Inteligência Artificial em Medicina Reprodutiva

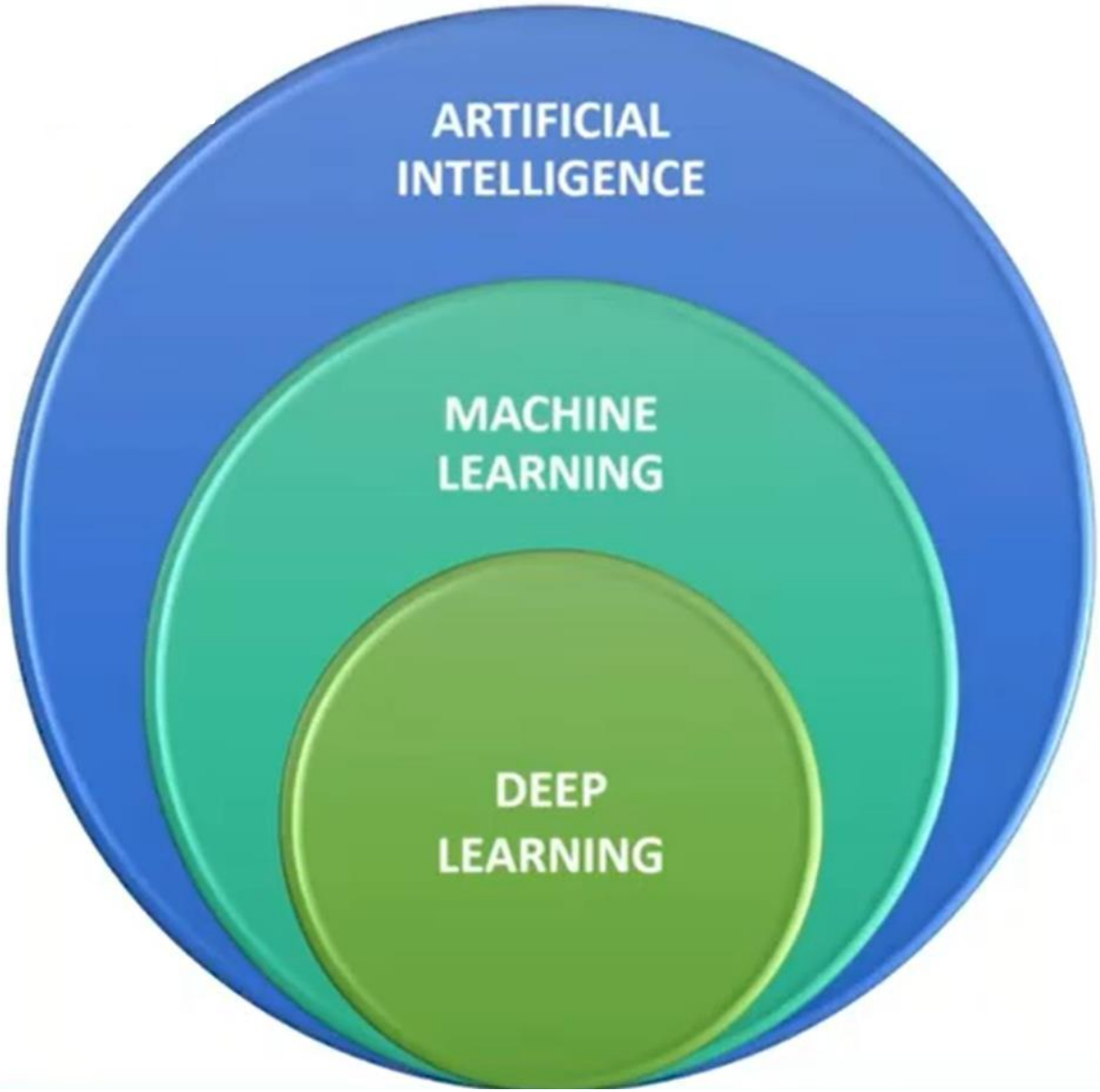
Edson Borges Jr.

The evolution of AI

1950s - Artificial Intelligence

1980s - Machine Learning

2010s - Deep Learning



Embryo through the lens: from time-lapse cinematography to artificial intelligence

Elnur Babayev, M.D. and Eve C. Feinberg, M.D.
Northwestern University Feinberg School of Medicine, Chicago, Illinois

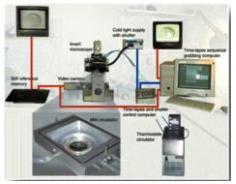
https://doi.org/10.1016/j.fertnstert.2019.12.001

The February 1970 issue of Fertility and Sterility contains the article, **"In Vitro Fertilization of Rabbit Ova: Time Sequence of Events"** by Brackett. Phasecontrast microscopy and time-lapse micro-cinematography were used to observe rabbit oocyte fertilization and embryo development. The author provided detailed documentation on the timing of oocyte penetration by spermatozoa, polar body extrusion, formation of pronuclei, and cell divisions in early embryos.

Brackett BG. In vitro fertilization of rabbit ova: time sequence of events. Fertil Steril 1970;21:169–76.

FERTILITY

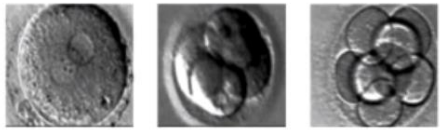
History of « modern » TLT



Single-point morphological assessment

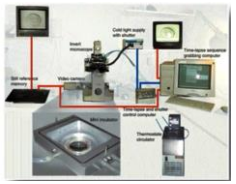
1997[1] **2011[2]** **2020**

D3 culture **Blastocyst culture**



[1]Payne et al. *Hum Reprod*. 1997;**12**:532–541.
[2]Meseguer et al. *Hum Reprod.* 2011;**26**:2658–2671.

History of « modern » TLT

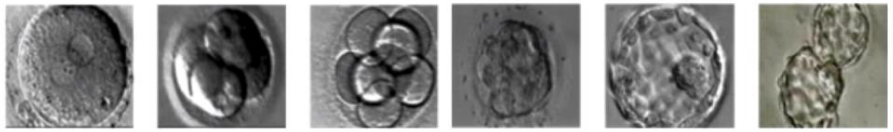


Single-point morphological assessment

Continuous embryo monitoring

1997[1] **2011[2]** **2020**

D3 culture **Blastocyst culture**



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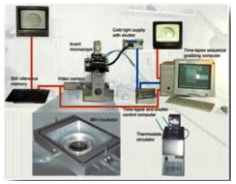

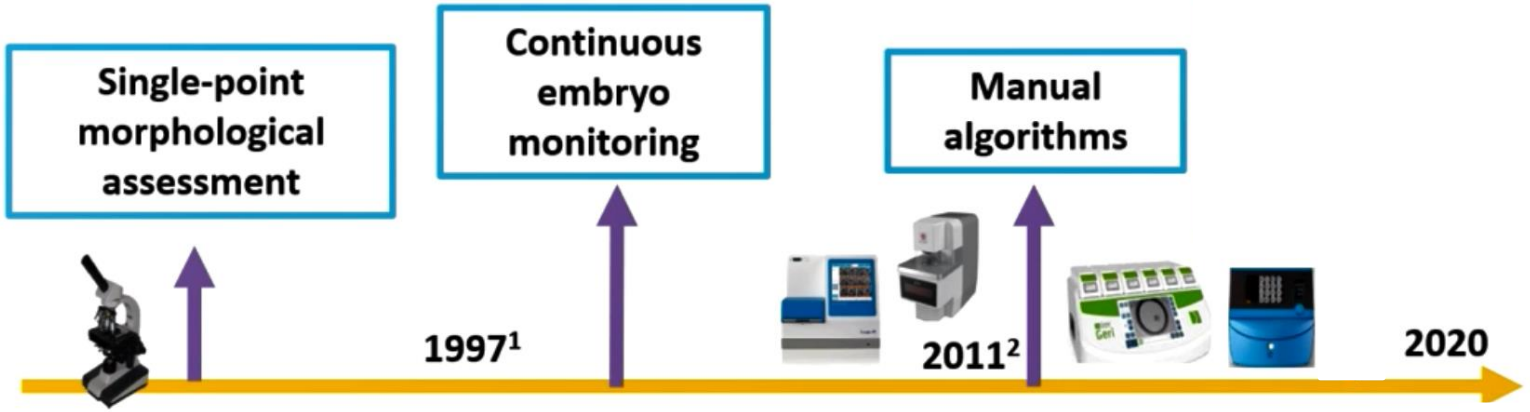

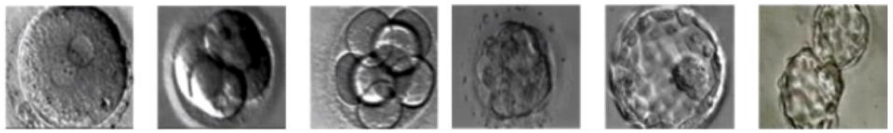

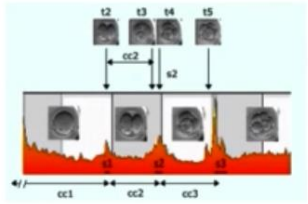

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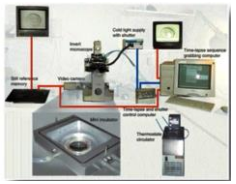

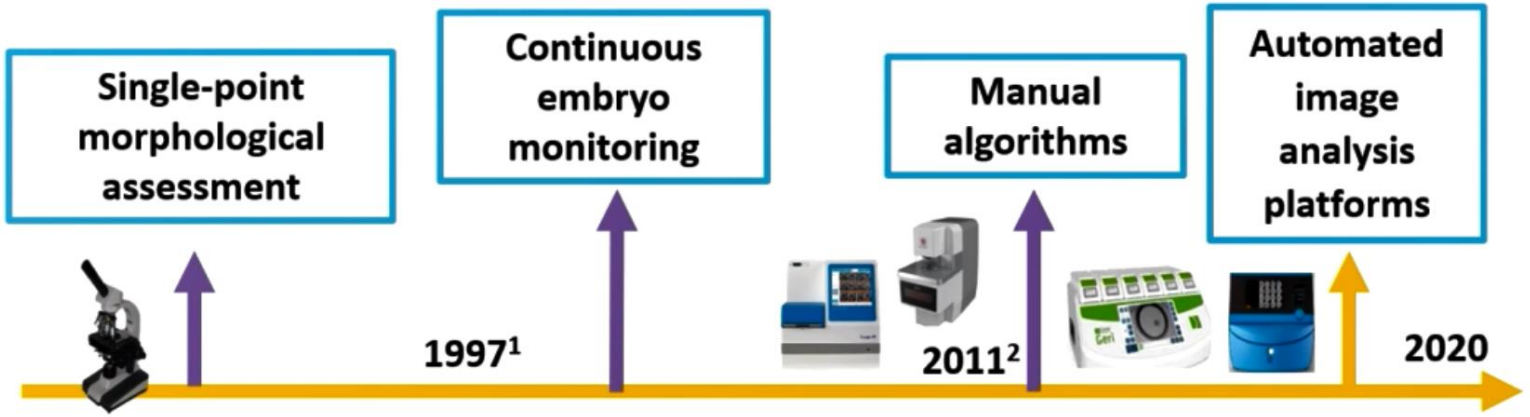

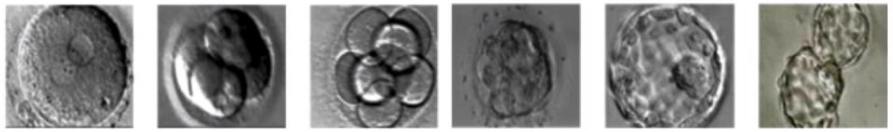

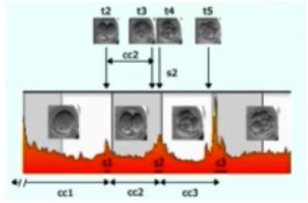

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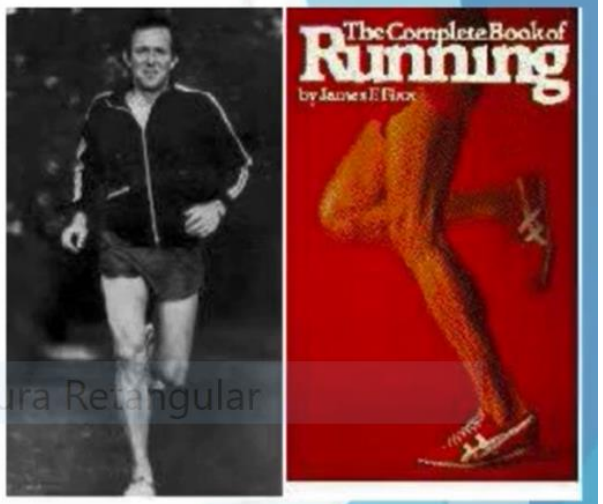
Morphokinetics and what we do not see!

- Winston Churchill
- Drank
- Smoked Cigars
- Overweight

- Roger Bannister
- The first man to run the 4 minute mile
- Exercised frequently

- Jimmy Fixx
- Started America's fitness revolution, popularizing running



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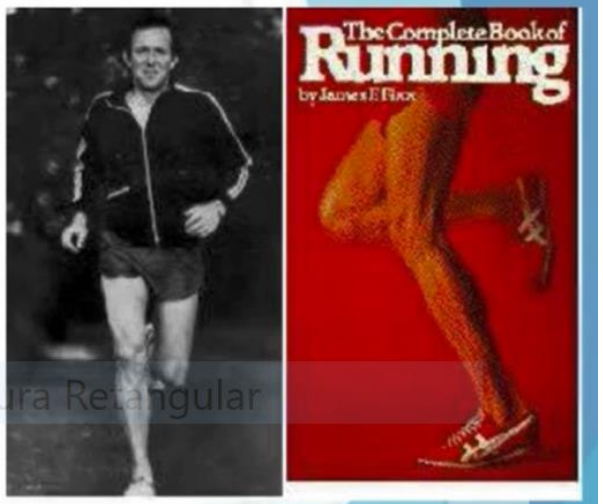

Who lived the longest?

Morphokinetics and what we do not see!

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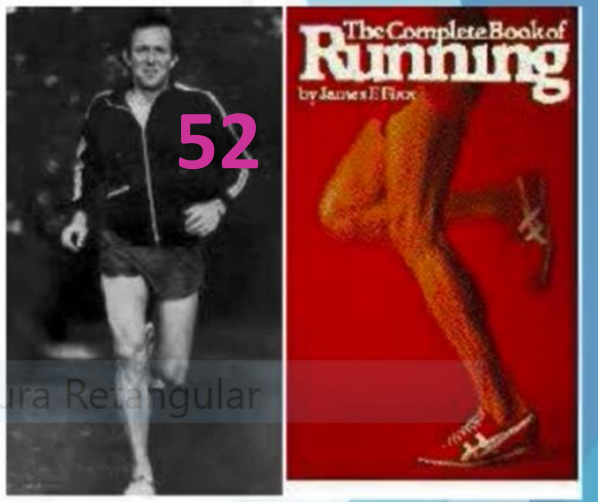


Who lived the longest?

Artificial intelligence for embryo assessment

human reproduction ORIGINAL ARTICLE *Embryology*

Deep learning as a predictive tool for fetal heart pregnancy following time-lapse incubation and blastocyst transfer

D. Tran[1,*], S. Cooke[2], P.J. Illingworth[2], and D.K. Gardner[3]

ARTICLE OPEN npj | Digital Medicine

Deep learning enables robust assessment and selection of human blastocysts after in vitro fertilization

Pegah Khosravi[1,2], Ehsan Kazemi[3], Qiansheng Zhan[4], Jonas E. Malmsten[4], Marco Toschi[4], Pantelis Zisimopoulos[1,2], Alexandros Sigaras[1,2], Stuart Lavery[5], Lee A. D. Cooper[6], Cristina Hickman[5], Marcos Meseguer[7], Zev Rosenwaks[4], Olivier Elemento[1,2,8], Nikica Zaninovic[4] and Iman Hajirasouliha[1,2]

Computers in Biology and Medicine 115 (2019) 103494

Automatic grading of human blastocysts from time-lapse imaging

Mikkel F. Kragh[a,b,*], Jens Rimestad[b], Jørgen Berntsen[b], Henrik Karstoft[a]

SCIENTIFIC REPORTS nature research

Predicting pregnancy test results after embryo transfer by image feature extraction and analysis using machine learning

Alejandro Chavez-Badiola[1*], Adolfo Flores-Saiffe Farias[1], Gerardo Mendizabal-Ruiz[2], Rodolfo Garcia-Sanchez[1], Andrew J. Drakeley[3] & Juan Paulo Garcia-Sandoval[4]

Reproductive BioMedicine Online (2013) 26, 42–49

Artificial intelligence techniques for embryo and oocyte classification

Claudio Manna [a,b], Loris Nanni [c], Alessandra Lumini [d,*], Sebastiana Pappalardo [a]

human reproduction ORIGINAL ARTICLE *Embryology*

Development of an artificial intelligence-based assessment model for prediction of embryo viability using static images captured by optical light microscopy during IVF

M. VerMilyea[1,2,†], J.M.M. Hall[3,4,†], S.M. Diakiw[3], A. Johnston[3,5], T. Nguyen[3], D. Perugini[3], A. Miller[1], A. Picou[1], A.P. Murphy[3], and M. Perugini[3,6,*]

Video Article

A Neural Network-Based Identification of Developmentally Competent or Incompetent Mouse Fully-Grown Oocytes

Federica Cavalera[1], Mario Zanoni[1], Valeria Merico[1], Thi Thu Hien Bui[1,2], Martina Belli[1,3], Lorenzo Fassina[4], Silvia Garagna[1], Maurizio Zuccotti[1]

- Different images
- Different software
- Different culture conditions

FERTILITY

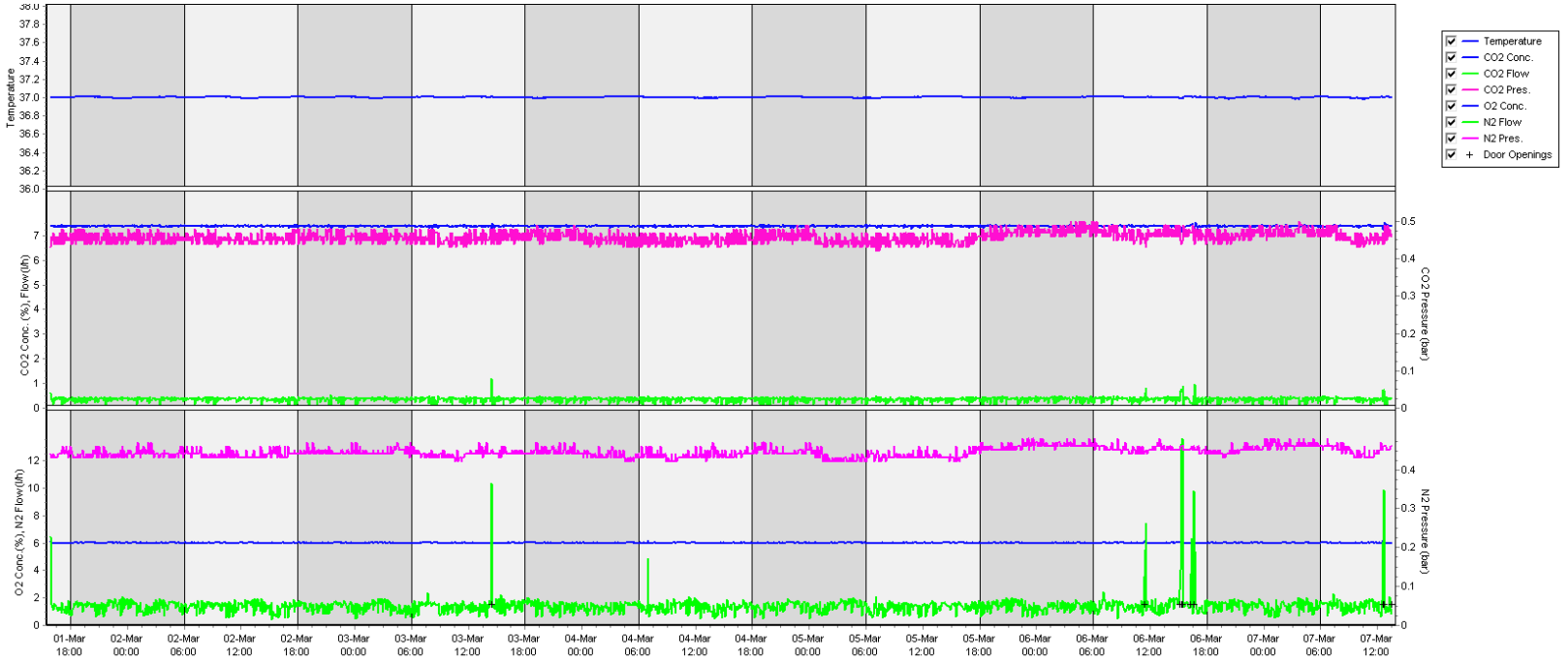
EMBRYOSCOPE *plus*

- ❑ CO2 / O2 incubator
- ❑ Capacity: 15 patients with 16 embryos (total 240 embryos)
- ❑ Air purified by activated carbon and HEPA filter
- ❑ Total time of exposure to light: <40 sec / day (per embryo)
- ❑ High-quality Hoffman modulation contrast optics
- ❑ Time between image acquisitions: 10 minutes
- ❑ Image acquisition in multiple focal planes
- ❑ Dry incubation

FERTILITY

EMBRYOSCOPE *plus*

SAFE CULTIVE ENVIRONMENT FOR EMBRYOS



- ❑ Temperature
- ❑ CO_2 / O_2
- ❑ pH
- ❑ VOC
- ❑ Images
- ❑ Alarm

Summary | Alarms | Warnings | Log | Other

Variable	Unit	Average	Min	Max	StdDev	Set-Point
Temperature	C	37.00	36.98	37.02	0.007	37.0
CO2 Concentration	%	7.38	7.25	7.46	0.032	7.4
CO2 Flow	l/h	0.36	0.01	0.60	0.096	0.0
CO2 Pressure	bar	0.46	0.42	0.50	0.016	0.0
O2 Concentration	%	6.01	5.97	6.15	0.011	6.0
N2 Flow	l/h	1.38	0.45	6.45	0.361	0.0
N2 Pressure	bar	0.44	0.42	0.48	0.013	0.0

FERTILITY

Relationship between **Implantation Rate** and the KID Score Day 5

Groups of similar interval length

p<.05

V2 1316 embryos

KIDScore Day 5 v2	≤ 2.5	2.6 - 5.0	5.1 - 7.5	> 7.5
Implantation Rate	38.6%	38.2%	52.5%	56.7%
N	34/88	83/217	277/528	274/483

p<.05

V3 1952 embryos

KIDScore Day 5 v3	≤ 2.5	2.6 - 5.0	5.1 - 7.5	> 7.5
Implantation Rate	35.44%	41.55%	55.77%	68.01%
N	28/79	145/349	609/1092	294/432

Quartiles of similar sample size

KIDScore Day 5 v2	≤ 5.3	5.4 - 7.1	7.2 - 7.9	≥8.0
Implantation Rate	39.3%	48.4%	59.2%	56.6%
N	129/328	168/347	190/321	181/320

KIDScore Day 5 v3	≤5.3	5.4 - 6.4	6.5 - 7.4	≥7.5
Implantation Rate	41.0%	54.2%	59.3%	67.9%
N	215/524	274/506	270/455	317/467

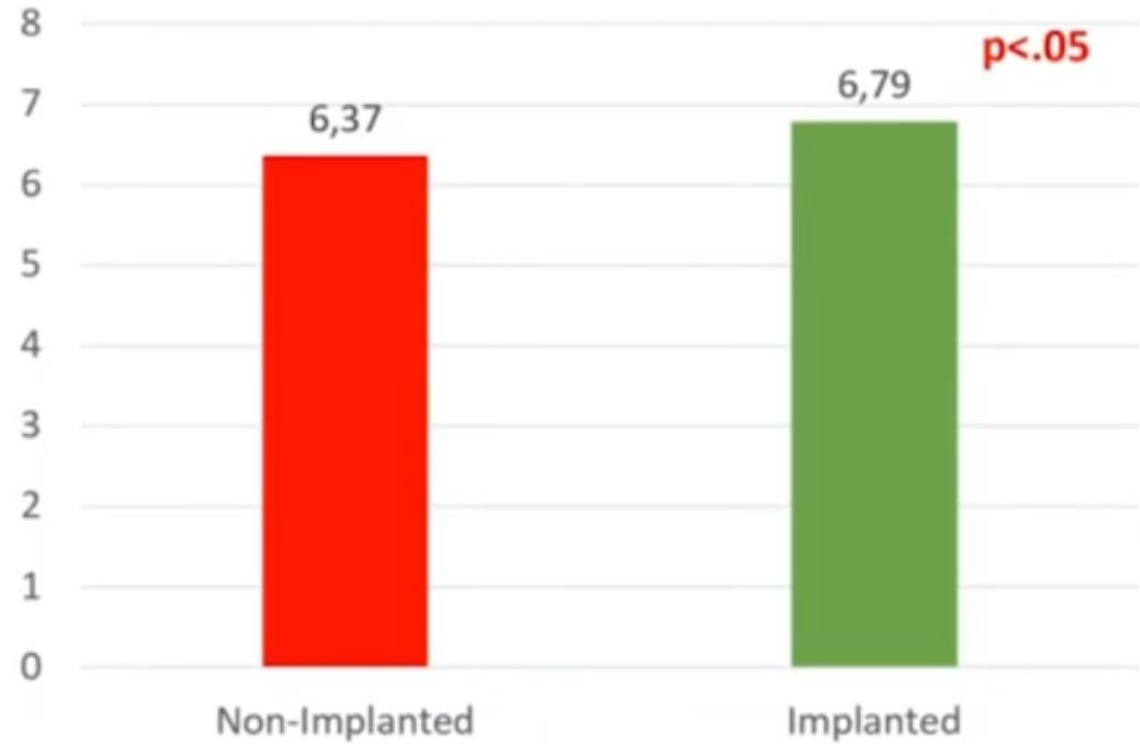
Innovation

FERTILITY

Relationship between **Implantation Rate** and the KID Score Day 5 in **good quality embryos (A+B,** *ASEBIR Criteria 2015*)

KID Score Day 5 VERSION 3

Implatation	Mean	Standard Deviation	N
Implanted	6.790	1.5420	972
Non-implanted	6.368	1.5502	696



Innovation

FERTILITY

Relationship between **Live Birth Rate** and the KID Score Day 5

p<.05

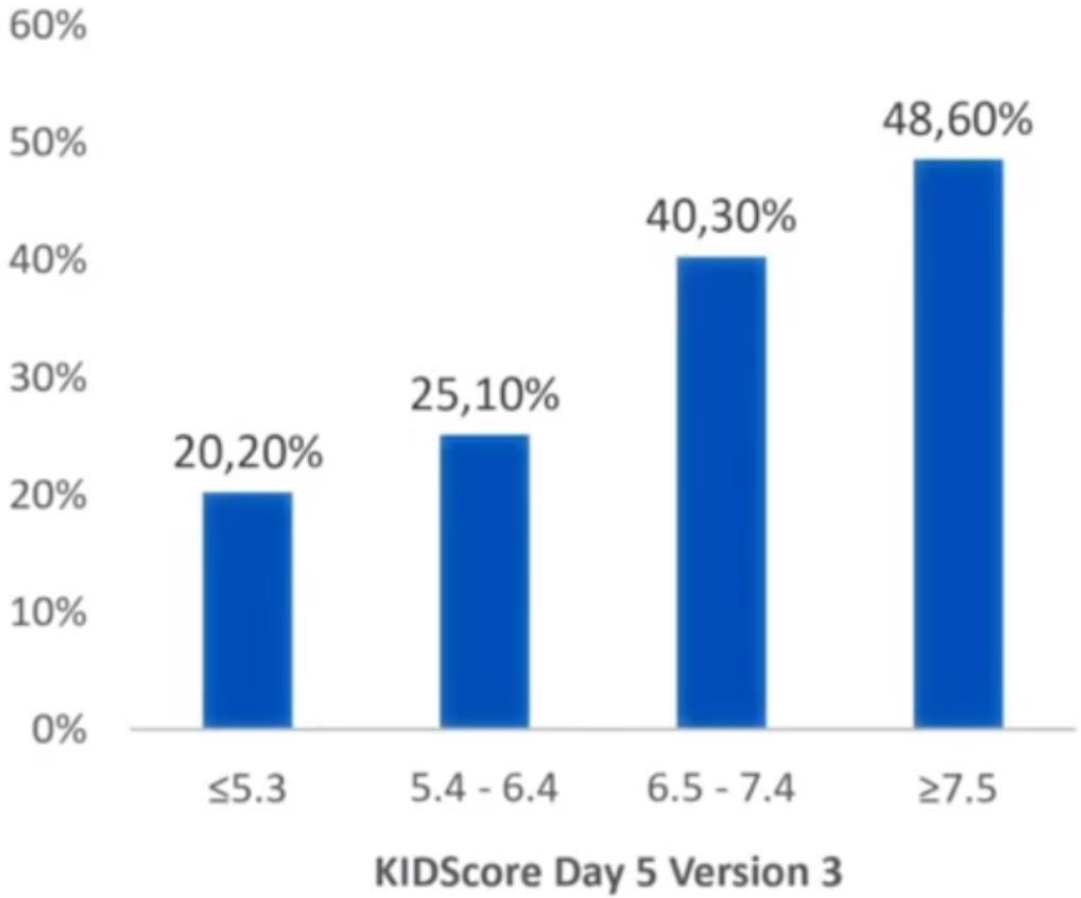
V2
1280
embryos

KIDScore Day 5 v2	≤ 5.3	5.4 - 7.1	7.2 - 7.9	≥8.0
Live Birth Rate	24.8%	35.2%	44.8%	41.9%
N	79/318	121/344	141/315	127/303

p<.05

V3
867
embryos

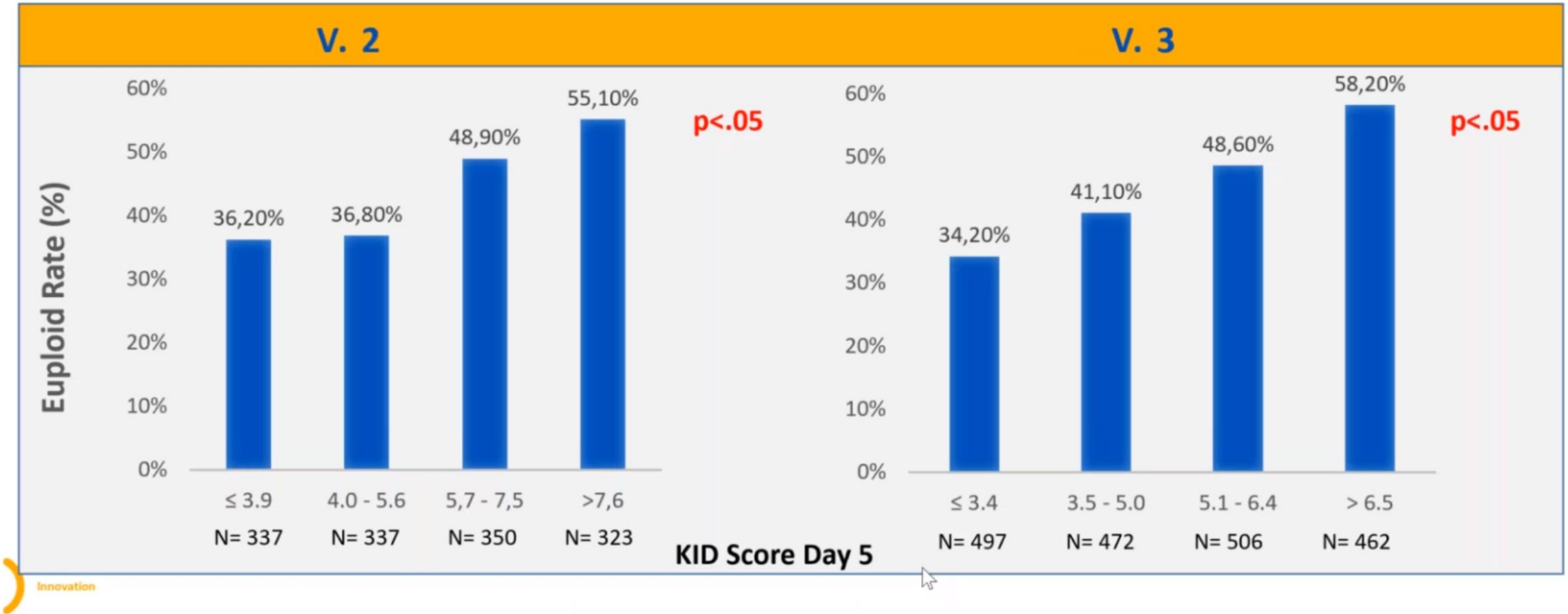
KIDScore Day 5 v3	≤5.3	5.4 - 6.4	6.5 - 7.4	≥7.5
Live Birth Rate	20.20%	25.10%	40.30%	48.60%
N	49/242	55/219	79/196	102/210



Innovation

FERTILITY

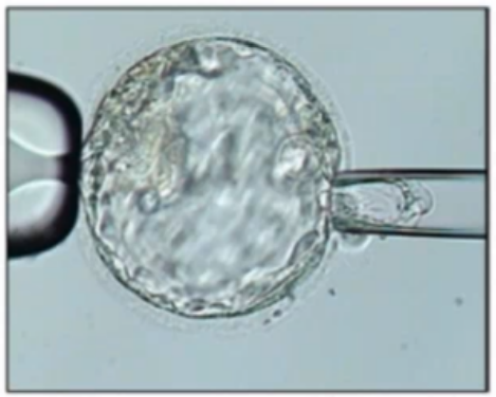
Relationship between **Euploid Rate** and the KID Score Day 5



Innovation

FERTILITY

Relationship between **Chromosomal Content** and the KID Score Day 5



V2
1347
embryos

KID Score Day 5 VERSION 2 **p<.05**

Ploidy	Mean	Standard Deviation	N
Euploid embryos	5.96	2.14	595
Aneuploid embryos	5.31	2.19	752

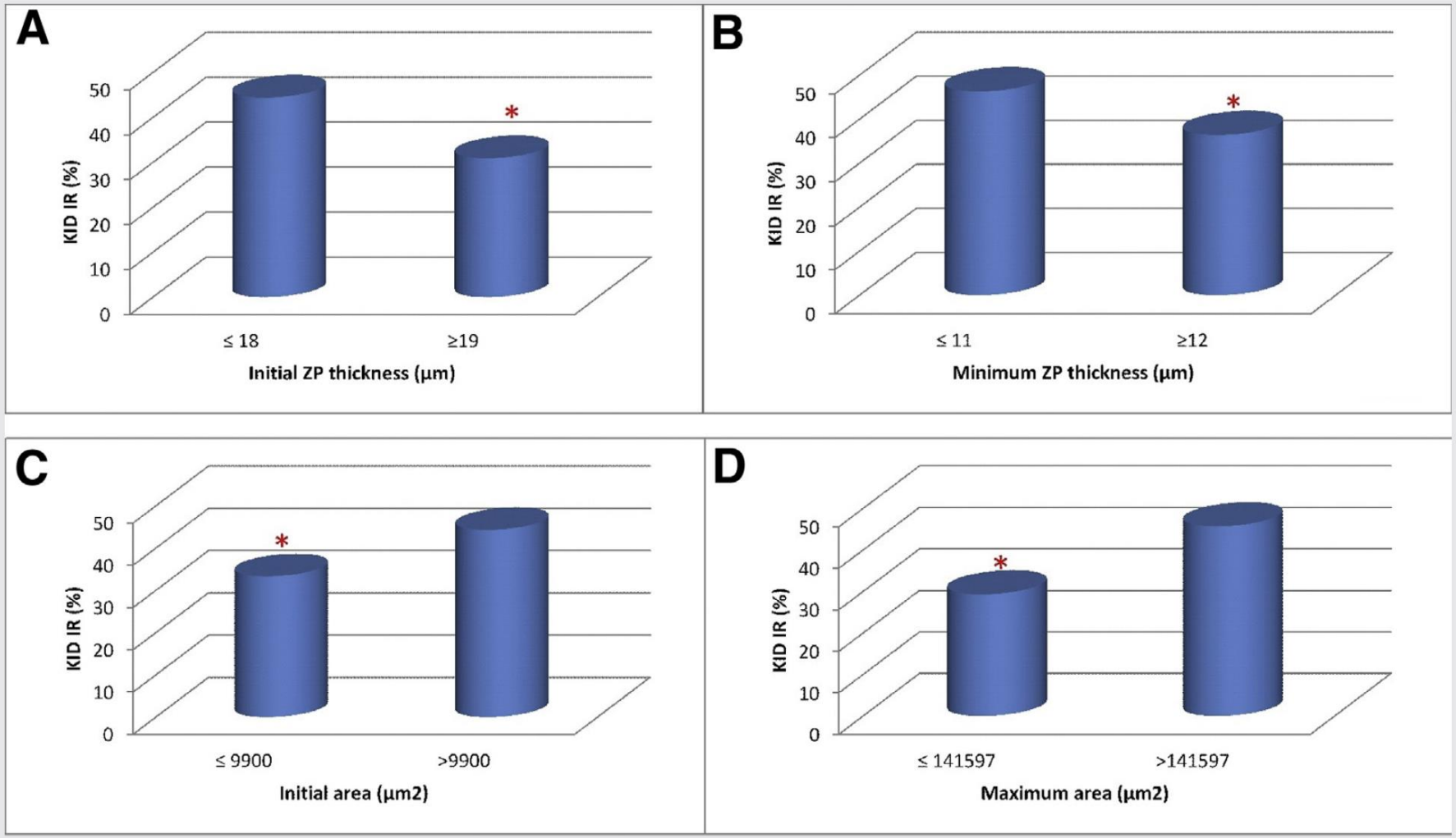
V3
1937
embryos

KID Score Day 5 VERSION 3 **p<.05**

Ploidy	Mean	Standard Deviation	N
Euploid embryos	5.25	1.87	879
Aneuploid embryos	4.59	1.80	1058

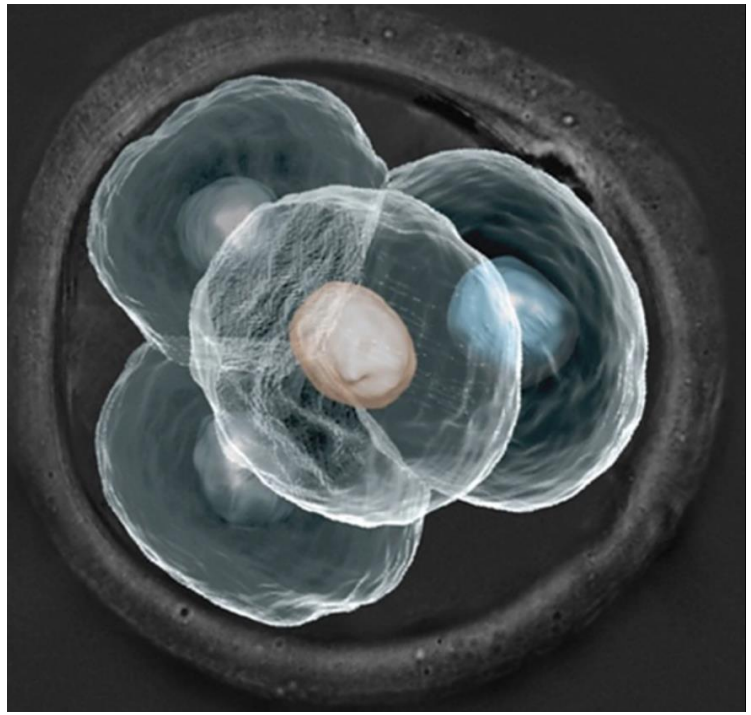
Innovation

FERTILITY



Percentage of implanting blastocysts with morphological dynamics variables within or beyond the ranges defined by the quartile limits for the total data set. The four panels show ranges and implantation for (**A**) initial ZP thickness, **P*=.02; (**B**) minimum ZP thickness, **P*=.03; (**C**) initial blastocyst area, **P*=.04; and (**D**) maximum blastocyst area, **P*=.004.

IA and deep learning – embryo evaluation

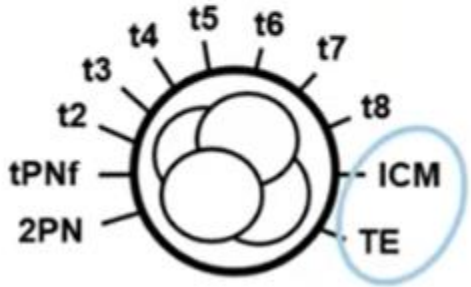


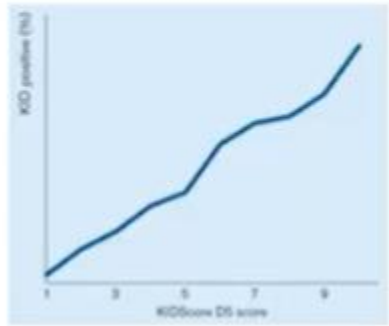
FERTILITY

EMBRYO ANNOTATION AND SELECTION

Embryologist

AI (indirect)





Implantation model

Contents lists available at ScienceDirect

Computers in Biology and Medicine

journal homepage: www.elsevier.com/locate/compbiomed

ELSEVIER

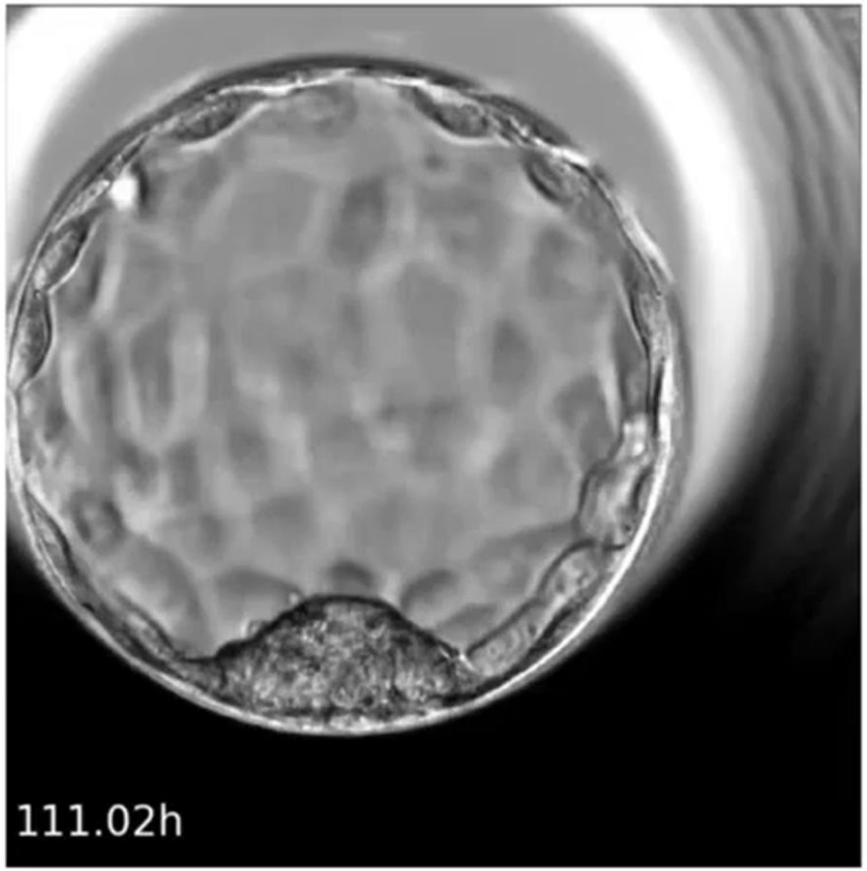
Automatic grading of human blastocysts from time-lapse imaging

Mikkel F. Kragh [a,b,*], Jens Rimestad [b], Jørgen Berntsen [b], Henrik Karstoft [a]

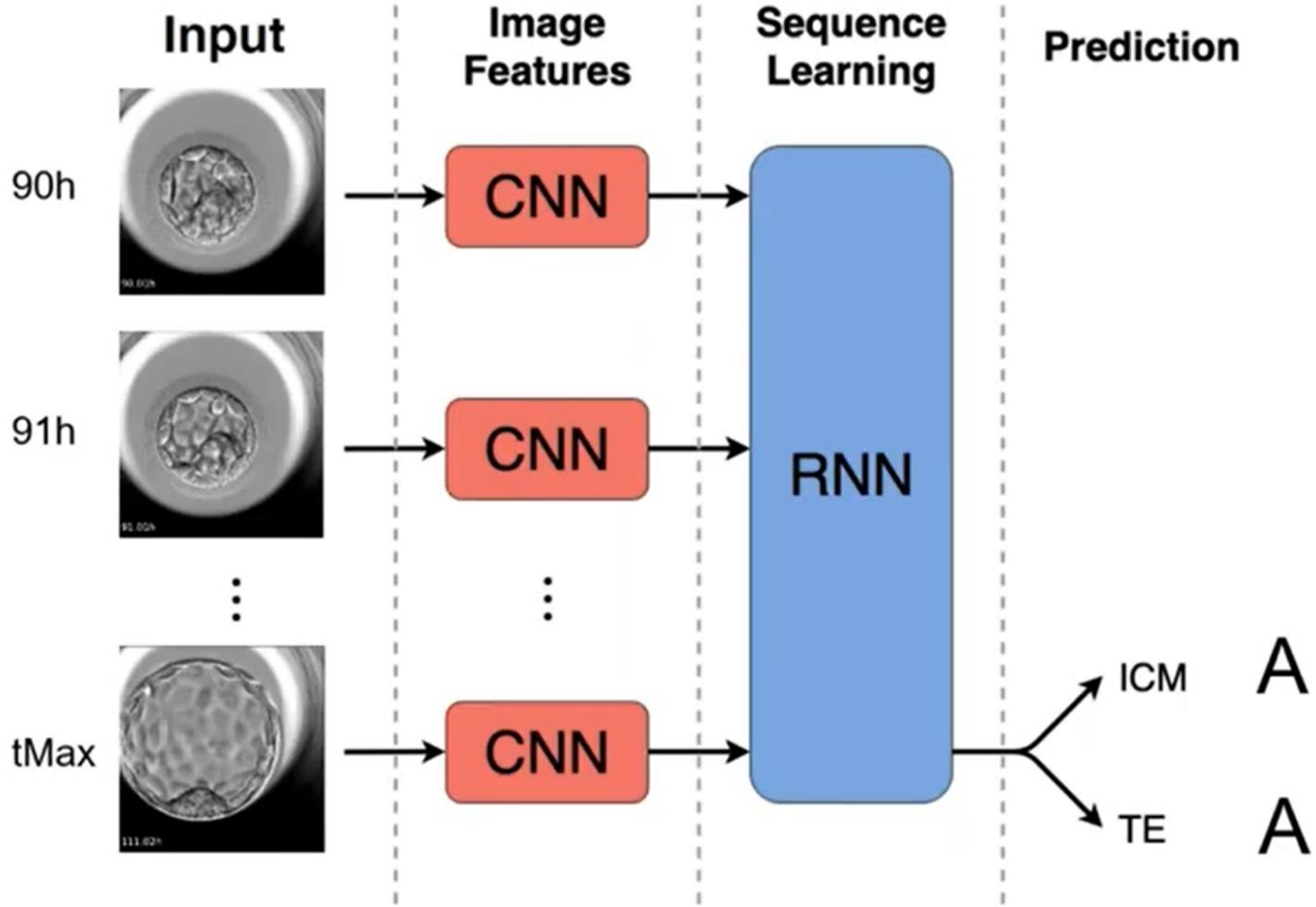
[a] Department of Engineering, Aarhus University, Denmark

[b] Vitrolife A/S, Denmark

BLASTOCYST GRADING WITH TIME-LAPSE VIDEOS



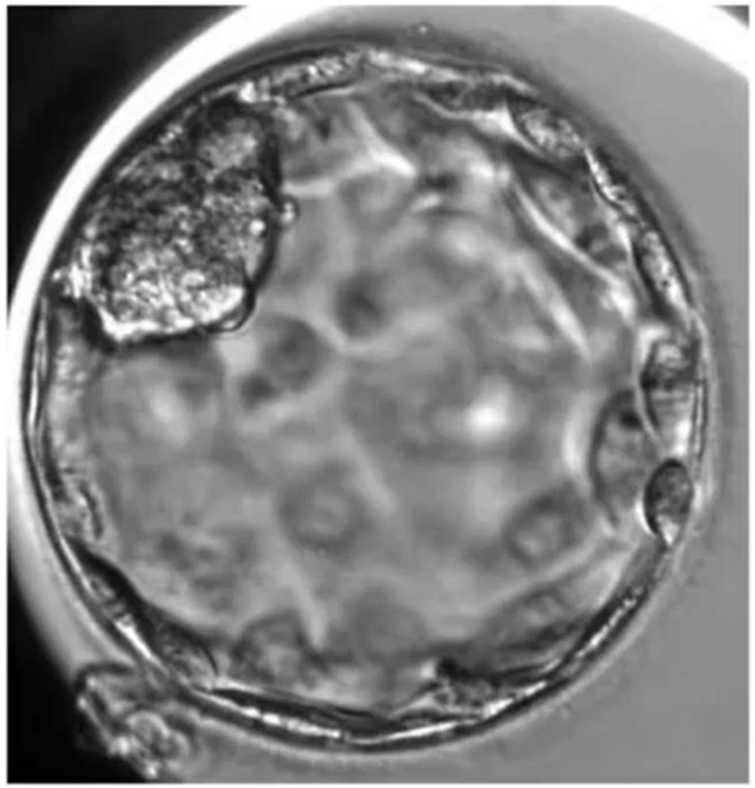
8664 day 5 blastocysts

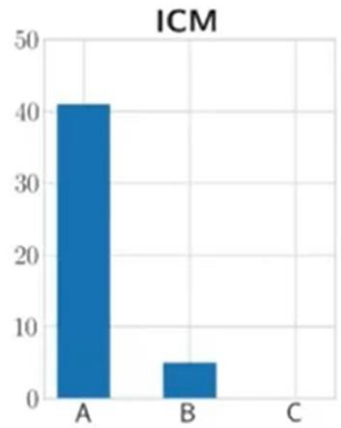


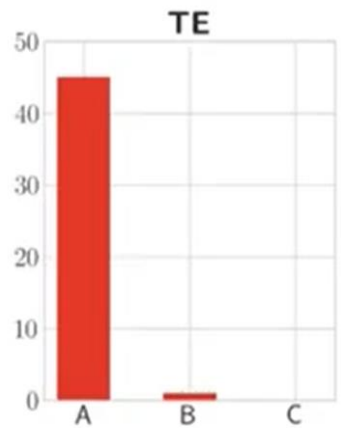
CNN: Convolutional Neural Network
RNN: Recurrent Neural Network

FERTILITY

INTER- AND INTRA-OBSERVER VARIATION

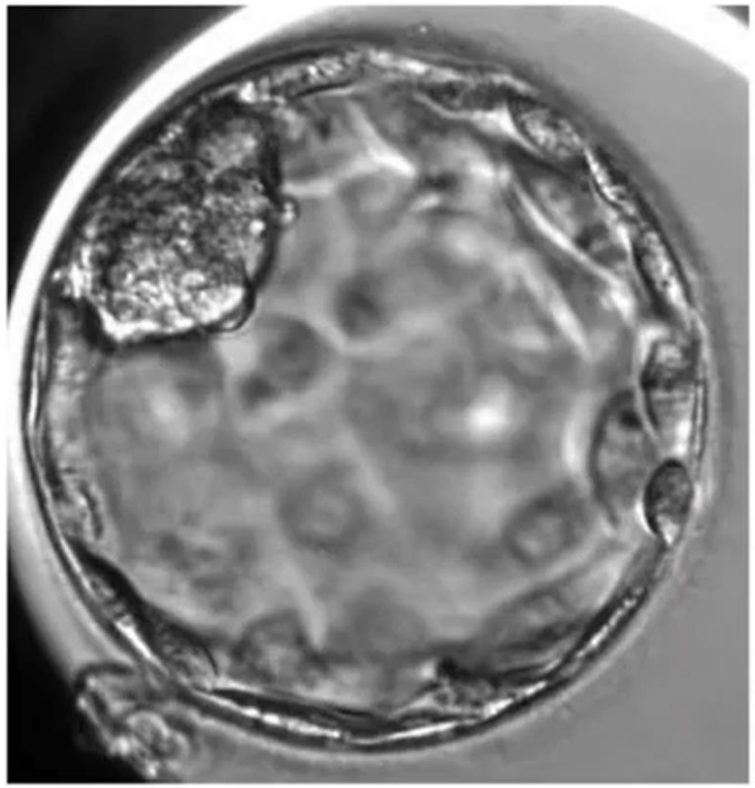


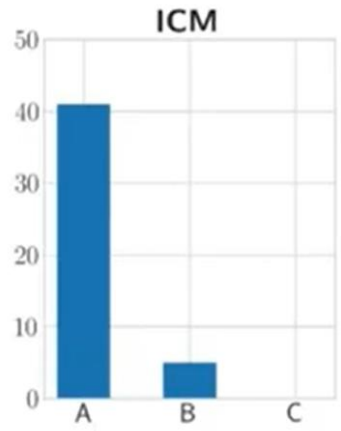


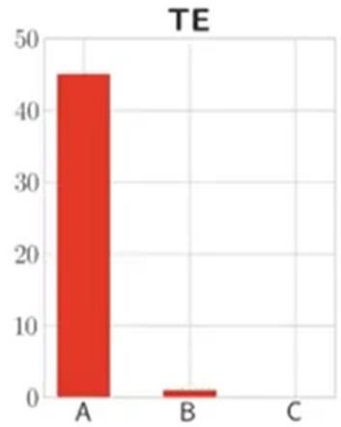


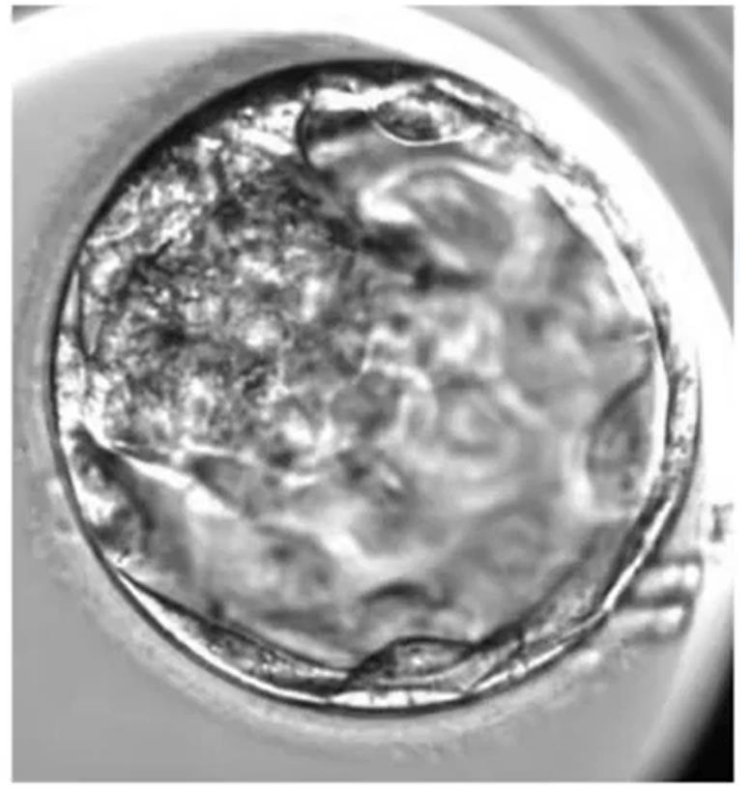
Similar studies: Richardson et al. (2015), Adolfsson et al. (2018)

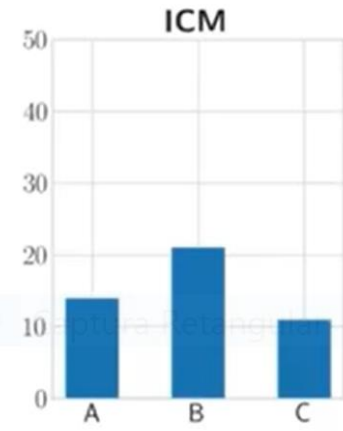
INTER- AND INTRA-OBSERVER VARIATION

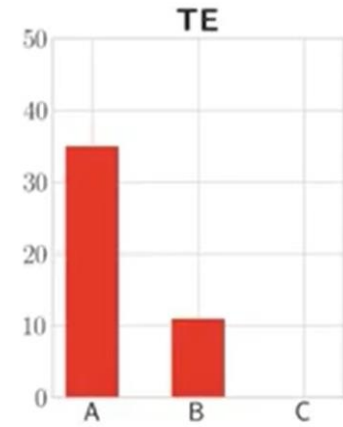












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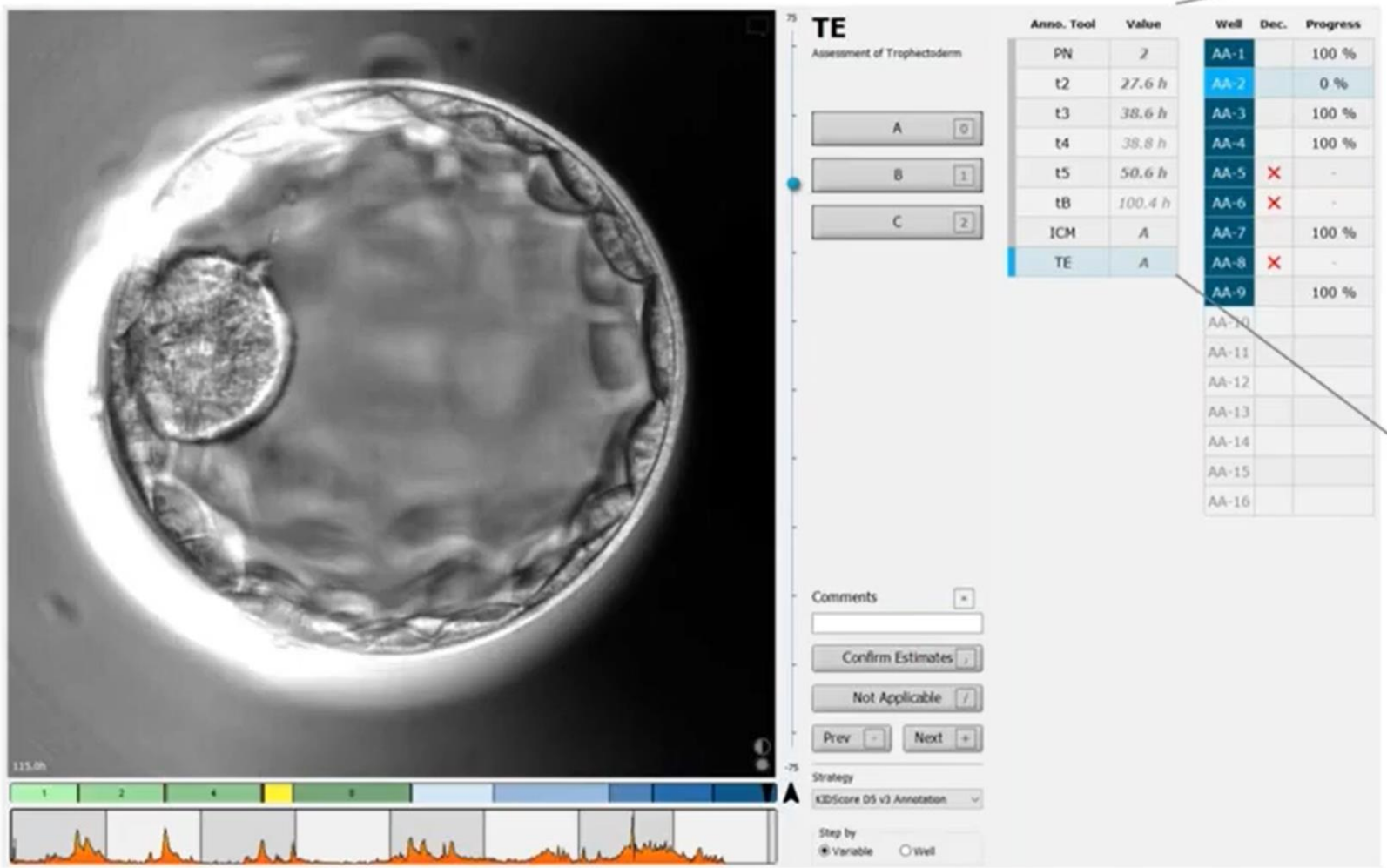
GUIDED ANNOTATION

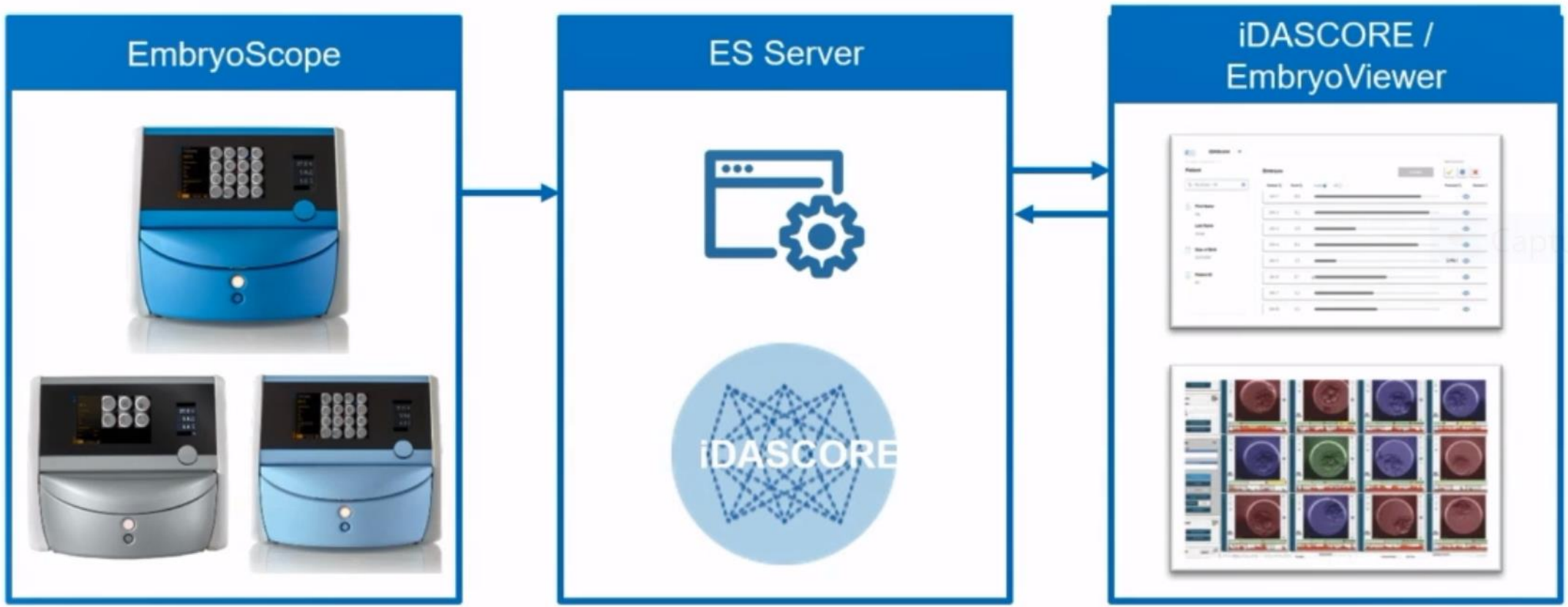


Anno. Tool	Value
PN	2
t2	27.6 h
t3	38.6 h
t4	38.8 h
t5	50.6 h
tB	100.4 h
ICM	A
TE	A

Well	Dec.	Progress
AA-1		100 %
AA-2		0 %
AA-3		100 %
AA-4		100 %
AA-5	✕	-
AA-6	✕	-
AA-7		100 %
AA-8	✕	-
AA-9		100 %
AA-10		
AA-11		
AA-12		
AA-13		
AA-14		
AA-15		
AA-16		

Anno. Tool	Value
PN	2
t2	27.6 h
t3	38.6 h
t4	38.8 h
t5	50.6 h
tB	100.4 h
ICM	A
TE	A

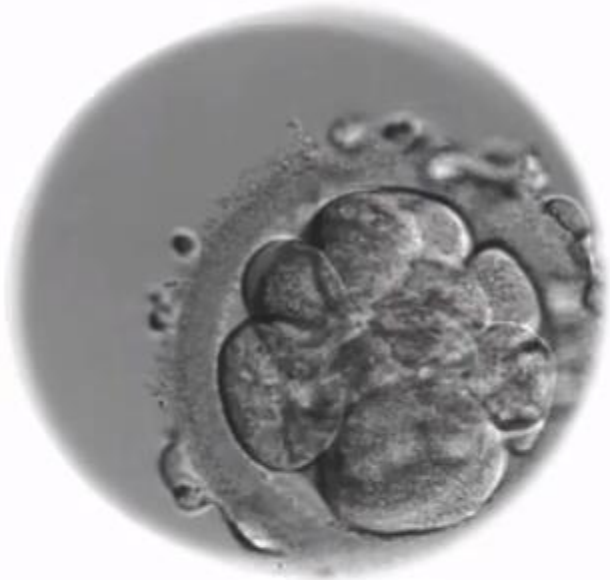
FERTILITY



FERTILITY

SCORE

Score: 2.0

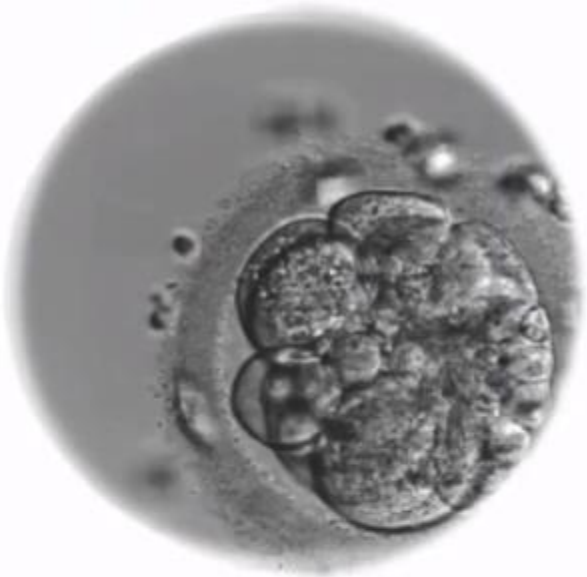


Score: 6.3

Score: 9.5

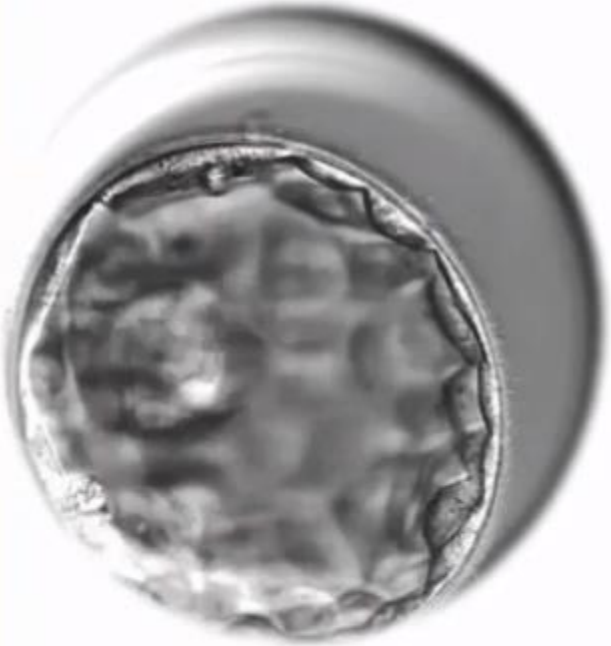
SCORE

Score: 2.0

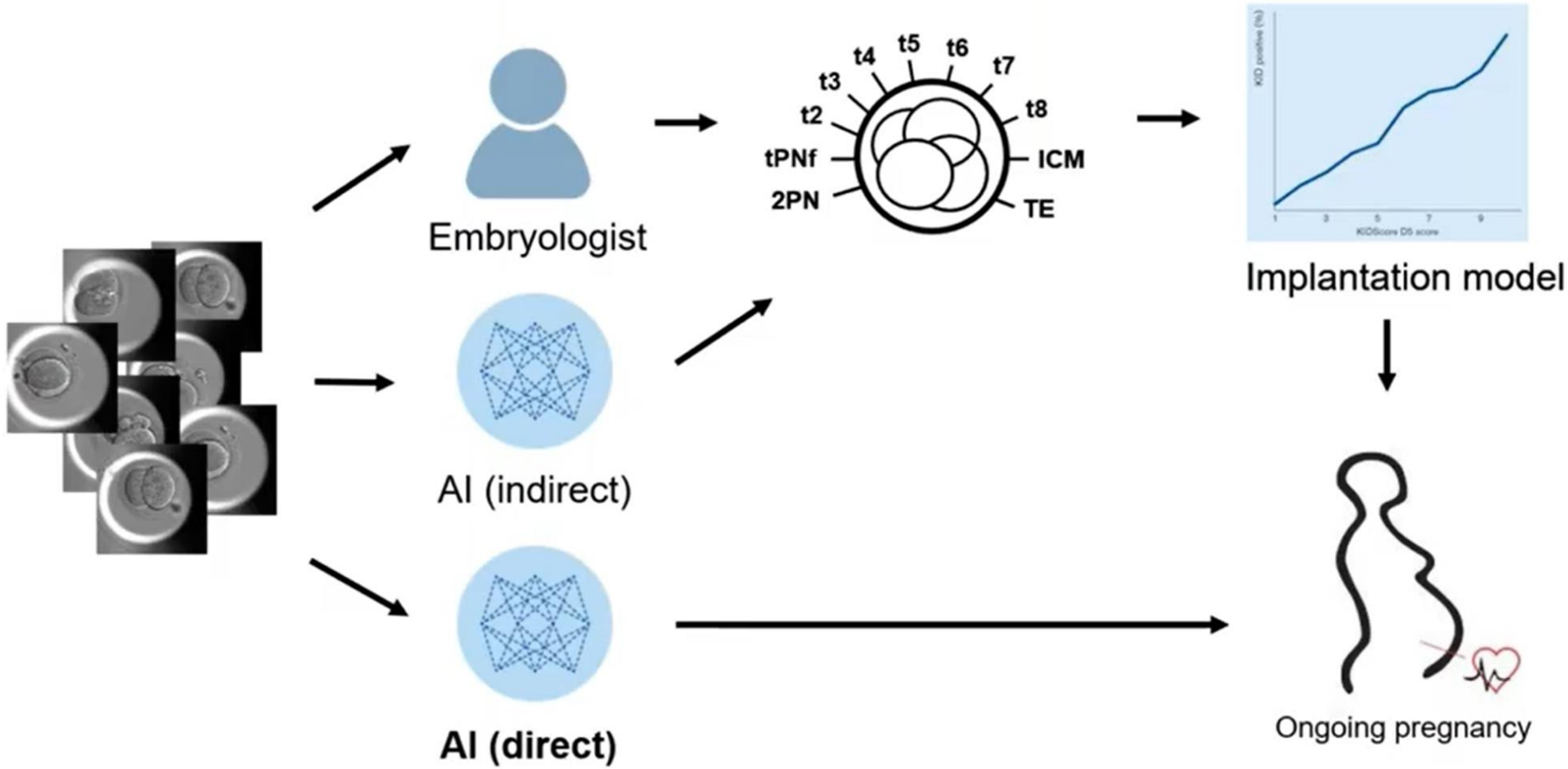


Score: 6.3

Score: 9.5



EMBRYO ANNOTATION AND SELECTION

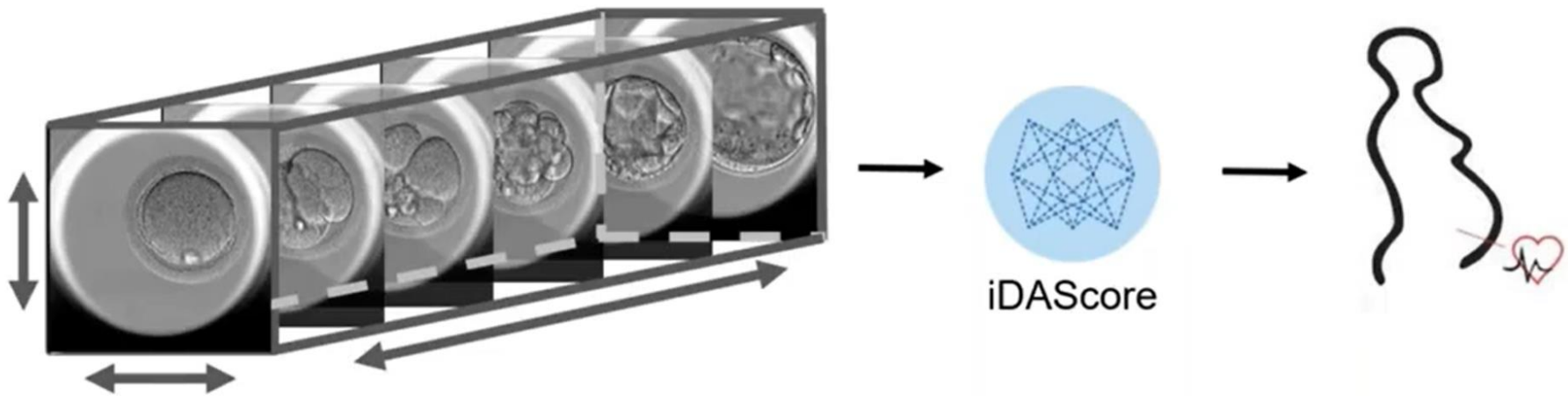


FERTILITY

IDASCORE

- Full time-lapse sequences
- 18 clinics
- Linked to fetal heartbeat (FH)

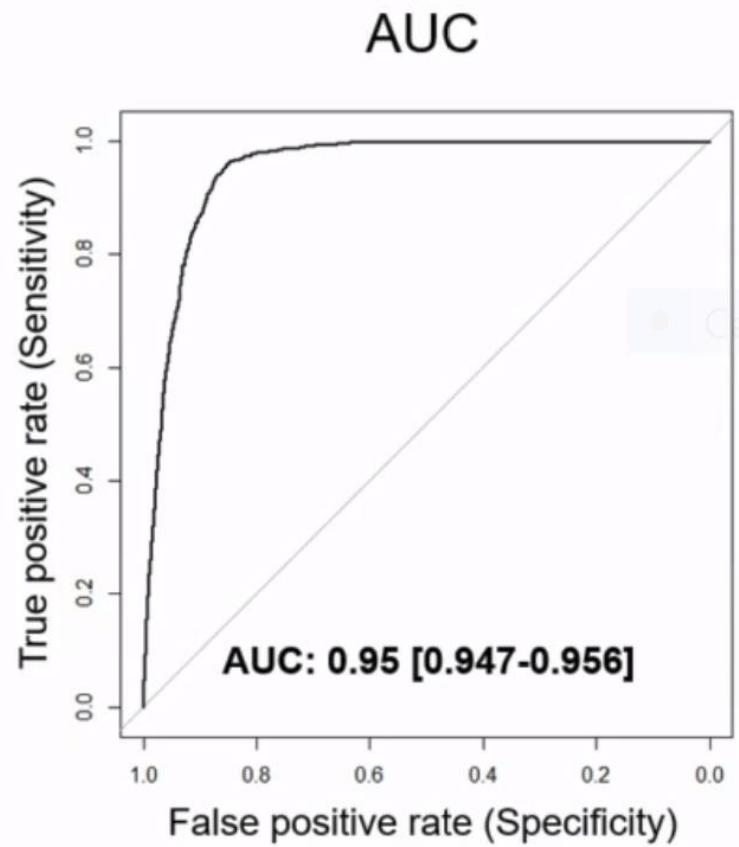
	IVY	iDAScore
FH+	694	4,337
FH-	1,079	10,307
Discards	7,063	101,188
Total	**8,836**	**115,832**



FERTILITY

EVALUATING iDASCORE

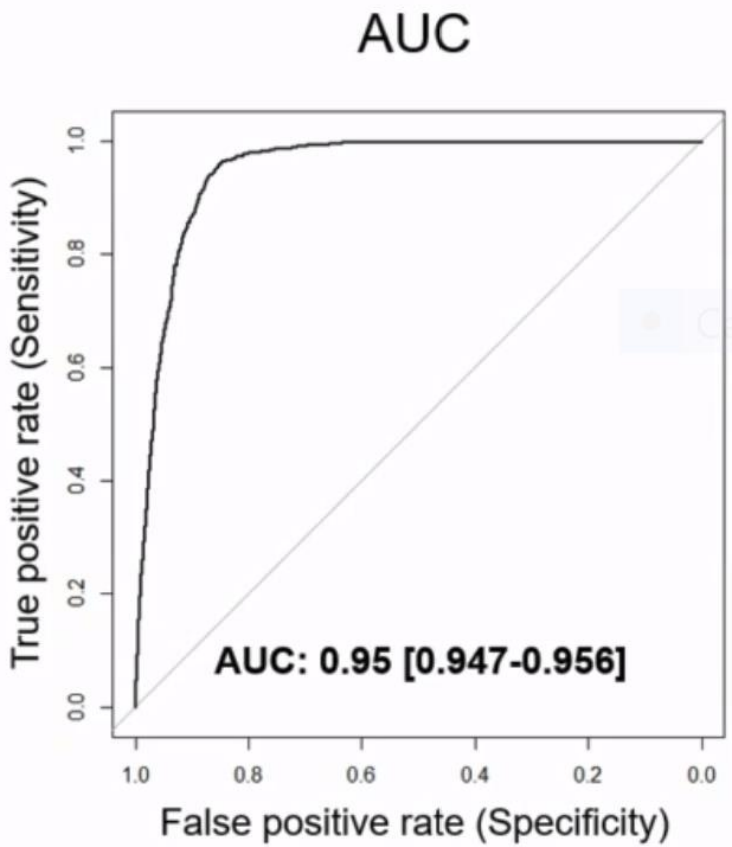
iDASCORE	Test
Clinics	18
Embryos	17.249
Positive fetal heartbeat	661
Negative fetal heartbeat	1.551
Discards	15.037



FERTILITY

EVALUATING iDASCORE

Area Under the Curve (AUC)	Diagnostic Test Quality
1.0-0.9	Excellent
0.9-0.8	Very Good
0.7-0.8	Good
0.6-0.7	Sufficient
0.5-0.6	Poor
<0.5	Test not usefull
Source: Šimundić, A.M., 2009. Measures of diagnostic accuracy: basic definitions. Ejifcc, 19(4), p.203.	

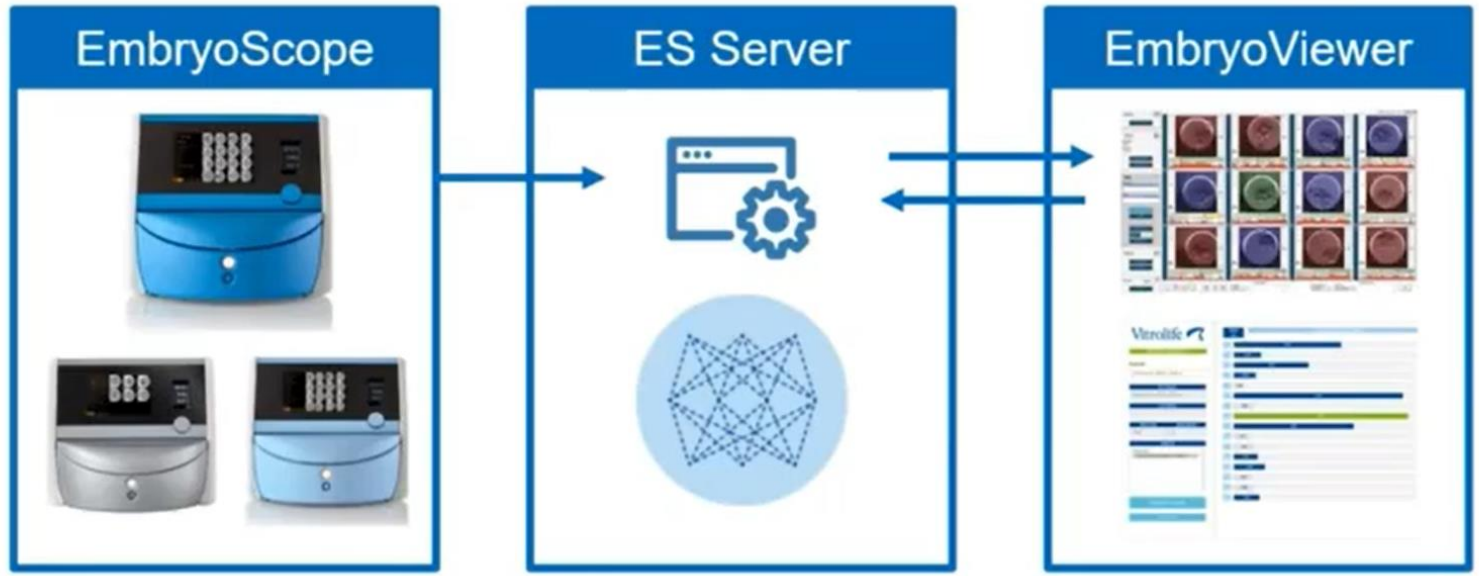


FERTILITY

INSIDE THE CLINIC

- Integrates with existing system
- Instant evaluation
- Consistent and accurate

- Fully automatic
  - No manual annotations
  - Independent of embryologist experience



FERTILITY

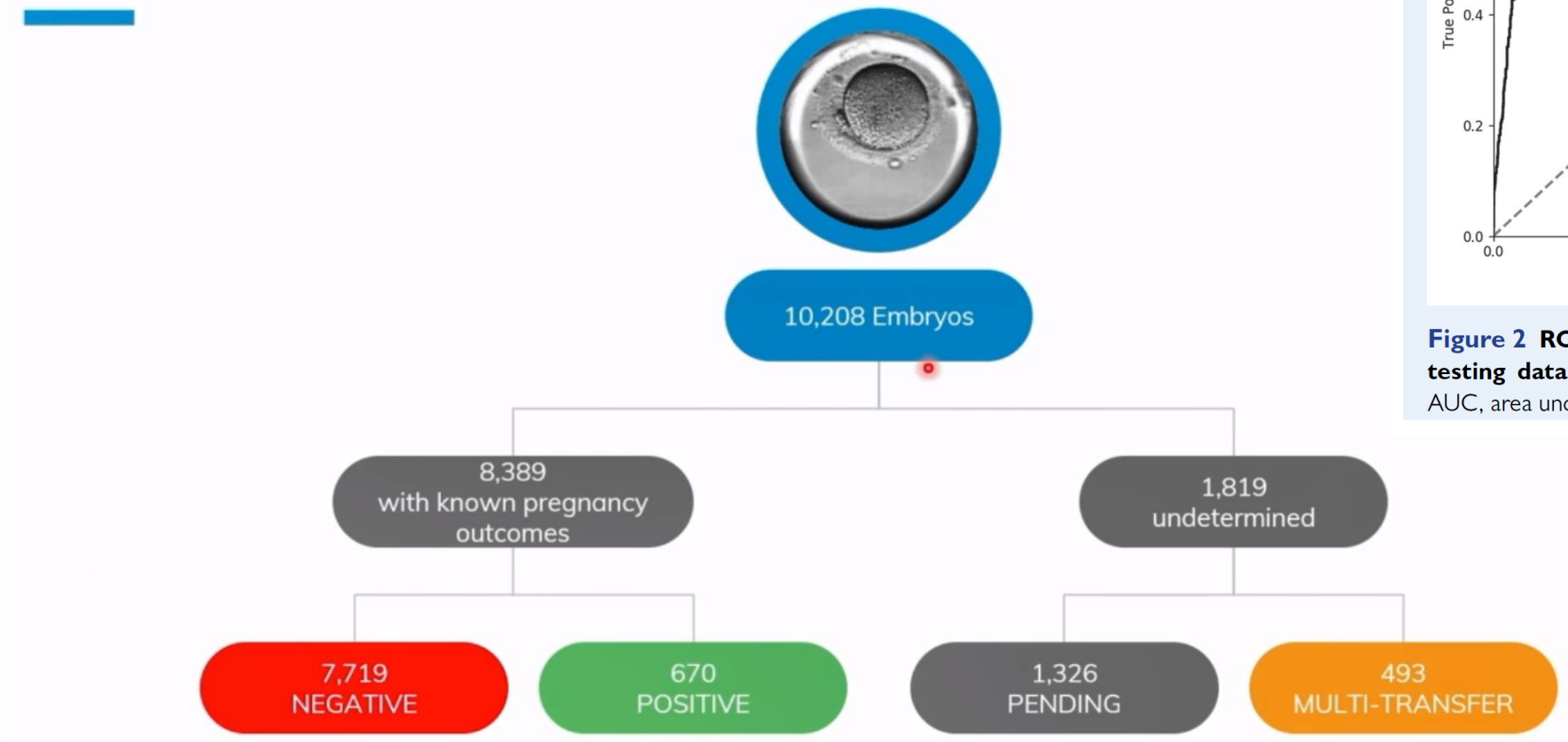
Human Reproduction, Vol.34, No.6, pp. 1011–1018, 2018
Advance Access Publication on May 21, 2019 doi:10.1093/humrep/dez064

human reproduction **ORIGINAL ARTICLE** ***Embryology***

Deep learning as a predictive tool for fetal heart pregnancy following time-lapse incubation and blastocyst transfer

D. Tran[1,*], S. Cooke[2], P.J. Illingworth[2], and D.K. Gardner[3]

[1]Medical AI, Harrison AI, Barangaroo, NSW, Australia [2]Embryology, IVF Australia, Greenwich, NSW, Australia [3]Embryology, Melbourne IVF, East Melbourne, Victoria, Australia



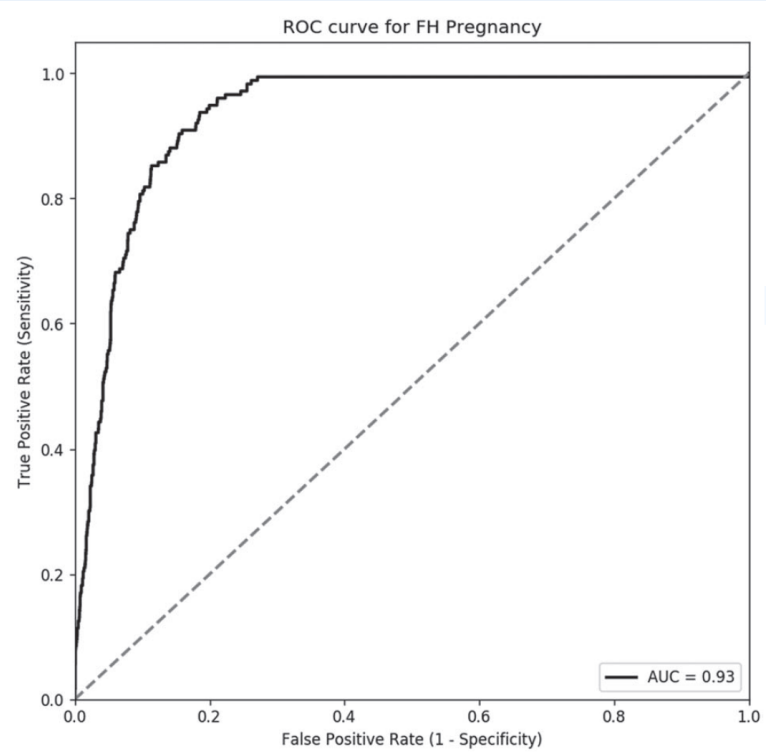
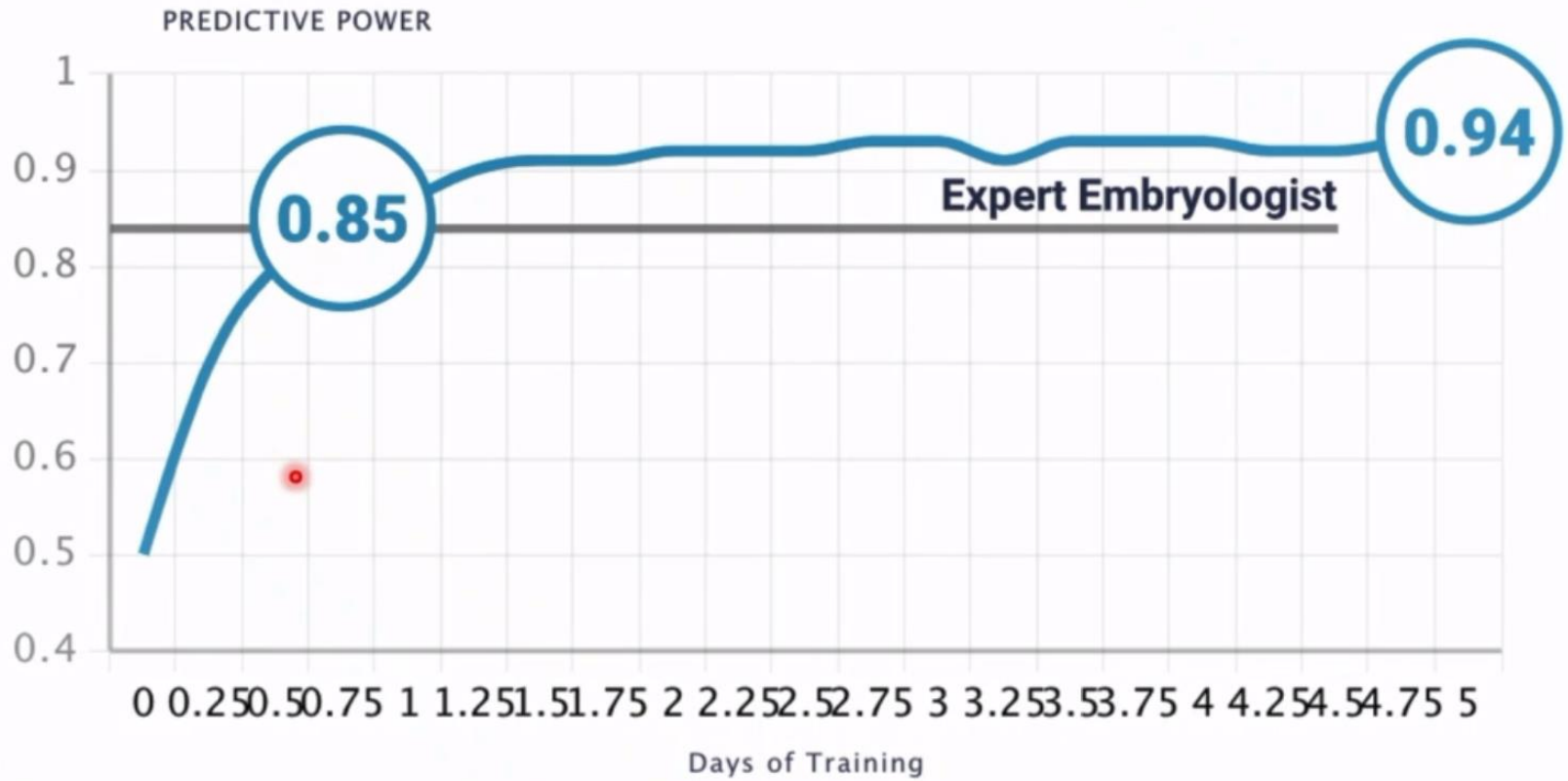


Figure 2 ROC curve for prediction of FH pregnancy on the testing dataset by IVY. ROC, Receiver operating characteristic; AUC, area under the curve.

AI technology **exceeded expert human embryologists after only one day** of training

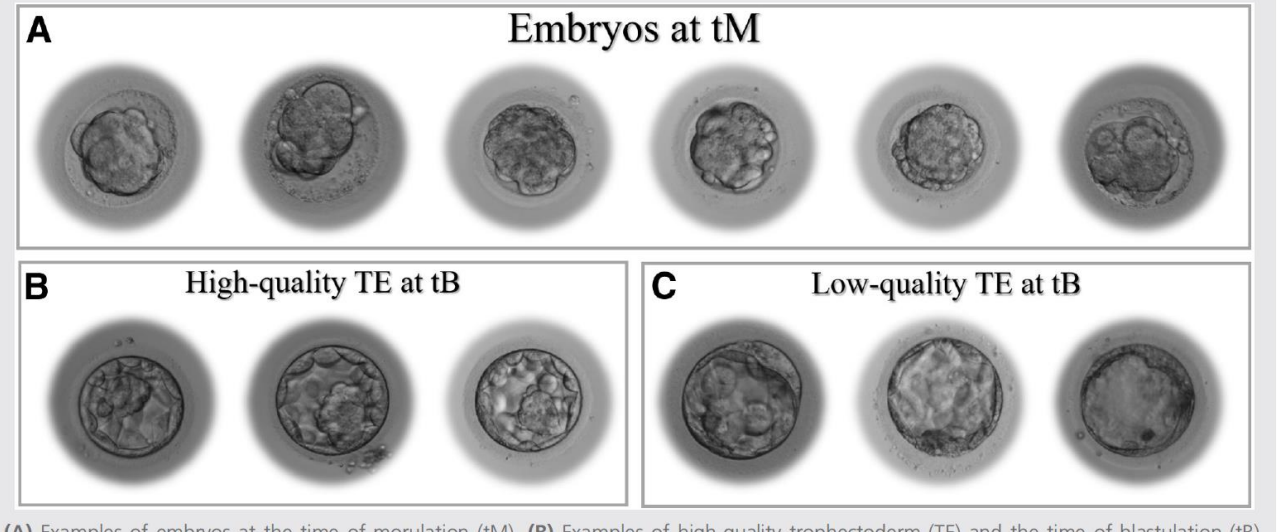


FERTILITY

Time of morulation and trophectoderm quality are predictors of a live birth after euploid blastocyst transfer: a multicenter study

Laura Rienzi, M.Sc.,[a] Danilo Cimadomo, Ph.D.,[a] Arantxa Delgado, Ph.D.,[b] Maria Giulia Minasi, M.Sc.,[c] Gemma Fabozzi, M.Sc.,[a] Raquel del Gallego, M.Sc.,[b] Marta Stoppa, M.Sc.,[a] Jose Bellver, M.D.,[b] Adriano Giancani, M.Sc.,[a,d] Marga Esbert, Ph.D.,[e] Antonio Capalbo, M.Sc.,[d,f] Jose Remohì, M.D.,[b] Ermanno Greco, M.D.,[c] Filippo Maria Ubaldi, M.D., Ph.D.,[a] and Marcos Meseguer, Ph.D.[b]

Fertility and Sterility® Vol. 112, No. 6, December 2019



(A) Examples of embryos at the time of morulation (tM). **(B)** Examples of high-quality trophectoderm (TE) and the time of blastulation (tB). **(C)** Examples of low quality TE at tB.

FERTILITY

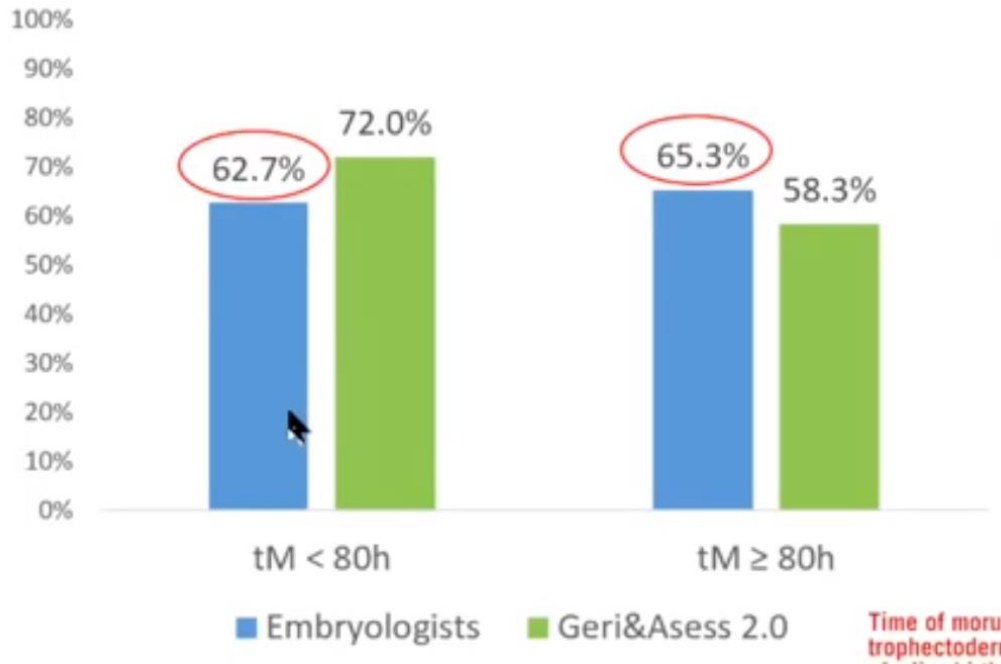
- Only *time of morulation (tM) and trophectoderm quality were outlined as putative predictors of live birth at two IVF centers*.

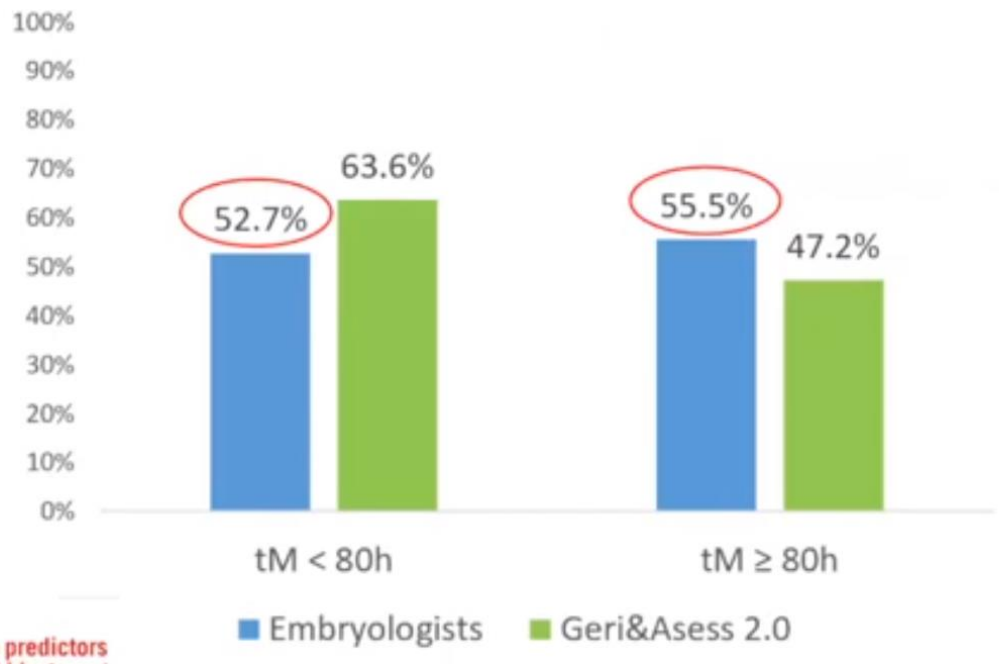
- In the validation set, the euploid blastocysts characterized by *tM <80 hours and high-quality trophectoderm resulted in a LBR of 55.2% (n = 37/67), while those with tM >80 hours and a low quality trophectoderm resulted in a LBR of 25.5% (N = 13/51).*

Clinical Result Prediction

tM < 80 h

n = 510 embryos





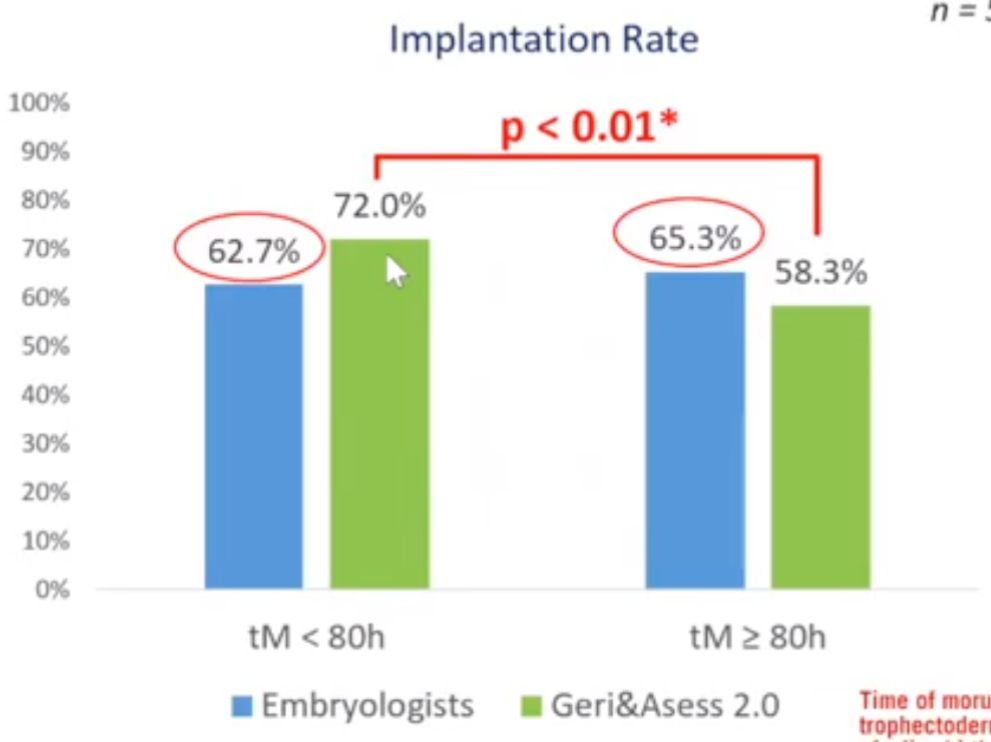
Time of morulation and trophectoderm quality are predictors

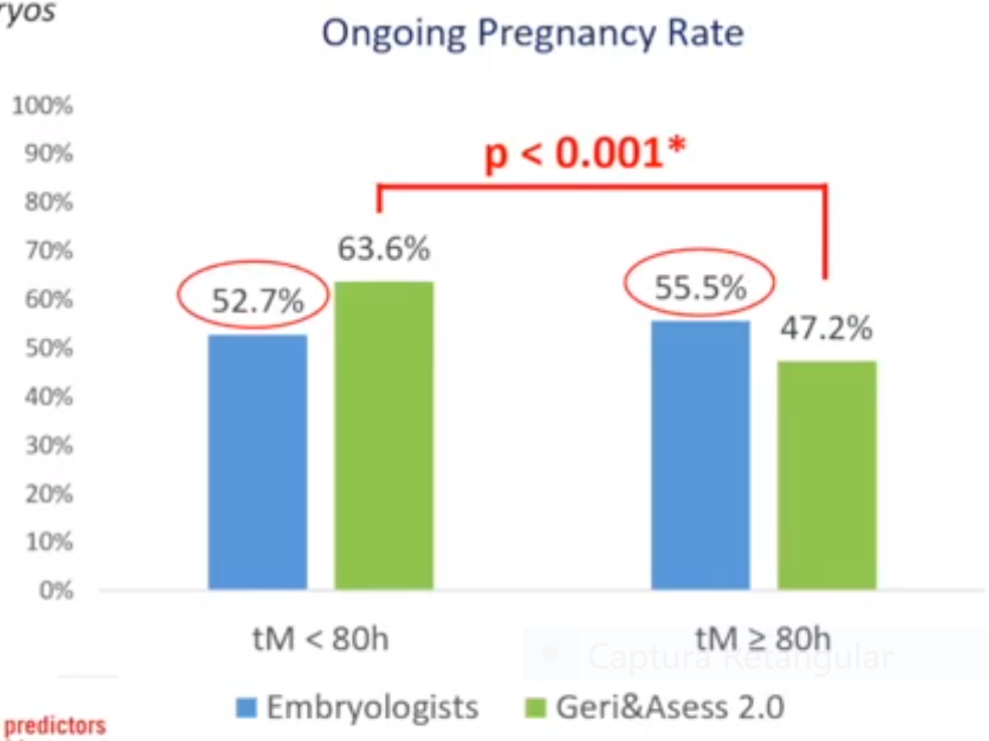
FERTILITY

Clinical Result Prediction

tM < 80 h

n = 510 embryos





Time of morulation and trophectoderm quality are predictors

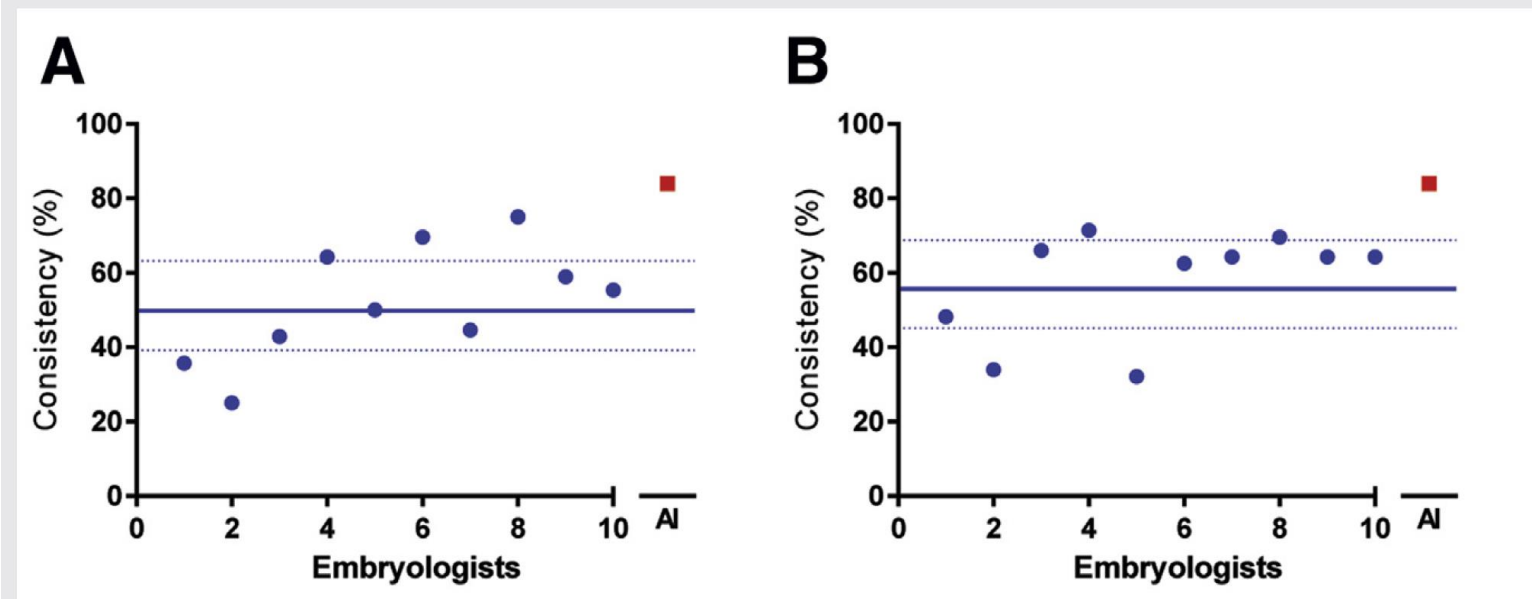
FERTILITY

Consistency and objectivity of automated embryo assessments using deep neural networks

Charles L. Bormann, Ph.D.,[a,b] Prudhvi Thirumalaraju, B. Tech,[c] Manoj Kumar Kanakasabapathy, M. Tech,[c] Hemanth Kandula, B. Tech,[c] Irene Souter, M.D.,[a] Irene Dimitriadis, M.D., Ph.D.,[a,b] Raghav Gupta, B. Tech,[c] Rohan Pooniwala, B. Tech,[c] and Hadi Shafiee, Ph.D.[a,b]

Fertility and Sterility® Vol. 113, No. 4, April 2020

Either discarding or selecting embryos for biopsy for cryo-preservation



Variability ***(%CV averages)*****:**

- Embryologist: *82.84% for 70 hpi and 44.98% for 113 hpi*
- Neural Network: 16,08%

FERTILITY

Obstetric and perinatal outcomes of pregnancies conceived with embryos cultured in a time-lapse monitoring system

Maria Fernanda Insua, Ph.D.,[a] Ana Cristina Cobo, Ph.D.,[a] Zaloa Larreategui, Ph.D.,[b] Marcos Ferrando, M.D.,[b] Vicente Serra, Ph.D.,[a] and Marcos Meseguer, Ph.D.[a]

[a] IVI Valencia, Valencia; and [b] IVI Bilbao, Bilbao, Spain

Fertility and Sterility® Vol. 108, No. 3, September 2017

Patient(s): Of 856 randomized patients, 378 gave birth to a live-born infant: 216 of the deliveries originated from embryos incubated in TLS, and 162 deliveries were from embryos cultured in SI.

Result(s): No significant differences were observed in the baseline characteristics of the study population. *The delivery rate was 49.3% (TLS) vs. 40.0% (SI), and multiple deliveries were higher in the TLS group: 31.0% (67 of 216) vs. 24.7% (40 of 162) in the SI group.*

Conclusion(s): *No detrimental effects were observed in obstetric and perinatal outcomes when a time-lapse incubator was used rather than a more widely used conventional incubator*.

FERTILITY

Does a universal TLT algorithm exist?

- Probably not.
- Each laboratory should perform a proper validation, certifying the value of each variable introduced and the corrections for putative confounders that could influence the algorithms

EMBRYOSCOPE – KIDScore D5

KIDscore D5 is based on information on embryonic development up to the 5th of approximately 1100 embryos with known implantation status.

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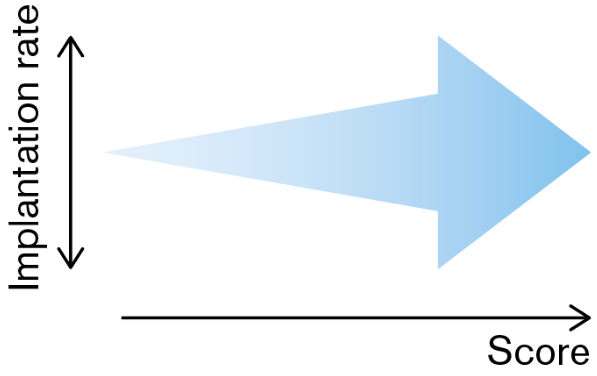
Score: 1 - 9,9 (according to the chance of implantation)



FERTILITY

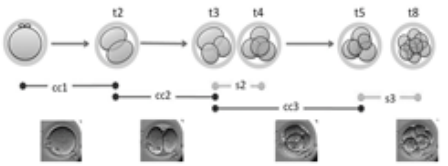
FERTscore FERTILITY

- **PN**
- pronuclei appearance **(tPNa)**
- timing to pronuclei fading **(tPNf)**
- timing to two **(t2)**, three **(t3)**, four **(t4)**, five, **(t5)**, six **(t6)**, seven **(t7)**, and eight cells **(t8)**
- timing to blastulation **(tB)**
- duration of the second cycle **(t3-t2) - cc2**
- duration of the third cycle **(t5-t3) - cc3**
- **(t2-tPNf) - s1**
- **(t4-t3) - s2**
- **(t8-t5) - s3**

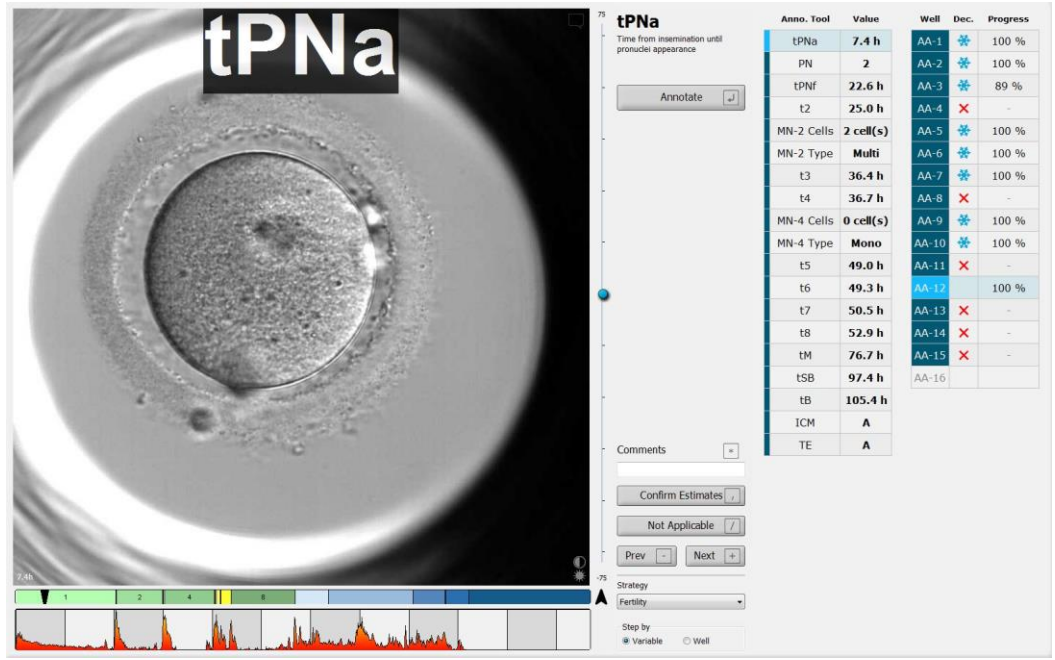
Parâmetros de Avaliação Embryoscope - Fertility

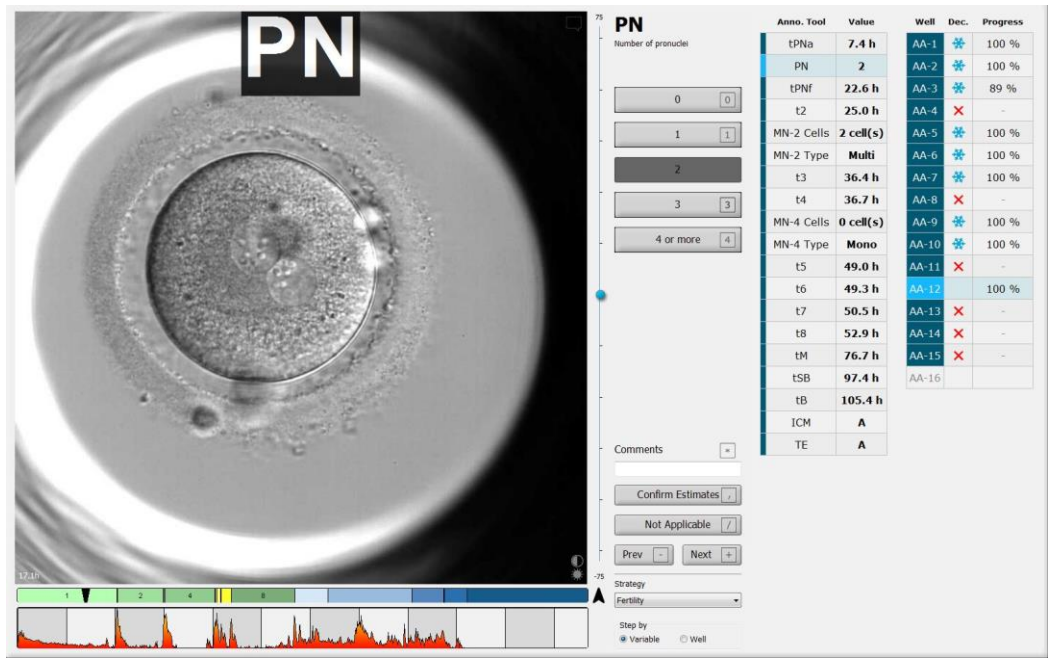
Variável	Descrição	Valores	Avaliação	Intervalo	Referência
PN	Quantidade de pronúcleos	Selecionar	Entre 16 - 18h após ICSI	-	-
tPNa	Tempo da inseminação até o aparecimento dos pronúcleos.	Horas	Anotar primeira imagem que **todos** os PNs podem ser observados.	9.16–9.64h	Aguilar 2014
tPNf	Tempo da inseminação até os pronúcleos desaparecerem	Horas	Anotar primeira imagem que todos os PNs desaparecem	>20h45m / 23.42–24.12h / 24.3 - 25.3h	Azarello 2012 / Aguilar 2014 / Desai 2014
t2	Tempo da inseminação até a completa divisão em 2 cel	Horas	No momento de divisão em 2cel	26.5 - 27.8 h	Desai 2014
t3	Tempo da inseminação até a completa divisão em 3 cel	Horas	No momento de divisão em 3cel	34-40h / 36.5 - 38.7 h	Basile 2015 / Desai 2014
t4	Tempo da inseminação até a completa divisão em 4 cel	Horas	No momento de divisão em 4cel	39.0 - 41.1 h	Desai 2014
t5	Tempo da inseminação até a completa divisão em 5 cel	Horas	No momento de divisão em 5cel	48.8 - 56.6 h / 50.8 - 53.2 h	Cruz 2012 / Desai 2014
t6	Tempo da inseminação até a completa divisão em 6 cel	Horas	No momento de divisão em 6cel	-	-
t7	Tempo da inseminação até a completa divisão em 7 cel	Horas	No momento de divisão em 7cel	-	-
t8	Tempo da inseminação até a completa divisão em 8 cel	Horas	No momento de divisão em 8cel	54.9 ± 5.2 h / 60.2 - 64.0 h	Dal Canto 2012 / Desai 2014
tB	Tempo da inseminação até a formação do blastocito	Horas	A última imagem antes do início da expansão (blastocito empurra a ZP)	120h / 103.8 - 106.6 h	Rubio 2014 / Desai 2014
ICM	Avaliação da Massa Celular Interna	A, B,C	classificar entre 115-120h (verificar ficha classificação D5)	-	-
TE	Avaliação do Trofectoderma	A, B,C	classificar entre 115-120h (verificar ficha classificação D5)	-	-

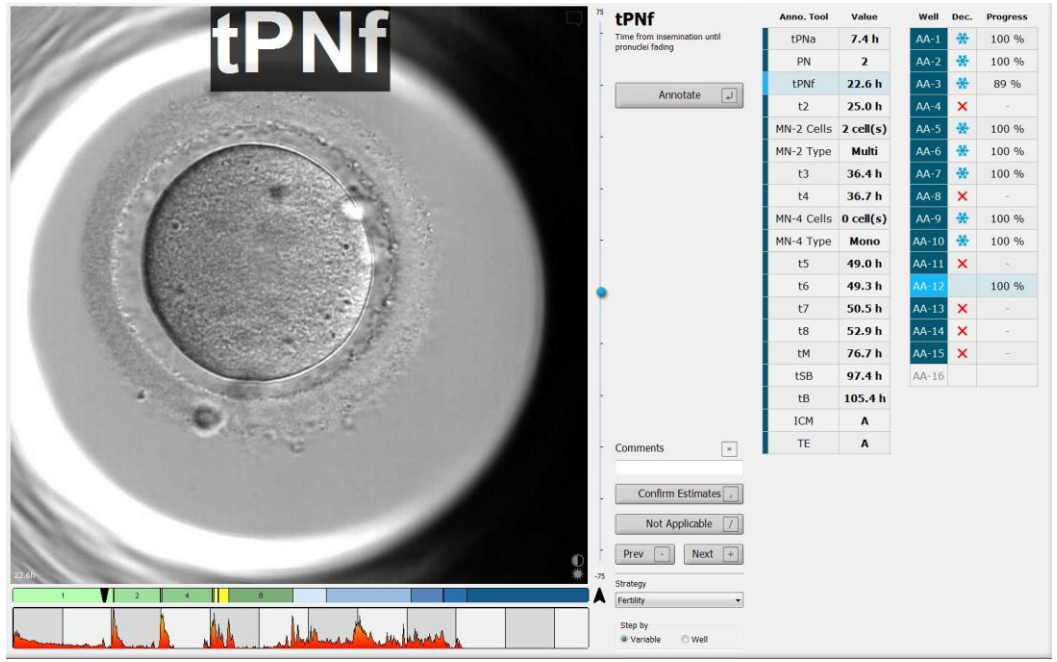
Legenda
Parâmetrar que geram o algoritmo
Parâmetrar que não geram o algoritmo

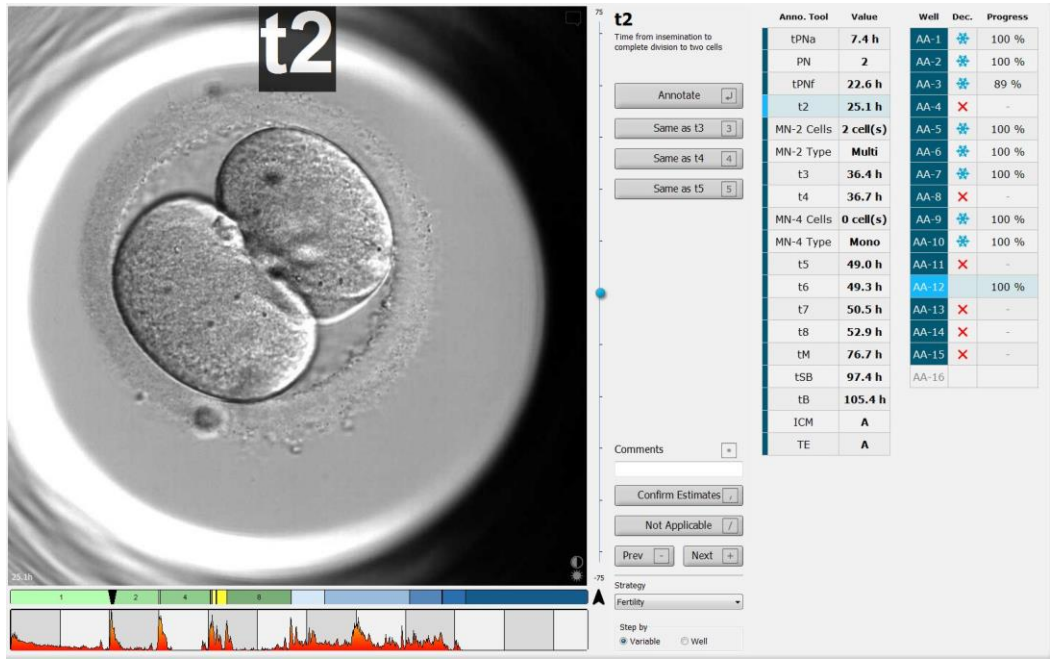


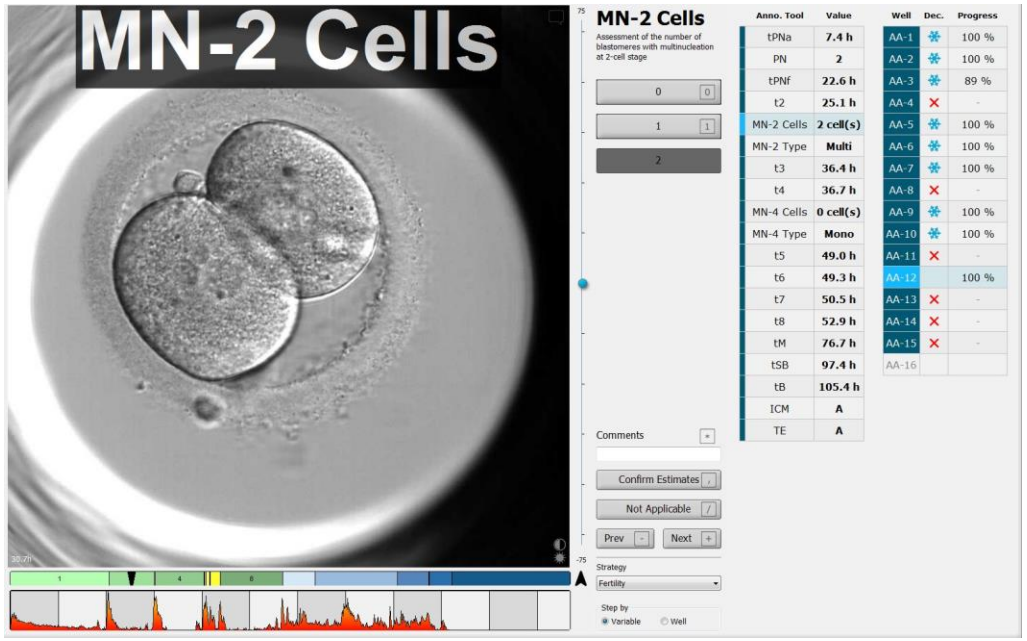
FERTILITY

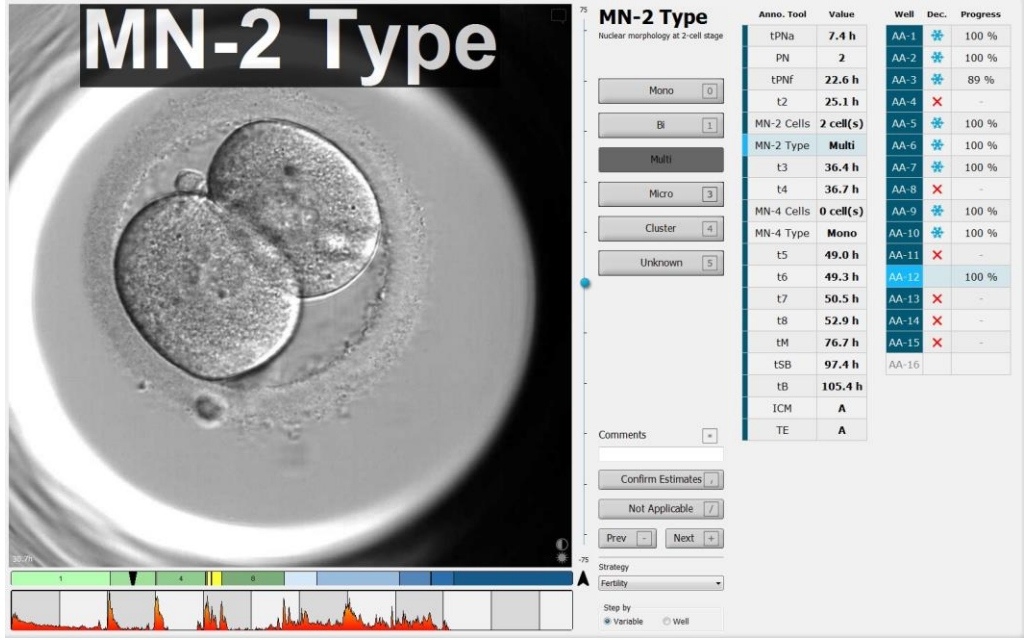

tPNa
tPNa
Time from insemination until pronuclei appearance
Annotate
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
Well
Dec.
Progress
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.0 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 36.7 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

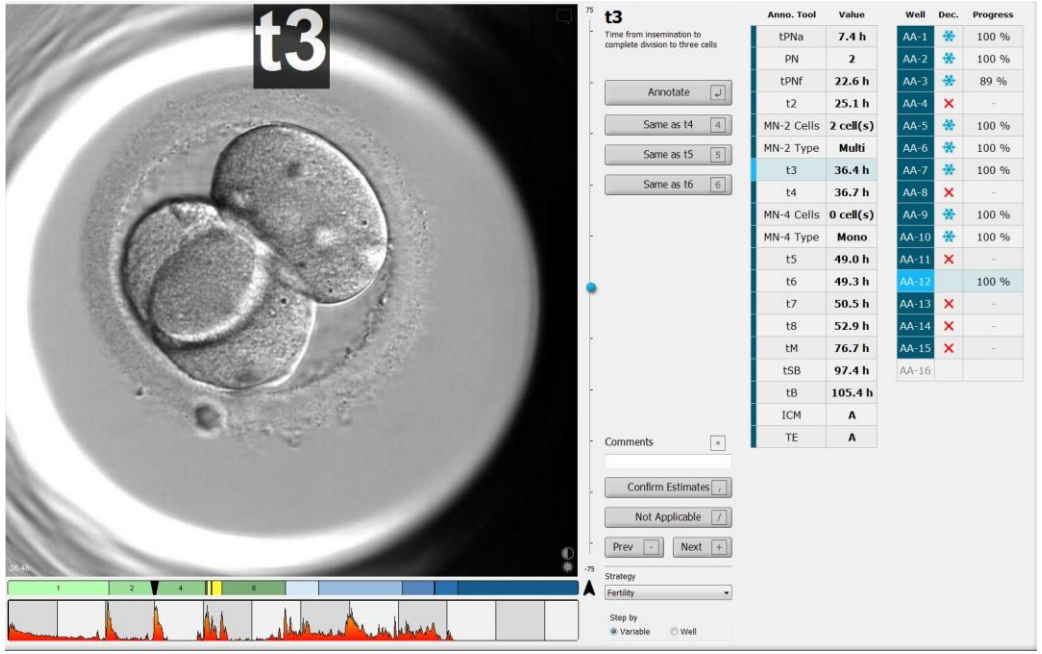

PN
PN
Number of pronuclei
0
1
2
3
4 or more
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
Well
Dec.
Progress
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.0 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 36.7 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

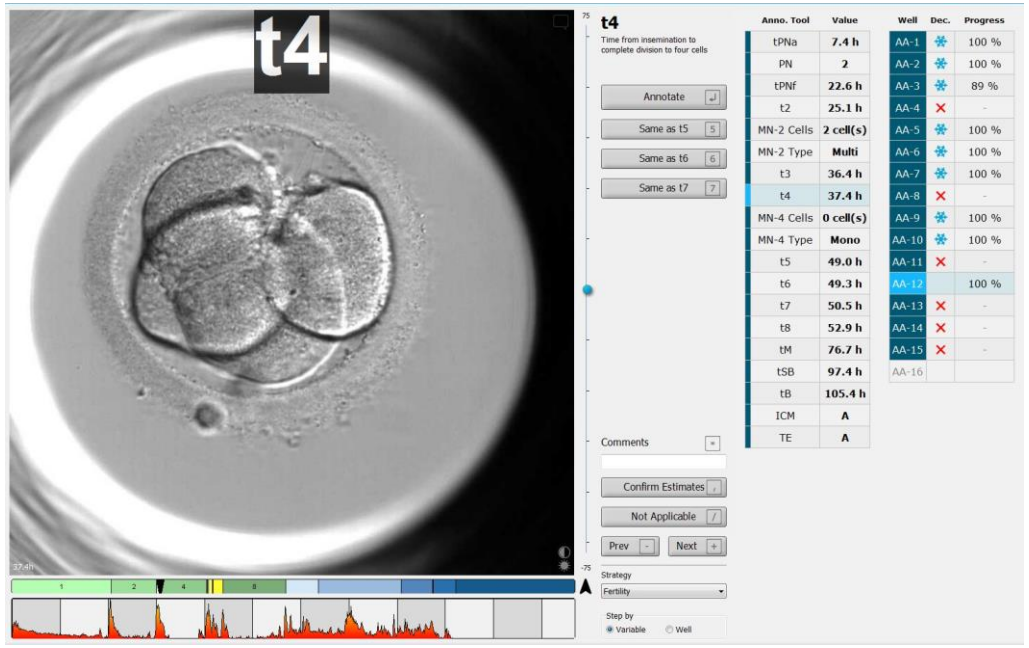

tPNf
tPNf
Time from insemination until pronuclei fading
Annotate
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
Well
Dec.
Progress
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.0 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 36.7 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

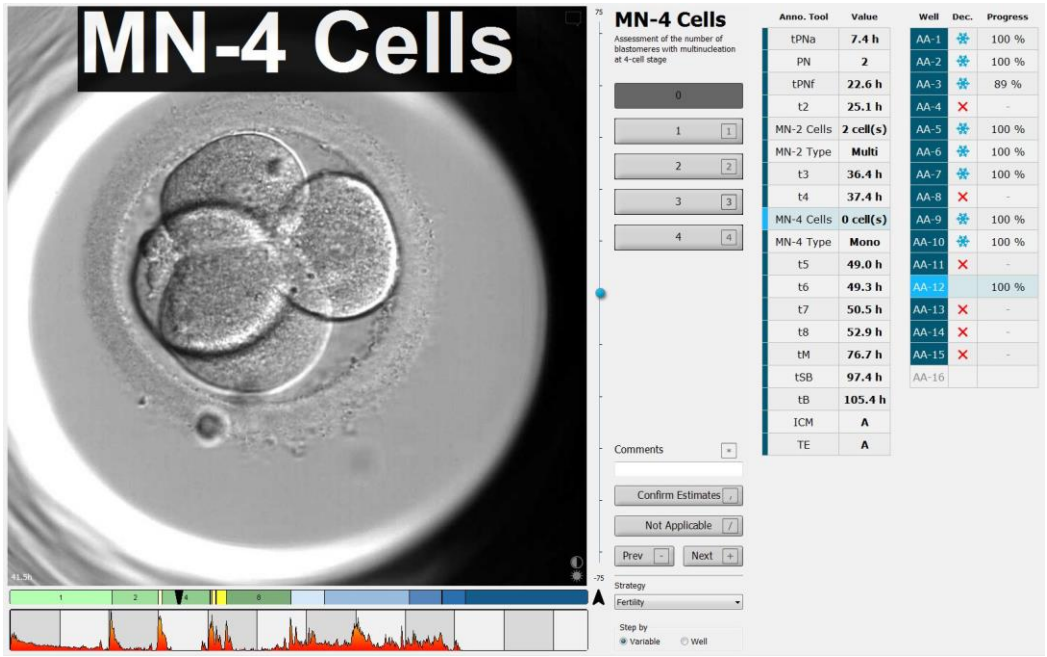

t2
t2
Time from insemination to complete division to two cells
Annotate
Same as t3
Same as t4
Same as t5
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
Well
Dec.
Progress
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 36.7 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

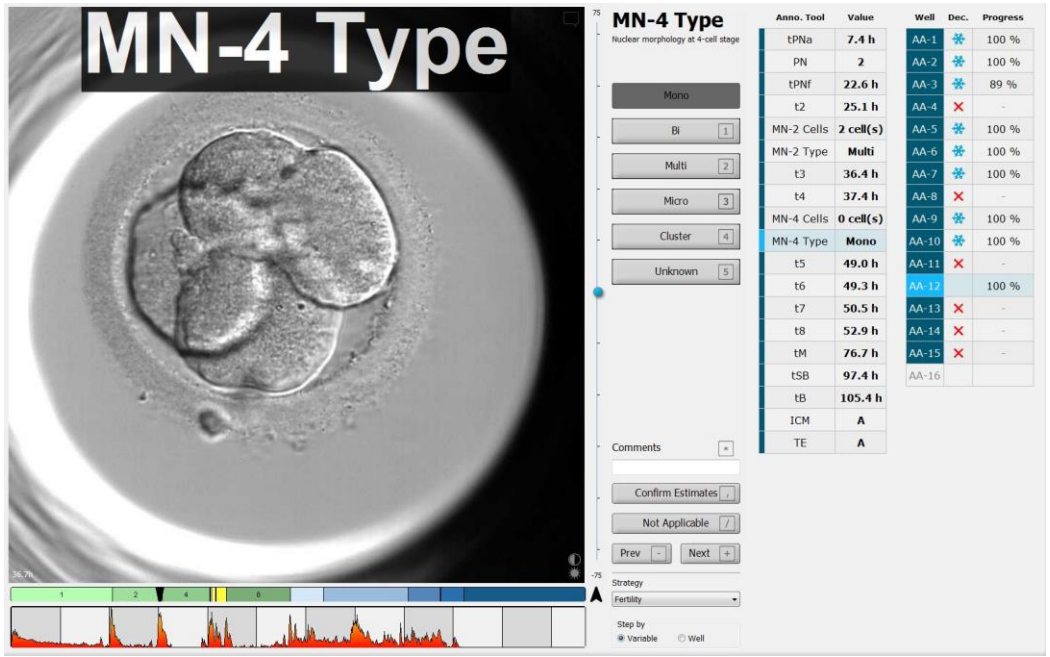

MN-2 Cells
MN-2 Cells
Assessment of the number of blastomeres with multinucleation at 2-cell stage
0
1
2
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 36.7 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

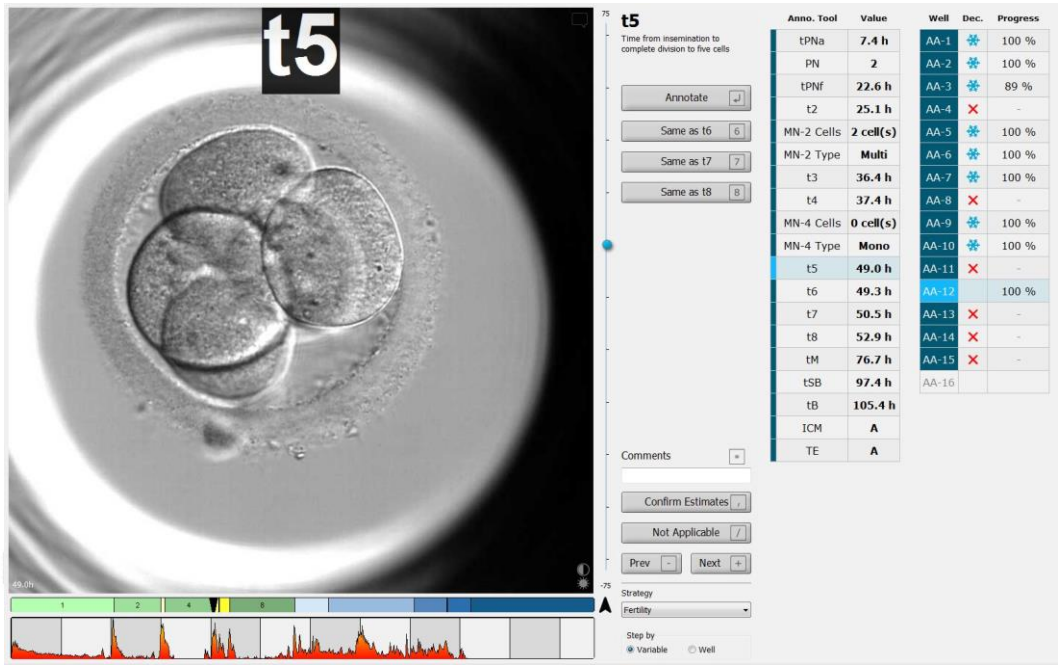

MN-2 Type
MN-2 Type
Nuclear morphology at 2-cell stage
Mono
Bi
Multi
Micro
Cluster
Unknown
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 36.7 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

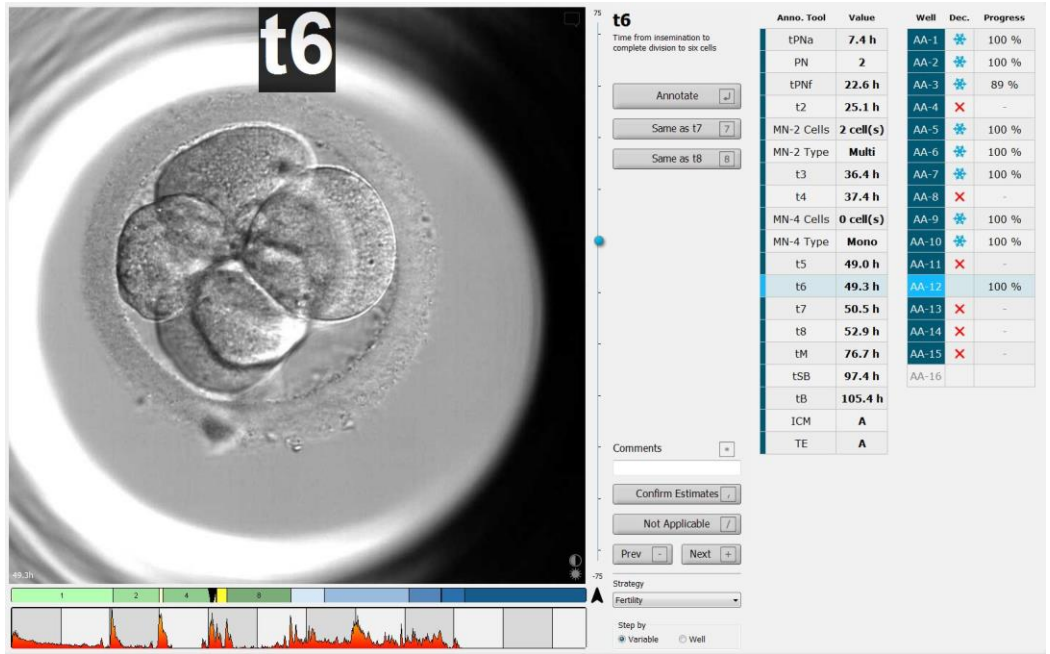

t3
t3
Time from insemination to complete division to three cells
Annotate
Same as t4
Same as t5
Same as t6
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 36.7 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

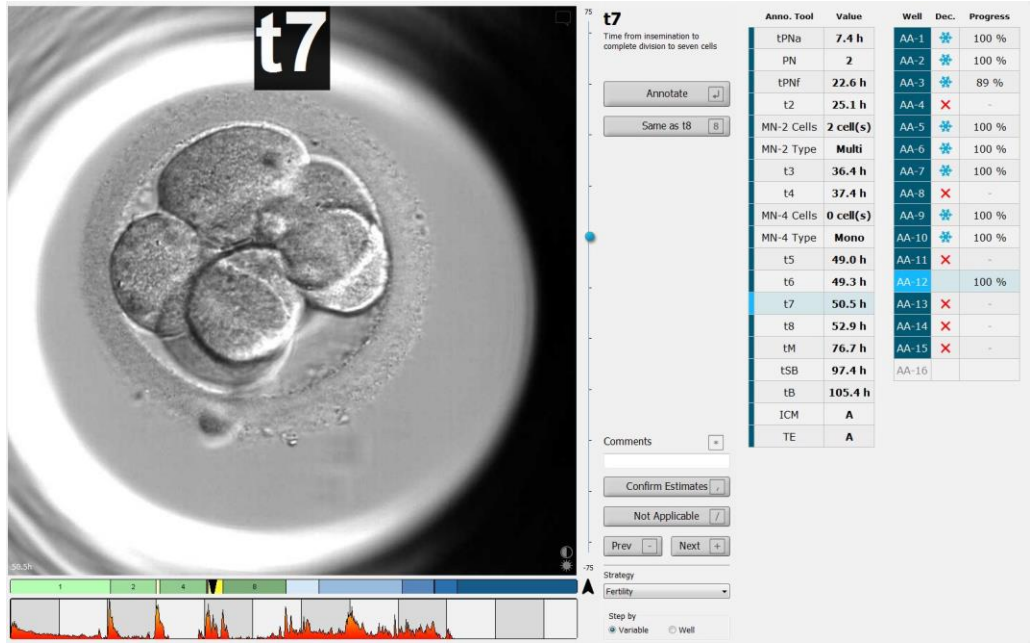

t4
t4
Time from insemination to complete division to four cells
Annotate
Same as t5
Same as t6
Same as t7
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

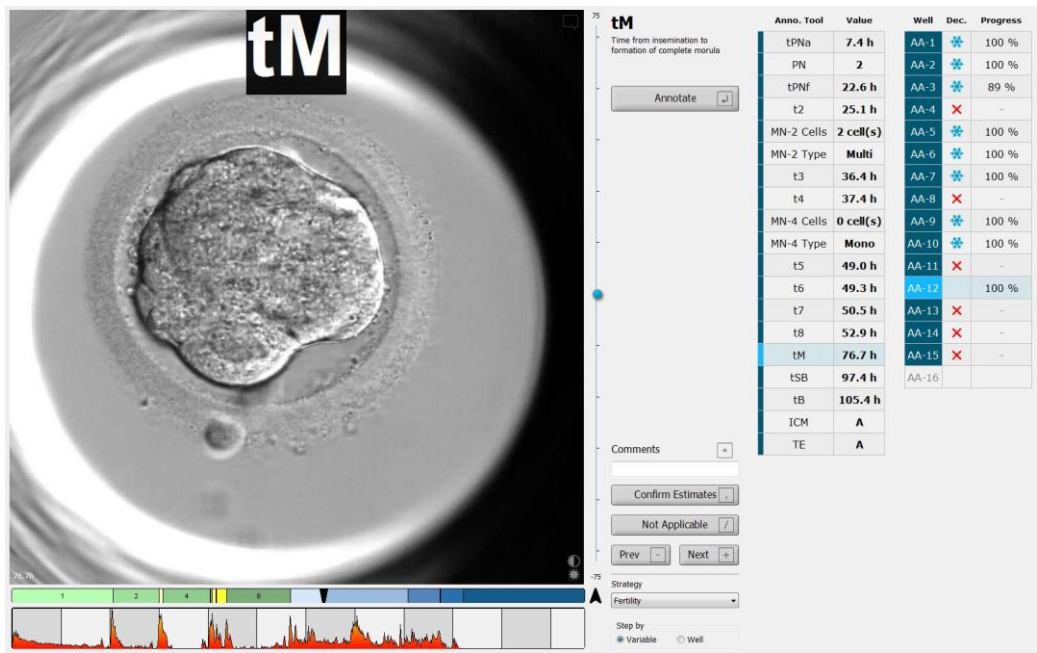

MN-4 Cells
MN-4 Cells
Assessment of the number of blastomeres with multinucleation at 4-cell stage
0
1
2
3
4
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4 -
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8 -
AA-9 100 %
AA-10 100 %
AA-11 -
AA-12 100 %
AA-13 -
AA-14 -
AA-15 -
AA-16

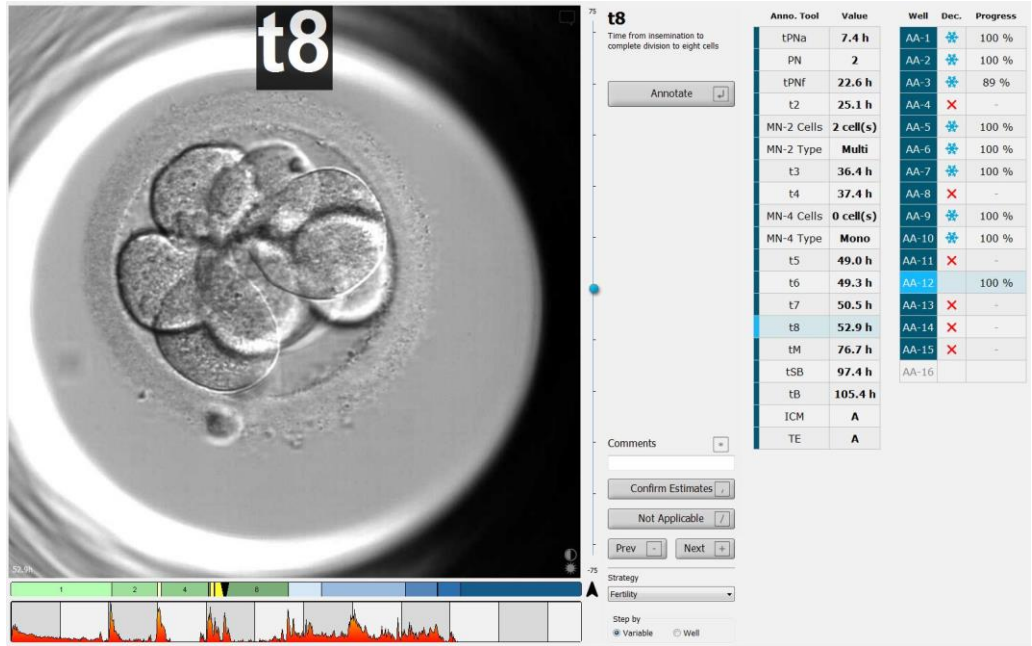

MN-4 Type
MN-4 Type
Nuclear morphology at 4-cell stage
Mono
Bi
Multi
Micro
Cluster
Unknown
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4 -
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8 -
AA-9 100 %
AA-10 100 %
AA-11 -
AA-12 100 %
AA-13 -
AA-14 -
AA-15 -
AA-16

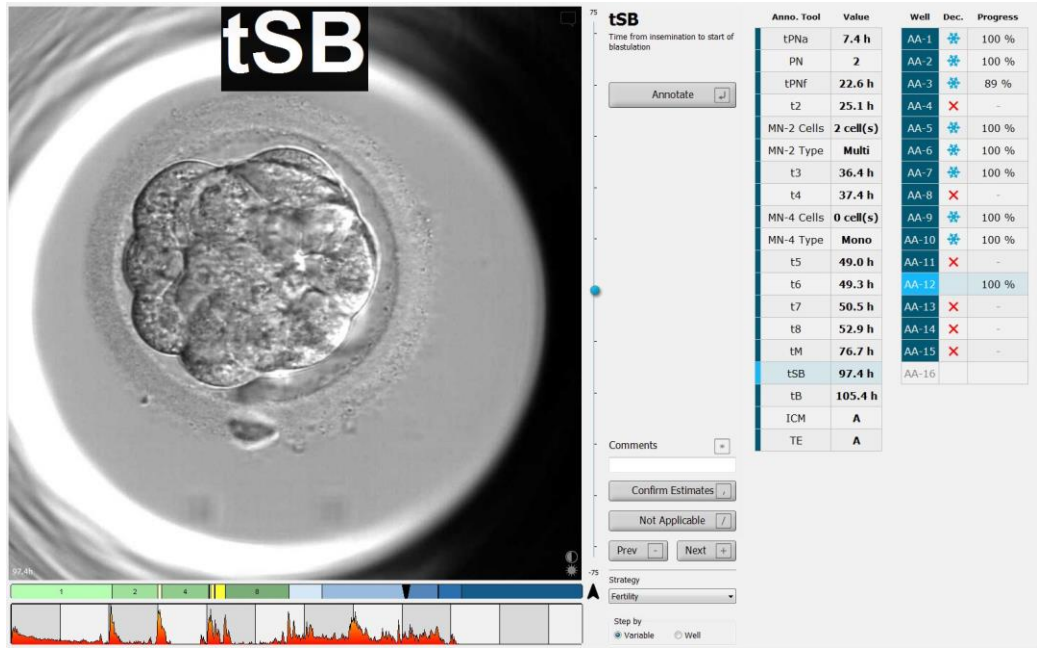

t5
t5
Time from insemination to complete division to five cells
Annotate
Same as t6
Same as t7
Same as t8
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4 -
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8 -
AA-9 100 %
AA-10 100 %
AA-11 -
AA-12 100 %
AA-13 -
AA-14 -
AA-15 -
AA-16

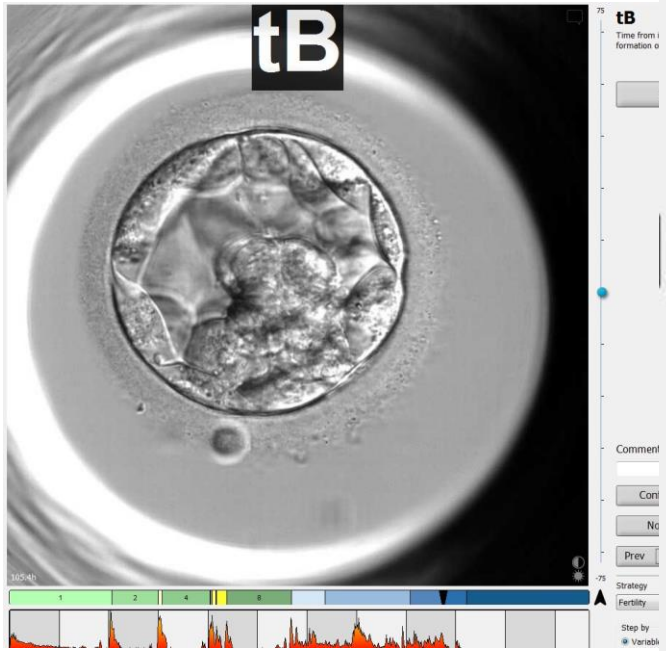

t6
t6
Time from insemination to complete division to six cells
Annotate
Same as t7
Same as t8
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4 -
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8 -
AA-9 100 %
AA-10 100 %
AA-11 -
AA-12 100 %
AA-13 -
AA-14 -
AA-15 -
AA-16

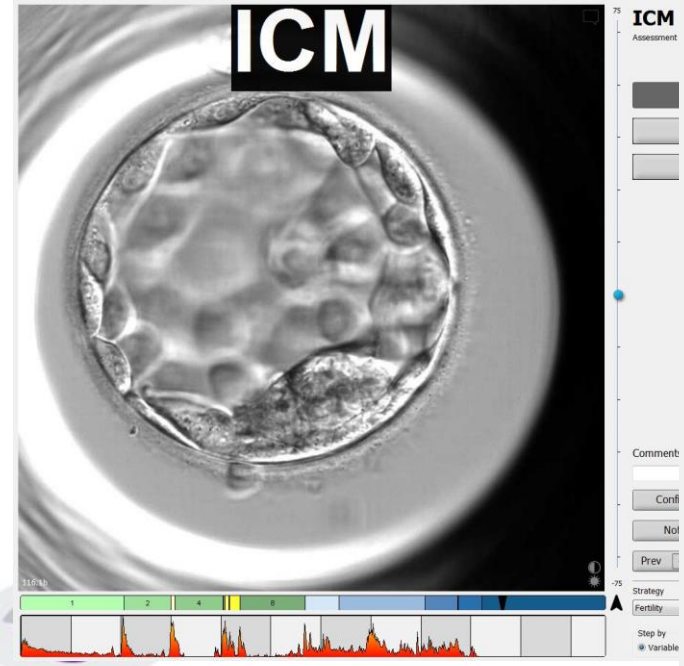

t7
t7
Time from insemination to complete division to seven cells
Annotate
Same as t8
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16


tM
tM
Time from insemination to formation of complete morula
Annotate
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16


t8
t8
Time from insemination to complete division to eight cells
Annotate
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16

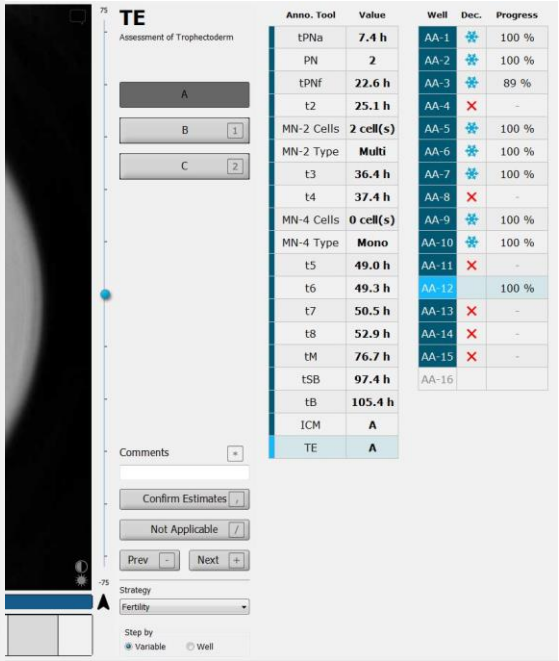

tSB
tSB
Time from insemination to start of blastulation
Annotate
Comments
Confirm Estimates
Not Applicable
Prev
Next
Strategy
Fertility
Step by
Variable
Well
Anno. Tool
Value
tPNa 7.4 h
PN 2
tPNf 22.6 h
t2 25.1 h
MN-2 Cells 2 cell(s)
MN-2 Type Multi
t3 36.4 h
t4 37.4 h
MN-4 Cells 0 cell(s)
MN-4 Type Mono
t5 49.0 h
t6 49.3 h
t7 50.5 h
t8 52.9 h
tM 76.7 h
tSB 97.4 h
tB 105.4 h
ICM A
TE A
Well
Dec.
Progress
AA-1 100 %
AA-2 100 %
AA-3 89 %
AA-4
AA-5 100 %
AA-6 100 %
AA-7 100 %
AA-8
AA-9 100 %
AA-10 100 %
AA-11
AA-12 100 %
AA-13
AA-14
AA-15
AA-16





Anno. Tool	Value
tPNa	7.4 h
PN	2
tPNf	22.6 h
t2	25.0 h
MN-2 Cells	2 cell(s)
MN-2 Type	Multi
t3	36.4 h
t4	36.7 h
MN-4 Cells	0 cell(s)
MN-4 Type	Mono
t5	49.0 h
t6	49.3 h
t7	50.5 h
t8	52.9 h
tM	76.7 h
tSB	97.4 h
tB	105.4 h
ICM	A
TE	A

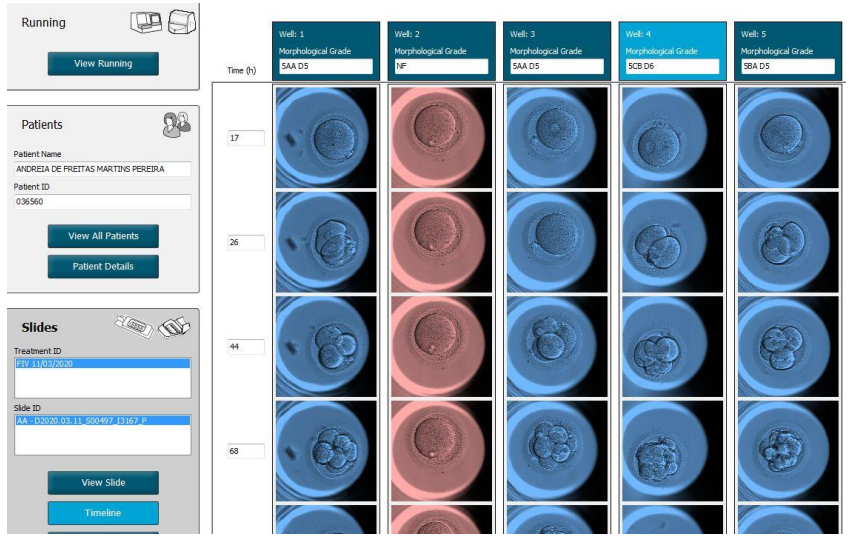
Well	Dec.	Progress
AA-1	❄	100 %
AA-2	❄	100 %
AA-3	❄	89 %
AA-4	✕	-
AA-5	❄	100 %
AA-6	❄	100 %
AA-7	❄	100 %
AA-8	✕	-
AA-9	❄	100 %
AA-10	❄	100 %
AA-11	✕	-
AA-12		100 %
AA-13	✕	-
AA-14	✕	-
AA-15	✕	-
AA-16		



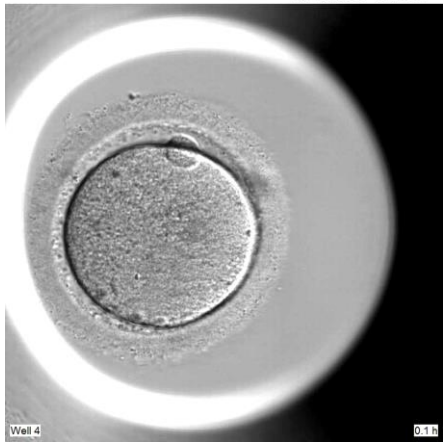
Anno. Tool	Value
tPNa	7.4 h
PN	2
tPNf	22.6 h
t2	25.1 h
MN-2 Cells	2 cell(s)
MN-2 Type	Multi
t3	36.4 h
t4	37.4 h
MN-4 Cells	0 cell(s)
MN-4 Type	Mono
t5	49.0 h
t6	49.3 h
t7	50.5 h
t8	52.9 h
tM	76.7 h
tSB	97.4 h
tB	105.4 h
ICM	A
TE	A

Well	Dec.	Progress
AA-1	❄	100 %
AA-2	❄	100 %
AA-3	❄	89 %
AA-4	✕	-
AA-5	❄	100 %
AA-6	❄	100 %
AA-7	❄	100 %
AA-8	✕	-
AA-9	❄	100 %
AA-10	❄	100 %
AA-11	✕	-
AA-12		100 %
AA-13	✕	-
AA-14	✕	-
AA-15	✕	-
AA-16		

FERTILITY
MEDICAL GROUP



FERTILITY
MEDICAL GROUP



Well	Dec.	Current score	NOT2PN	t2	t3	t4	t5	tB	ICM	TE			Last stage	Morph. grade	Last image	Saved score
AA-1	❄	8.5	●	24.1	34.9	35.8	47.9	100.9	A	A			B	5AA D5		8.5
AA-2	✗	0	△	?	?	?	?	?	?	?			-	NF		0
AA-3	❄	8.8	●	26.6	38.5	38.5	51.7	99.8	A	A			B	5AA D5		8.8
AA-4	❄	4.7	●	24.3	34.1	35.4	46.9	101.1	C	B			B	5CB D6		4.7
AA-5	❄	7.3	●	24.0	35.0	35.2	35.2	105.3	B	A			B	5BA D5		7.3
AA-6	✗	NA	?	?	?	?	?	?	?	?			-			NA

Current Model

KIDScoreD5 v3

Created 2018-11-01 by Vitrolife

Saved Model

Save Score

KIDScoreD5 v3

Saved 2020-03-17 12:19:08 by ADMIN

Transfer Info

Save Info

Transfer Date

2020-03-17

View All Patient Embryos

FERTILITY

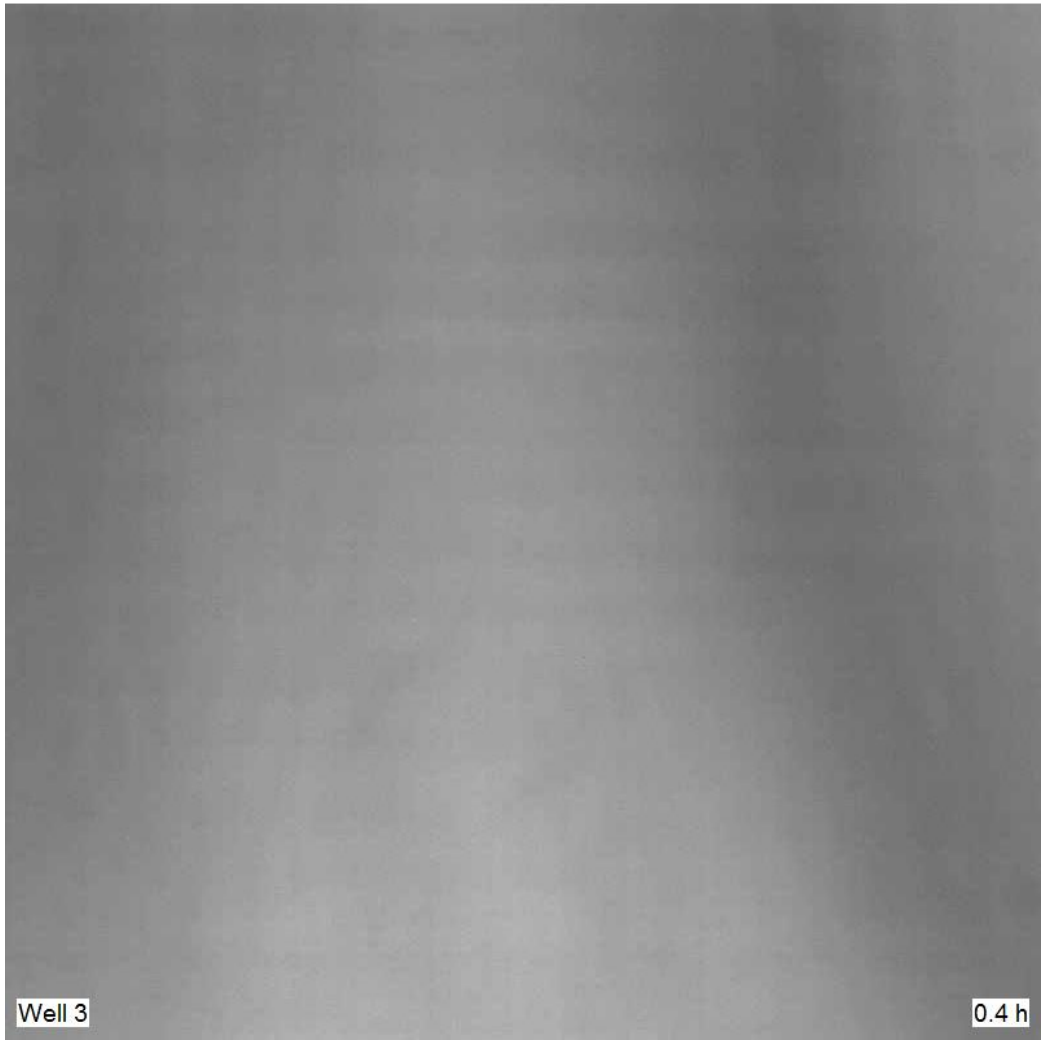
Assincronia PN

FERTILITY
MEDICAL GROUP

FERTILITY

Clivagem caótica

FERTILITY
MEDICAL GROUP



FERTILITY

Clivagem direta 1-3

Clivagem direta 1-4

Clivagem direta 2-5

FERTILITY

Clivagem reversa

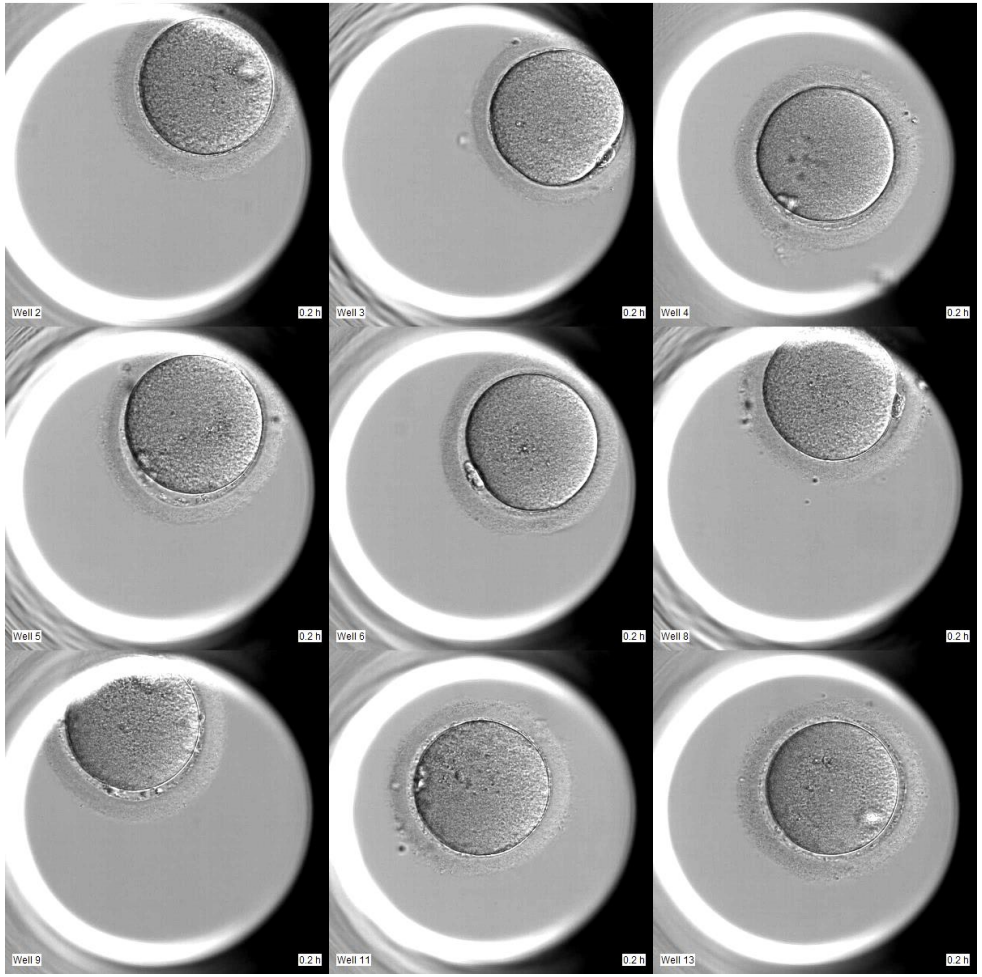
Multinucleação

Embryoscope FERTILITY

- 427 ciclos
- 372 pacientes

✓3.020 ovócitos cultivados
✓2.398 2PN (79,4%)
✓1.488 blastocistos: *62,1% 2PN*

❑ 2018: *49,9% 2PN*



FERTILITY

Embryoscope FERTILITY

Análise discriminante de parâmetros associados à formação de blastocisto

		Não blastocisto (n=657)		Blastocisto (n=563)		
Cut-off	Variável	Média	DP	Média	DP	p-value
	tPNa	7,36	4,03	6,57	2,04	
	tPNf	24,35	5,24	22,90	6,02	
	t2	27,26	5,33	25,29	3,19	<0.001
	S1 (t2-tPNf)	19,90	3,68	18,71	2,82	
	t3	36,50	6,79	36,02	4,65	
	cc2 (t3-t2)	9,24	5,22	10,74	3,10	
	t4	39,74	7,29	37,46	4,43	
	s2 (t4-t3)	3,24	4,64	1,43	2,69	<0.001
	t5	48,30	9,59	48,77	7,15	
	cc3 (t5-t3)	11,80	6,68	12,75	4,62	
	t6	53,28	10,44	51,55	7,02	
	t7	57,34	11,62	54,21	8,40	<0.001
	t8	62,06	13,07	57,25	9,51	
	s3 (t8-t5)	13,75	10,05	8,48	7,84	<0.001

FERTILITY

Embryoscope FERTILITY

Análise discriminante de parâmetros associados à formação de blastocisto

		Não blastocisto (n=657)		Blastocisto (n=563)		
Cut-off	Variável	Média	DP	Média	DP	p-value
	tPNa	7,36	4,03	6,57	2,04	
	tPNf	24,35	5,24	22,90	6,02	
26,27	t2	27,26	5,33	25,29	3,19	<0.001
	S1 (t2-tPNf)	19,90	3,68	18,71	2,82	
	t3	36,50	6,79	36,02	4,65	
	cc2 (t3-t2)	9,24	5,22	10,74	3,10	
	t4	39,74	7,29	37,46	4,43	
2,34	s2 (t4-t3)	3,24	4,64	1,43	2,69	<0.001
	t5	48,30	9,59	48,77	7,15	
	cc3 (t5-t3)	11,80	6,68	12,75	4,62	
	t6	53,28	10,44	51,55	7,02	
55,78	t7	57,34	11,62	54,21	8,40	<0.001
	t8	62,06	13,07	57,25	9,51	
11,12	s3 (t8-t5)	13,75	10,05	8,48	7,84	<0.001

76,1% de casos originais agrupados corretamente classificados

FERTILITY

EmbryoScope FERTILITY

ICSI e OVODON					
Variáveis	Convencional (n=764)		Embryoscope (n=119)		p
	Média	DP	Média	DP	
Taxa de fertilização (%)	76,5	25,0	74,4	26,5	0,255
Taxa de blastocisto (%)	**59,2**	25,0	**66,0**	25,4	**0,003**
Embriões transferidos (n)	**2,0**	0,6	**1,2**	0,9	**<0,001**
Taxa de implantação (%)*	**24,5**	37,3	**36,4**	42,2	**0,006**
Taxa de gestação (%)*	**34,6**		**55,7**		**<0,001**
Taxa de aborto (%)*	**11,5**		**2,3**		**0,001**

FERTILITY

EmbryoScope FERTILITY

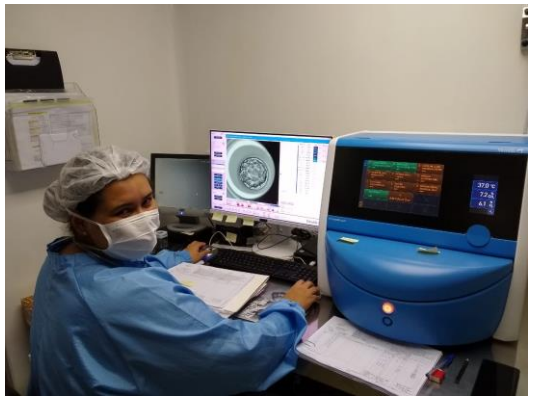
Resultado clínico estratificado por idade					
Até 35 anos					
	Convencional (n=182)		**Embryoscope (n=181)**		**p**
	Média	**DP**	**Média**	**DP**	
Taxa de implantação (%)	41.9	5.5	29.8	6.3	0.147
Taxa de gestação (%)	51.6		38.3		0.166
Taxa de aborto (%)	16.1		27.8		0.329
36 a 39 anos					
	Convencional (n=182)		**Embryoscope (n=275)**		**p**
	Média	**DP**	**Média**	**DP**	
Taxa de implantação (%)	29.7	4.9	24.4	4.4	0.421
Taxa de gestação (%)	32.9		37.3		0.576
Taxa de aborto (%)	12.5		7.4		0.542
≥ 40 anos					
	Convencional (n=140)		**Embryoscope (n=225)**		**p**
	Média	**DP**	**Média**	**DP**	
Taxa de implantação (%)	11.1	4.2	21.0	4.5	**<0.001**
Taxa de gestação (%)	14.1		28.8		**0.045**
Taxa de aborto (%)	31.3		32.0		0.915

FERTILITY

EmbryoScope FERTILITY

KIDscore D5	≤ 2,5	2,6 – 5,0	5,1 – 7,5	> 7,5
Taxa de Implantação (%)	24,0[a]	27,3[b]	31,4[c]	37,2[d]

a ≠ b ≠ c ≠ d, p < 0,001
General linear model, função Log linear, distribuição Poison



FERTILITY

Improved embryonic development and utilization rates with EmbryoScope: A within-subject comparison versus a benchtop incubator

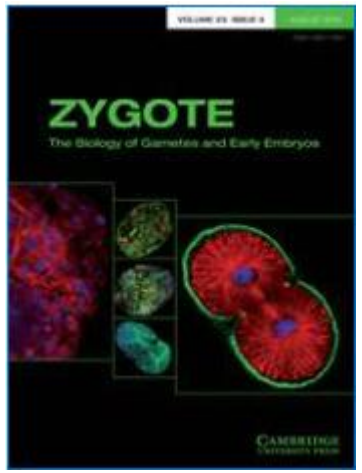


Table 2. Comparison of embryonic development between Control and TLI groups using GzLM followed by Bonferroni post hoc test

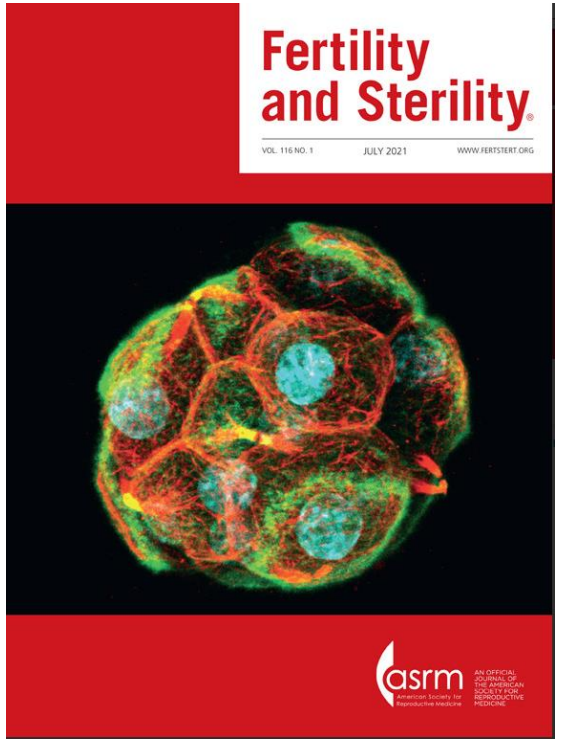
Variables	Control group (n=71)	TLI group (n=71)	p-value
Fertilization (%)	76.0 ± 1.3 (73.5 – 78.7)	80.0 ± 1.4 (77.2 – 82.6)	0.044
Non-fertilization (%)	14.8 ± 0.6 (13.7 – 15.9)	6.3 ± 0.4 (5.6 – 7.0)	<0.001
Day-2 non-cleavage (%)	3.8 ± 0.2 (3.3 – 4.3)	1.1 ± 0.1 (0.9 – 1.3)	<0.001
Cleavage (%)	85.3 ± 1.2 (83.0 – 87.7)	84.2 ± 1.3 (81.7 – 86.8)	0.521
Day-5 embryos (%)	62.4 ± 1.0 (60.5 – 64.3)	86.4 ± 1.1 (84.2 – 88.6)	<0.001
Blastocyst development (%)	40.9 ± 1.1 (38.8 – 43.1)	55.6 ± 1.3 (53.1 – 58.1)	<0.001
Frozen blastocyst (%)	31.8 ± 0.8 (30.3 – 33.3)	37.0 ± 0.9 (35.2 – 38.9)	<0.001
OUR	40.7 ± 1.0 (38.8 – 42.7)	50.2 ± 1.1 (48.0 – 52.4)	<0.001
EUR	52.4 ± 1.1 (50.3 – 54.7)	66.6 ± 1.2 (64.3 – 68.9)	<0.001

Note: Values are means ± standard error (95% confidence interval). TLI: timelapse imaging, GzLM: generalized linear models, OUR: oocyte utilization rate, EUR: embryo utilization rate.

Time-lapse monitoring: an adjunct tool to select embryos for preimplantation genetic testing

Results from General Linear Models followed by Bonferroni Post Hoc for the comparison of embryo morphokinetics between aneuploidy and euploidy embryos.

Morphokinetic data	Euploid embryos (n=352)	Aneuploid embryos (n=605)	*p-value*
tPNa	6.220 ± 000	6,222±,057	0.974
tPNf	22.503 ± 0.157	24,063±0.000	**< 0.001**
t2	24,998±0.0	24,998±0.157	**< 0.001**
t3	36,141±,000	37,684±,152	**< 0.001**
t4	37,254±,227	39,259±,171	**< 0.001**
t5	49,868±,000	49,862±,239	0.981
t6	50,780±,000	53,026±,268	**< 0.001**
t7	52,561±,358	54,797±,269	**< 0.001**
t8	55,435±,431	58,653±,338	**< 0.001**
tM	85,845±,467	87,370±,366	**0.024**
tB	105,319±0.000	108,639±0,000	**<0.001**
cc2	11.3±0.13	11.3±0.10	0.809
cc3	12.7 ± 0.25	12.4 ± 0.19	0.327
s1	2.5 ± 0.04	2.6 ± 0.03	0.108
s2	1.0 ± 0.12	1.3 ± 0.09	**0.022**
s3	7.0 ± 0.38	8.37 ± 0.29	**0.006**
MN in two cell stage	0.32 ± 0.028	0.36 ± 0.022	0.275
MN in four cell stage	0.075 ± 0.015	0.079 ± 0.012	0.845
KidScore D5	6.6 ±0.0	5.7 ± 0.83	**< 0.001**



First International Journal of Andrology
ANDROLOGIA

Early and late paternal contribution to cell division of embryos in a time-lapse imaging incubation system

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Manuscript Type:	Original Article
Date Submitted by the Author:	n/a
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Keywords:	male age, semen, morphokinetics, Time-lapse imaging

FERTILITY

RESULTS

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Variable	Mean ± SD
Female age (years)	37.7 ± 3.8

RESULTS

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Early and late paternal contribution to cell division of embryos in a time-lapse imaging incubation system

Variable	Mean ± SD
Semen analysis	
Male age (years)	41.3 ± 6.8
Ejaculatory abstinence length (days)	3.2 ± 2.5

FERTILITY

RESULTS

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Early and late paternal contribution to cell division of embryos in a time-lapse imaging incubation system

Variable	Mean ± SD
ICSI outcomes	
Fertilization rate (%)	75.8
Blastocyst development (%)	64.4
Transferred embryos (n)	1.3 ± 0.5
Endometrial thickness (mm)	8.3 ± 4.4
Implantation rate (%)	24.4 ± 56.0
Pregnancy rate (%)	24.0
Miscarriage rate (%)	0.0

FERTILITY

RESULTS

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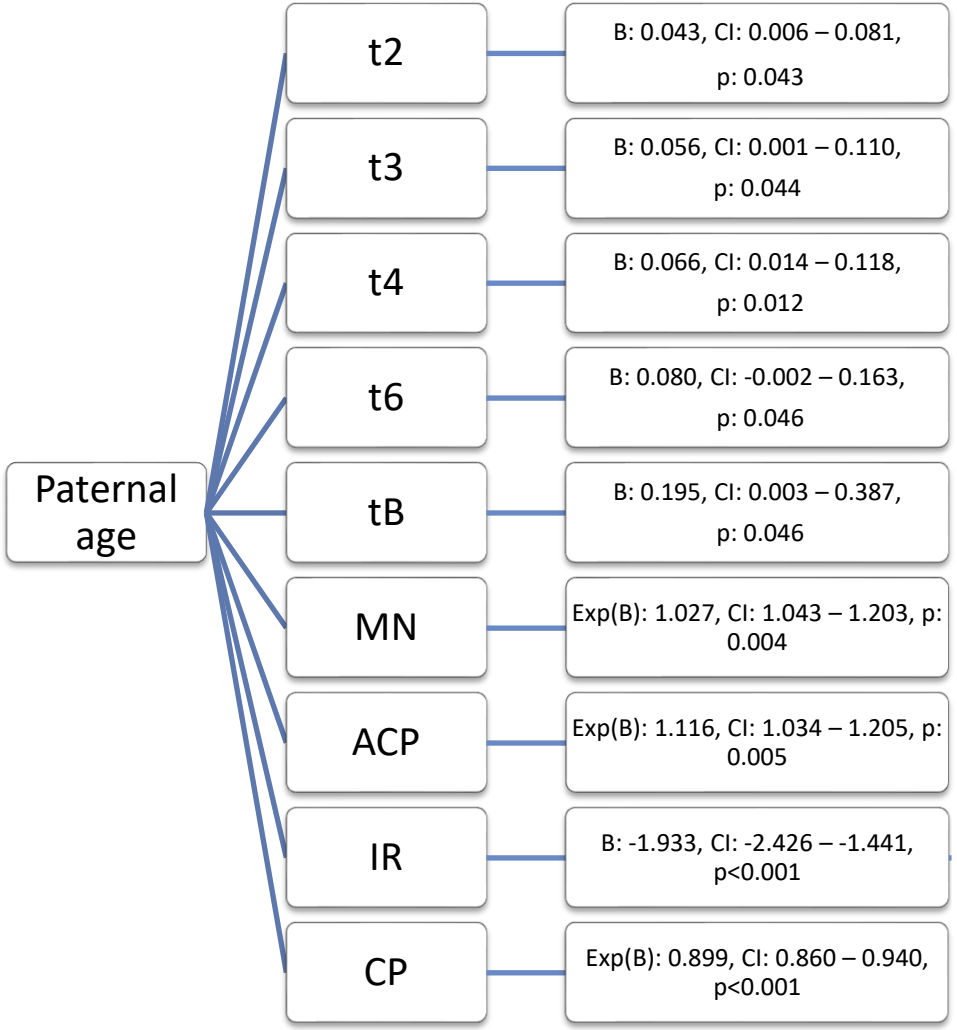
Early and late paternal contribution to cell division of embryos in a time-lapse imaging incubation system



FERTILITY

RESULTS

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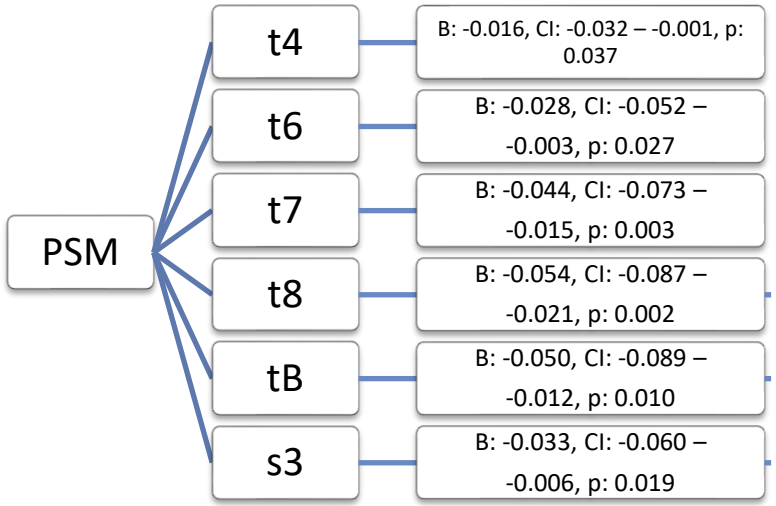
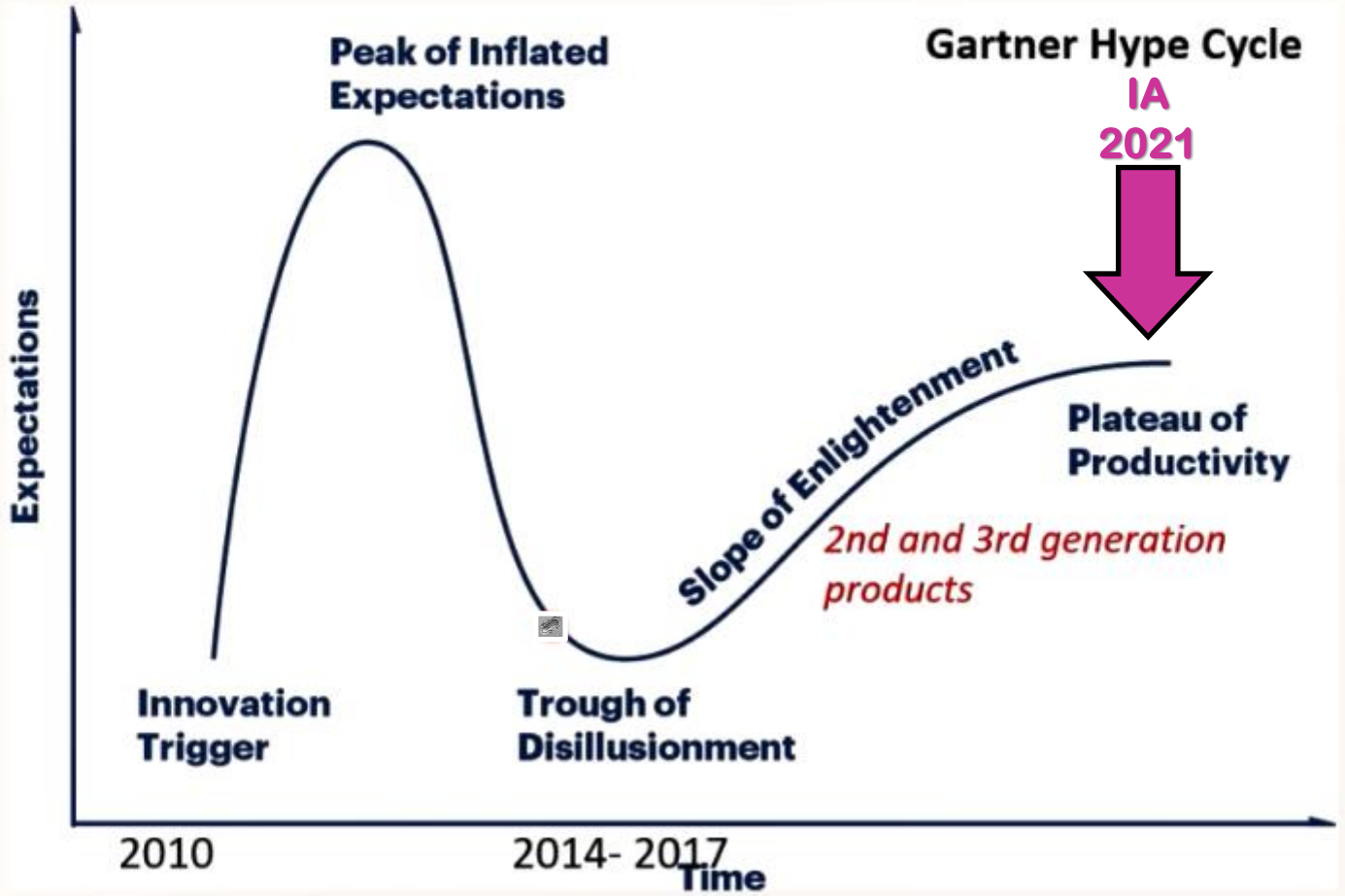


FERTILITY

Gartner Hype cycle

Five key phases of a technology's life cycle



Time lapse technology (TLT) – Ideal automation partner

From past to future...

Embryo through the lens: from time-lapse cinematography to artificial intelligence

Elnur Babayev, M.D. and Eve C. Feinberg, M.D.

Northwestern University Feinberg School of Medicine, Chicago, Illinois

https://doi.org/10.1016/j.fertnstert.2019.12.001

"Once a new technology rolls over you, if you're not part of the steamroller, you're part of the road."

—Stewart Brand

FERTILITY

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https://fertility.com.br/aulas-ministradas/

AULAS MINISTRADAS

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Obrigado!

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