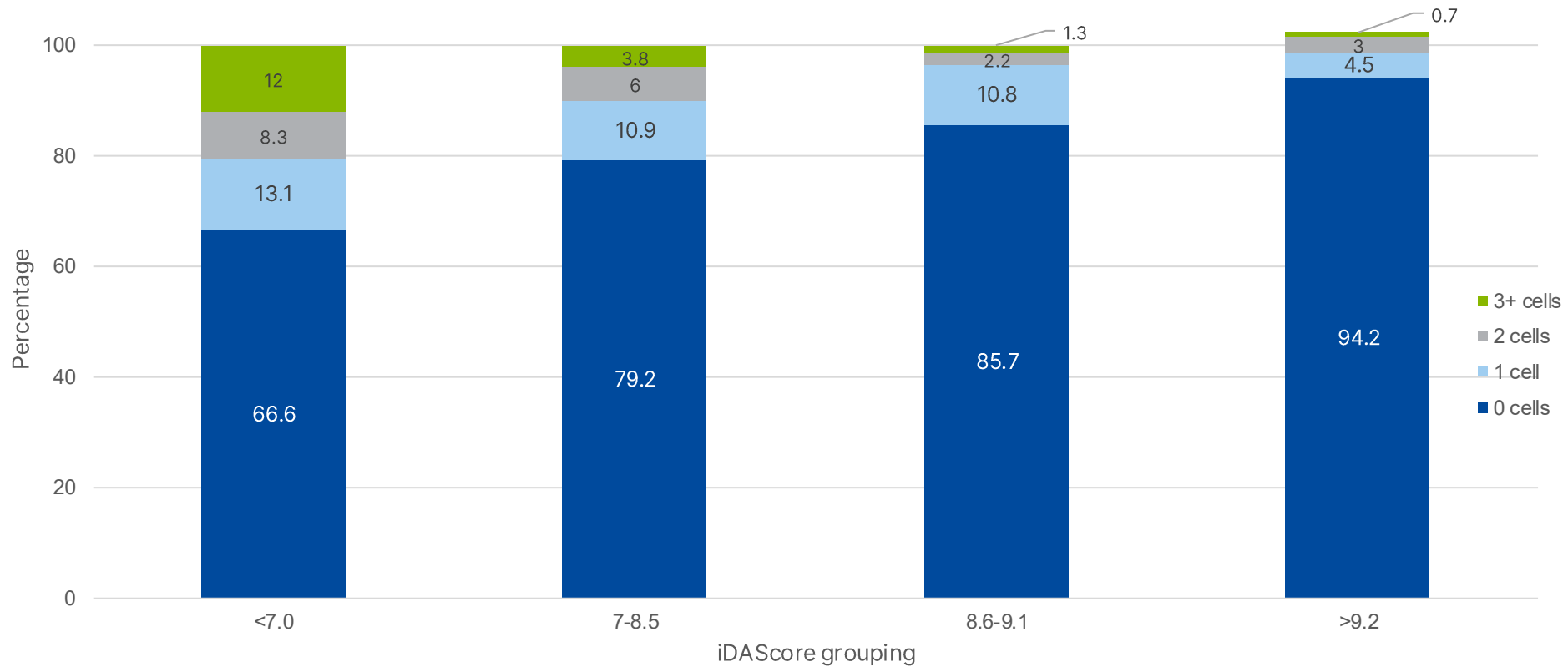
n=1,503 blastocysts analysed

p<0.0001 for each morphokinetic interval

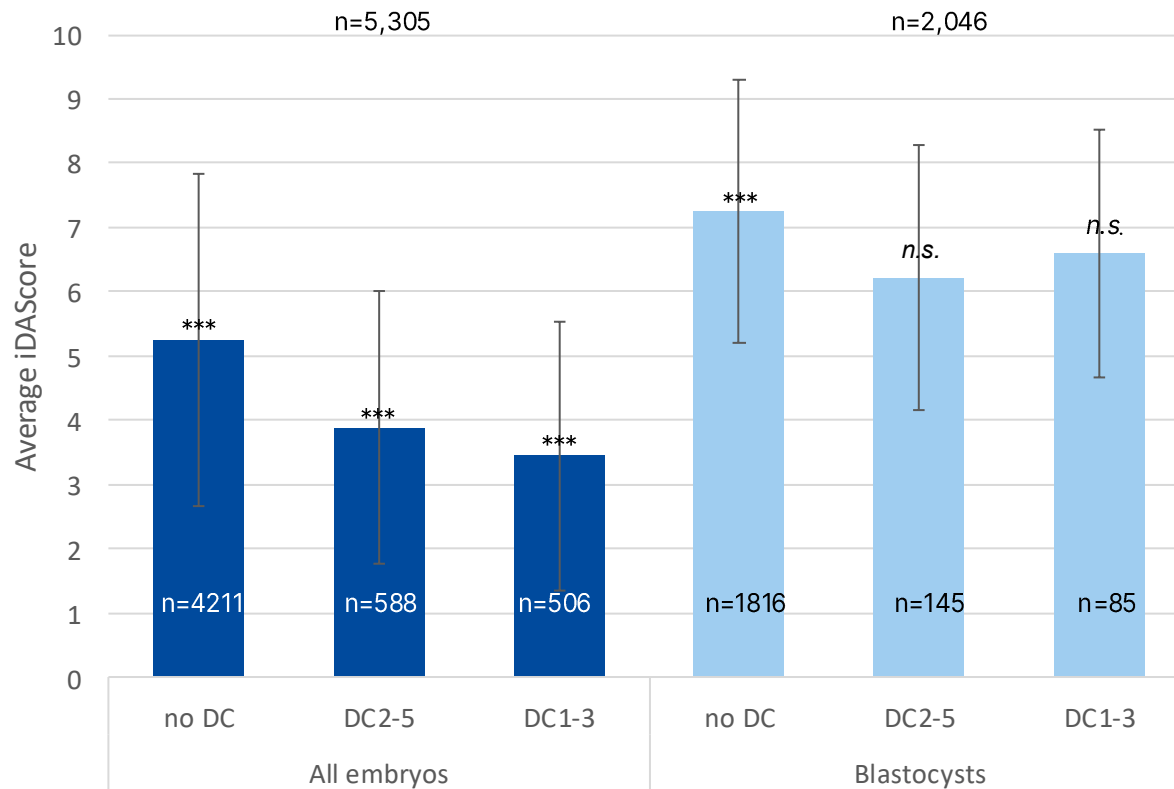
Ezoe et al. Association of a deep learning-based scoring system with morphokinetics and morphological alterations in human embryos. RBMOnline 2022, 45(6) 1124-1132

Blastocysts with higher iDAScore[®] have fewer cell extruded

Percentage of blastocysts with cells extruded post compaction



iDAScore® related to direct cleavages

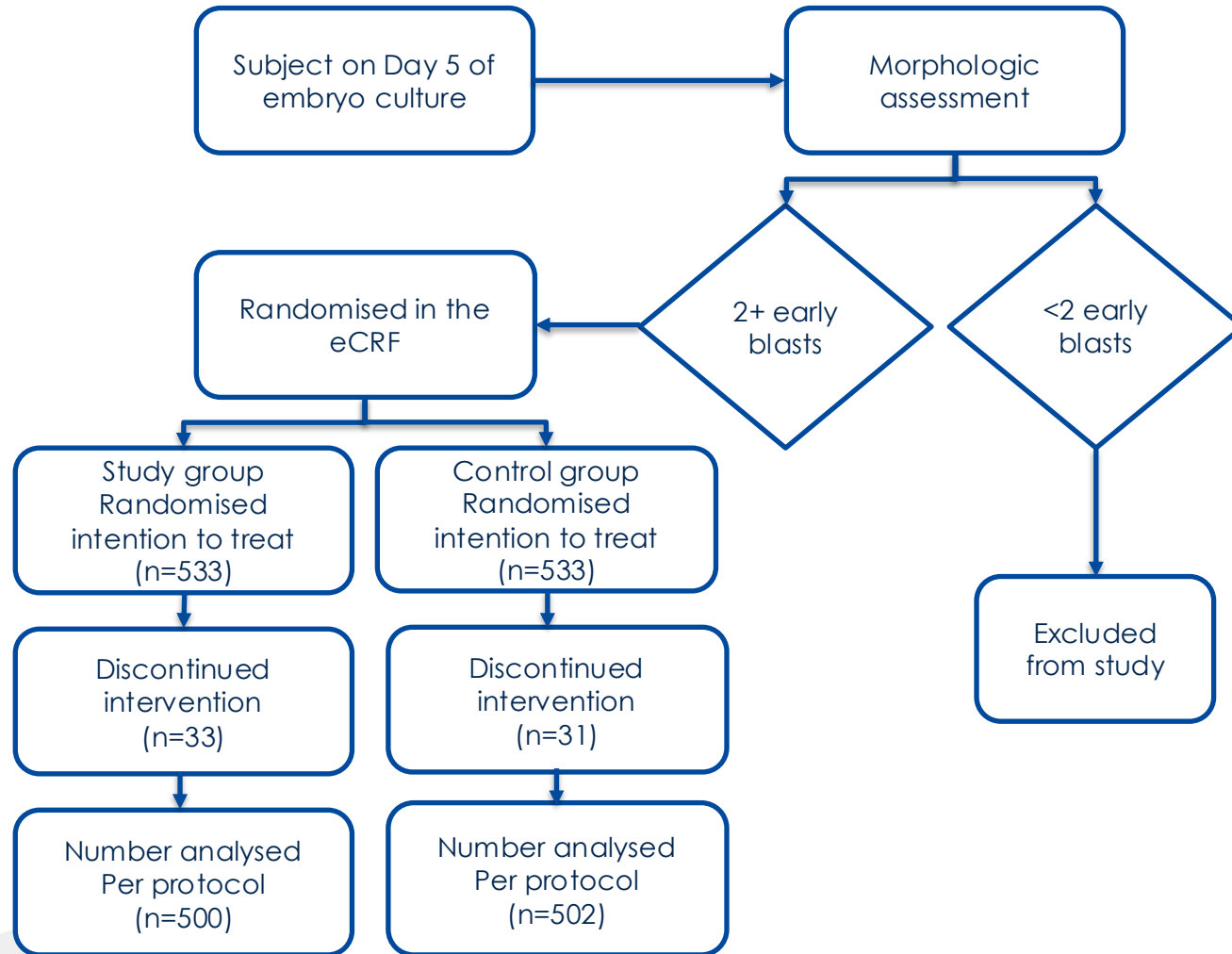


DC1-3: t3-tPNf < 5 hours, DC2-5: t5-t3 < 5 hours



Berntsen et al. (2022) Robust and generalizable embryo selection based on artificial intelligence and time-lapse image sequences PLoS ONE 17(2): e0262661

The VISA trial



nature medicine

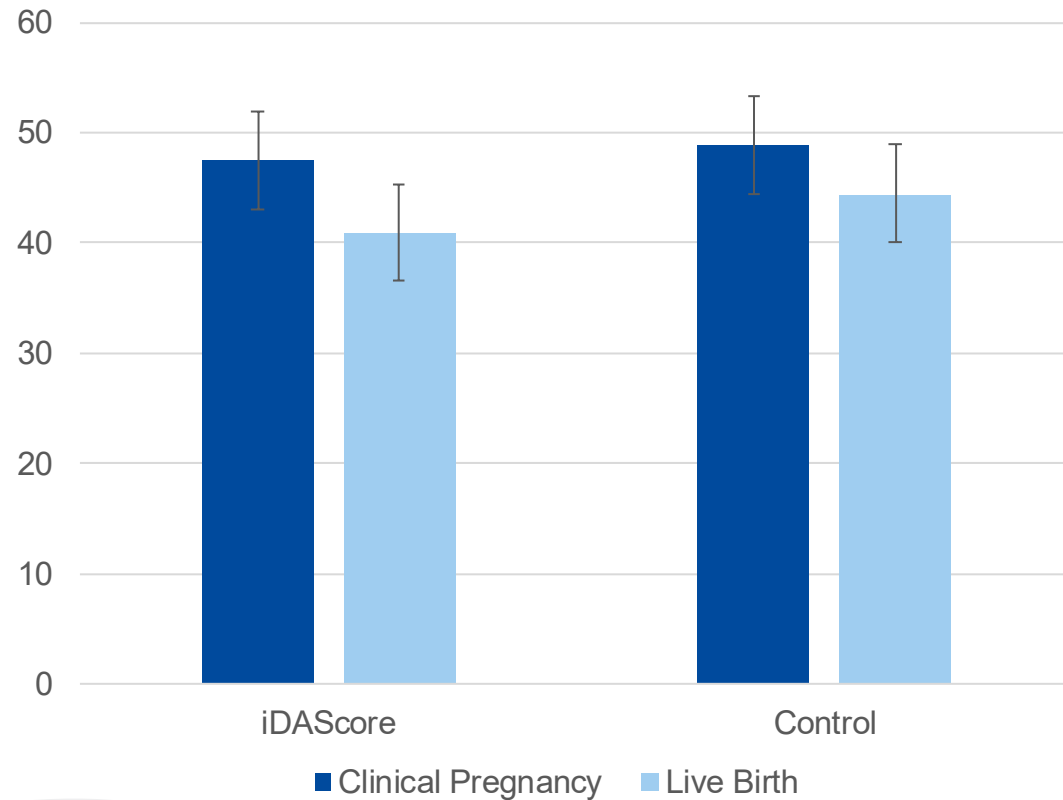
Article <https://doi.org/10.1038/s41591-024-03>

Deep learning versus manual morphology-based embryo selection in IVF: a randomized, double-blind noninferiority trial

Non-inferiority trial

Results – Per Protocol (n=1,002)

Clinical Pregnancy and Live Birth



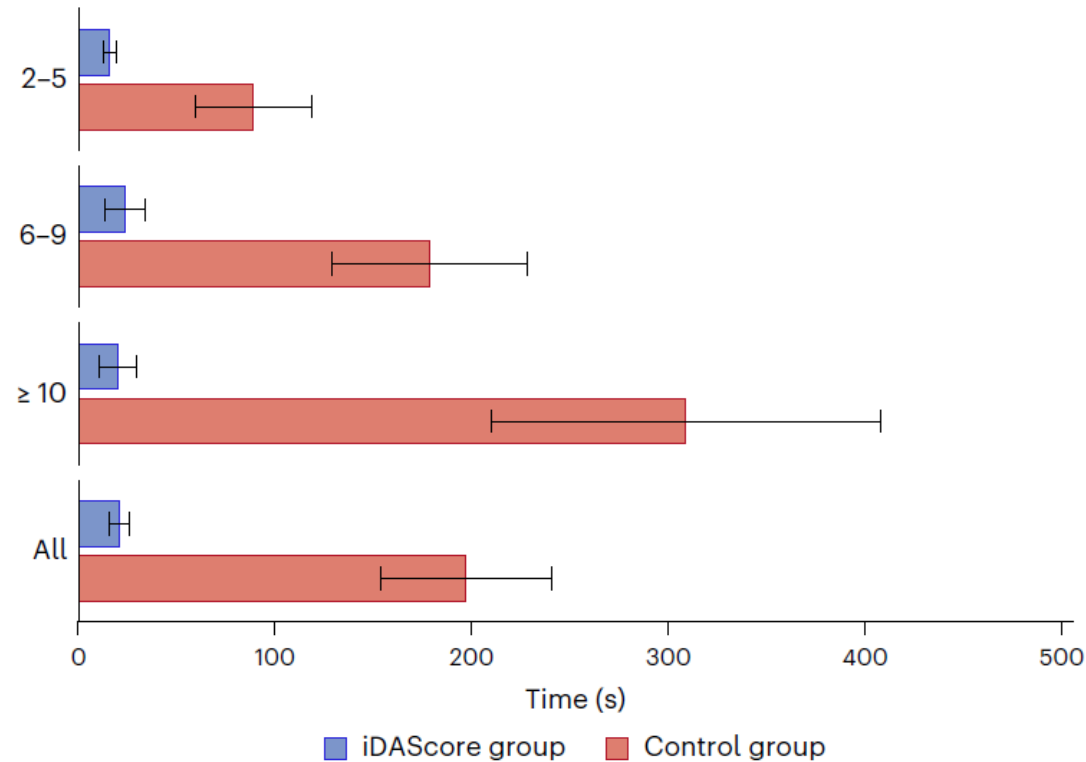
Conclusion

- CPR and LBR are clinically similar and not significantly different
 - CPR: -1.4% (p=0.66)
 - LBR: -3.7% (p=0.25)
- iDAScore group
CPR=47.4% and LBR=40.8%

Illingworth PJ, Venetis C, Gardner DK, Nelson SM, Berntsen J, Larman MG, et al. Nat Med 2024 Nov 30(11): 3114-20

RCT using deep learning for embryo selection

The iDAScore group obtained a clinical pregnancy rate of 46.5% (248 of 533 patients), compared to 48.2% (257 of 533 patients) in the morphology group



Time use for day 5 evaluation in the iDAScore® group and control group

Improved workflow efficiency

Outcomes from the iDAScore® RCT

iDAScore vs. manual morphology-based embryo selection in IVF:
a randomised, double blind, non-inferiority trial

Streamlining workflow efficiency

10 times faster

evaluation with iDAScore

Resulted in a similar clinical pregnancy and live birth rates as morphological EmbryoScope evaluation.

Clinics

14

World-first Randomised Controlled Trial (RCT) of deep-learning AI embryo evaluation tool in IVF.

Patients

1066



Time to Live Birth by use of iDAScore®?

Estimation of (TTLB)?

Retrospective **cohort study**.

3,383 treatments. 17,914 usable embryos. 7,571 transferred in either fresh or FET cycles.

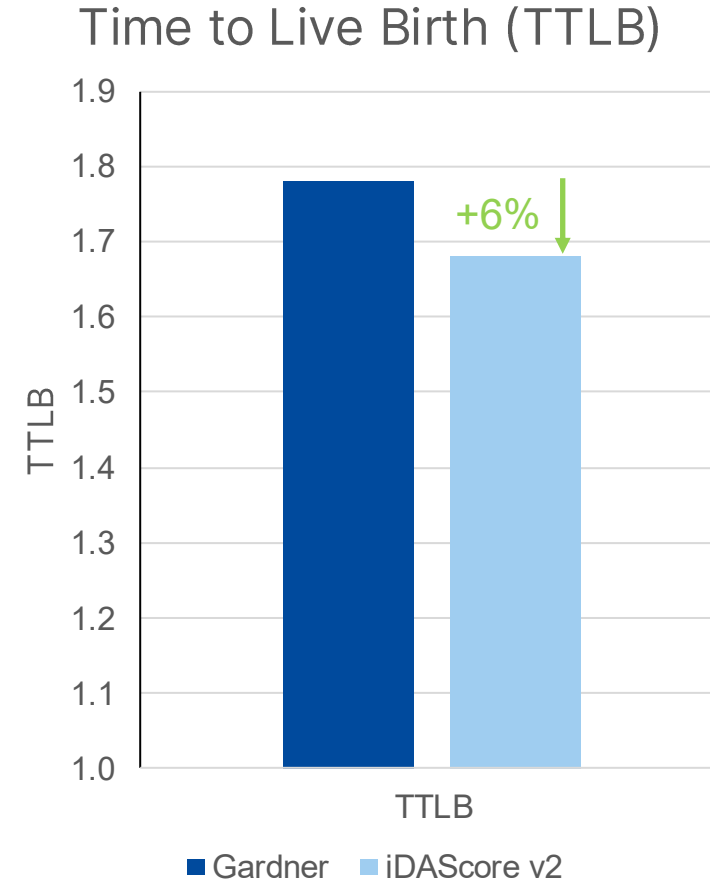
The outcome of non-transferred embryos were estimated using the multiple imputation by chained equations (MICE) procedure.

Bori L., Johansen K., Berntsen J., Parner E., Meseguer M. (2025) Predicting time to live birth with deep learning embryo ranking: a novel multiple imputation approach. Human Reproduction

Outcome imputation – Clinical Utility

Conclusions

- The first study that unbiased can estimate the clinical effect of embryo selection methods.
- Estimating the AUC for transferred embryos **underestimates** the actual performance of AI algorithms
- **6% improvement** with iDAScore® v2 for both AUC and TTLB



In Summary

- The EmbryoScope+ family offers an optimal usage of gas and culture conditions virtually unchanged (temp, pH, oxygen)
- Documented improved embryo development, increasing blastocyst formation and cumulative pregnancy rate
- **iDAScore**® reduce high variability between operators and provide a tool to improve the evaluation process
 - Validated Decision support tool
 - World's largest data set
 - Supports better workflow
 - Correlation between morphology-morphokinetic-ploidy and clinical outcomes





**Thank
you!**