

Prise en charge des réarrangements chromosomiques en médecine de la reproduction

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Maternité des Bluets, Paris

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Caryotype



1



2



3



4



5



6



7



8



9



10



11



12



13



14



15



16



17



18



19



20



21



22



X



Y

or



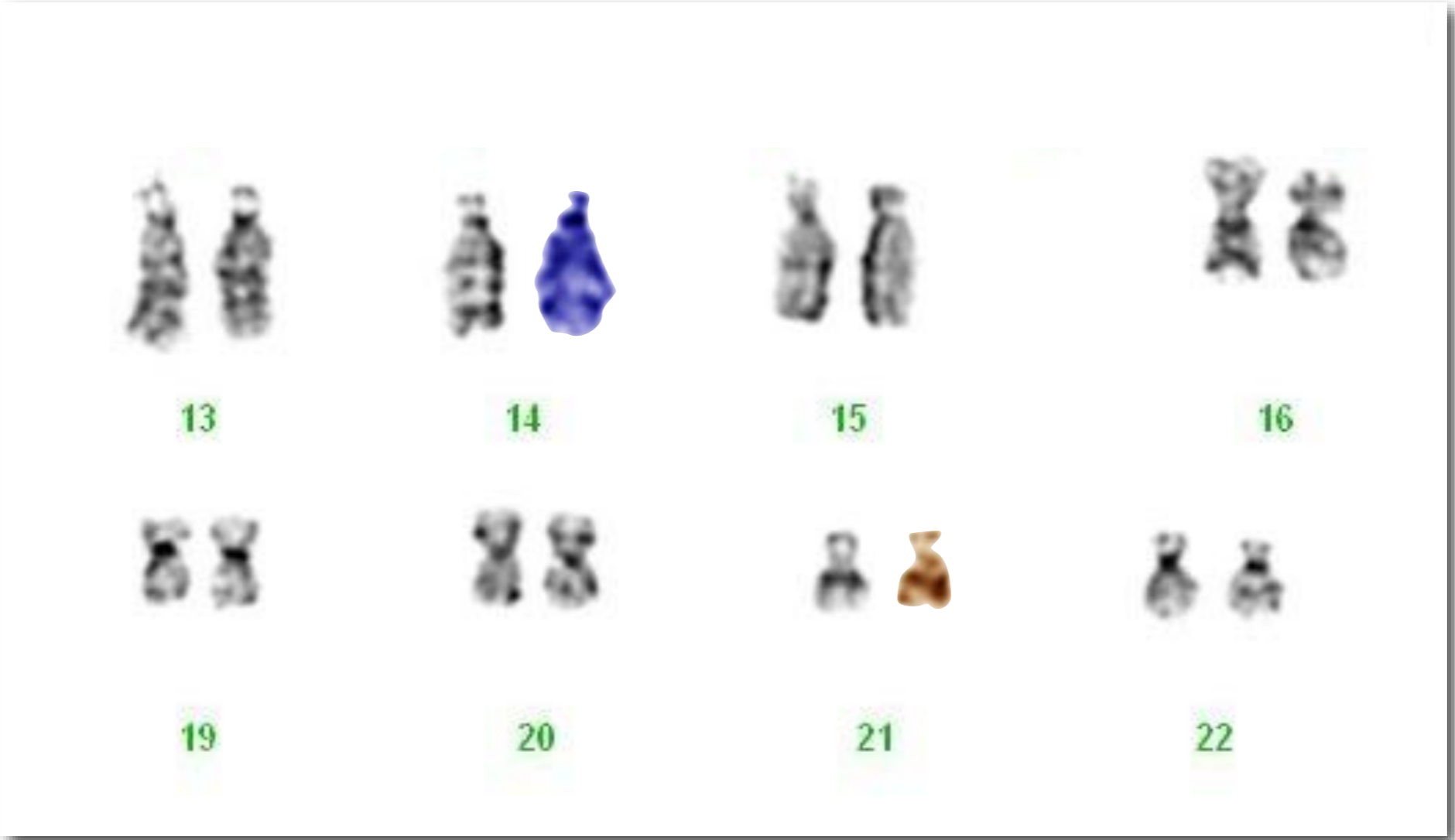
X X

Shown here are human chromosomes

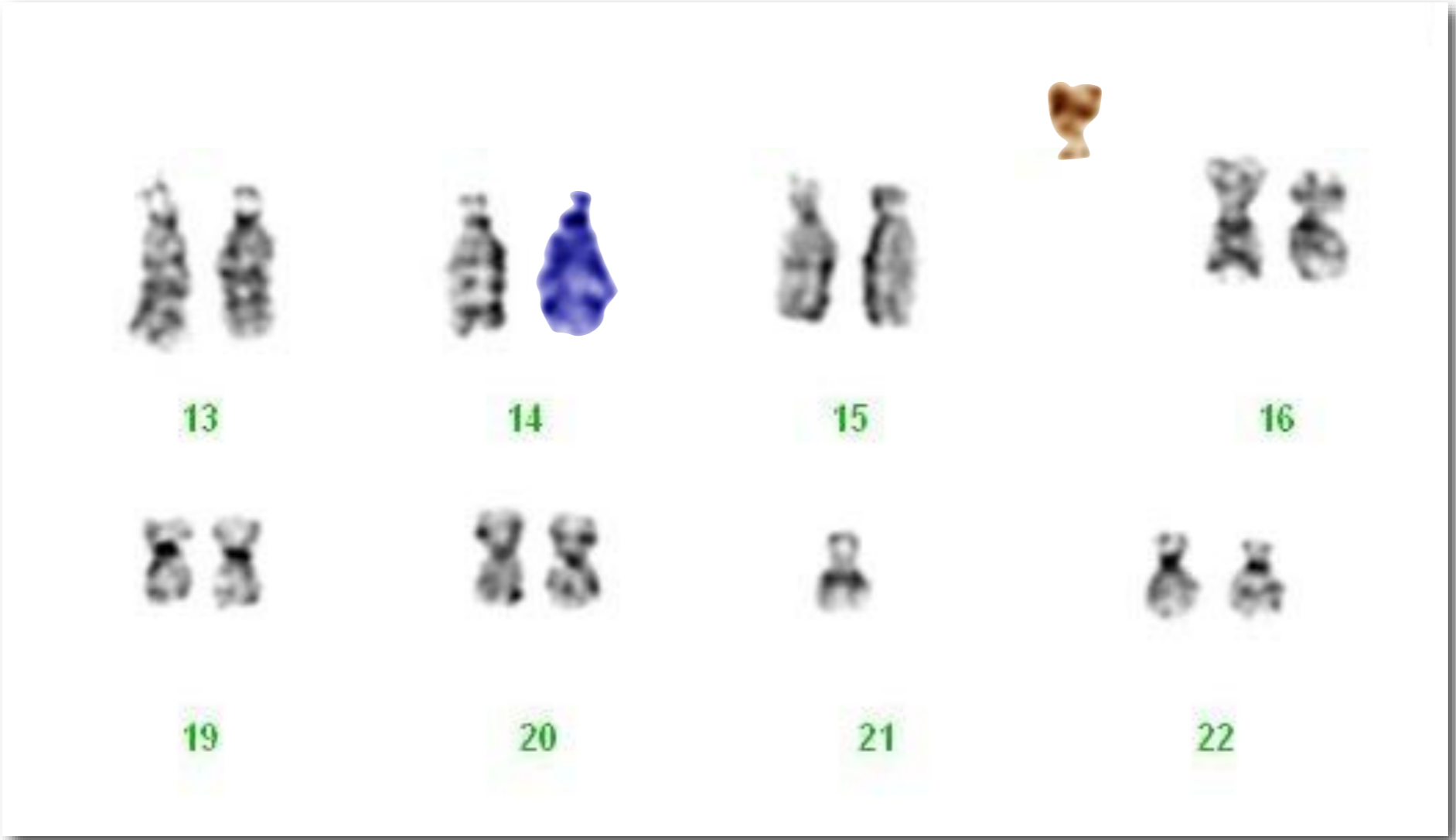
- **Indications du caryotype en médecine de la reproduction**
 - Fausses couches à répétition
 - A partir de 2 à 3 FCS
 - Anomalies au spermogramme (OATS, azoospermie)
 - Insuffisance ovarienne prématurée
 - Enquête familiale
 - Produit de FCS: dérivé déséquilibré d'un réarrangement

- **Translocations Robertsoniennes**
- **Translocations réciproques**
- **Inversions péricentriques**

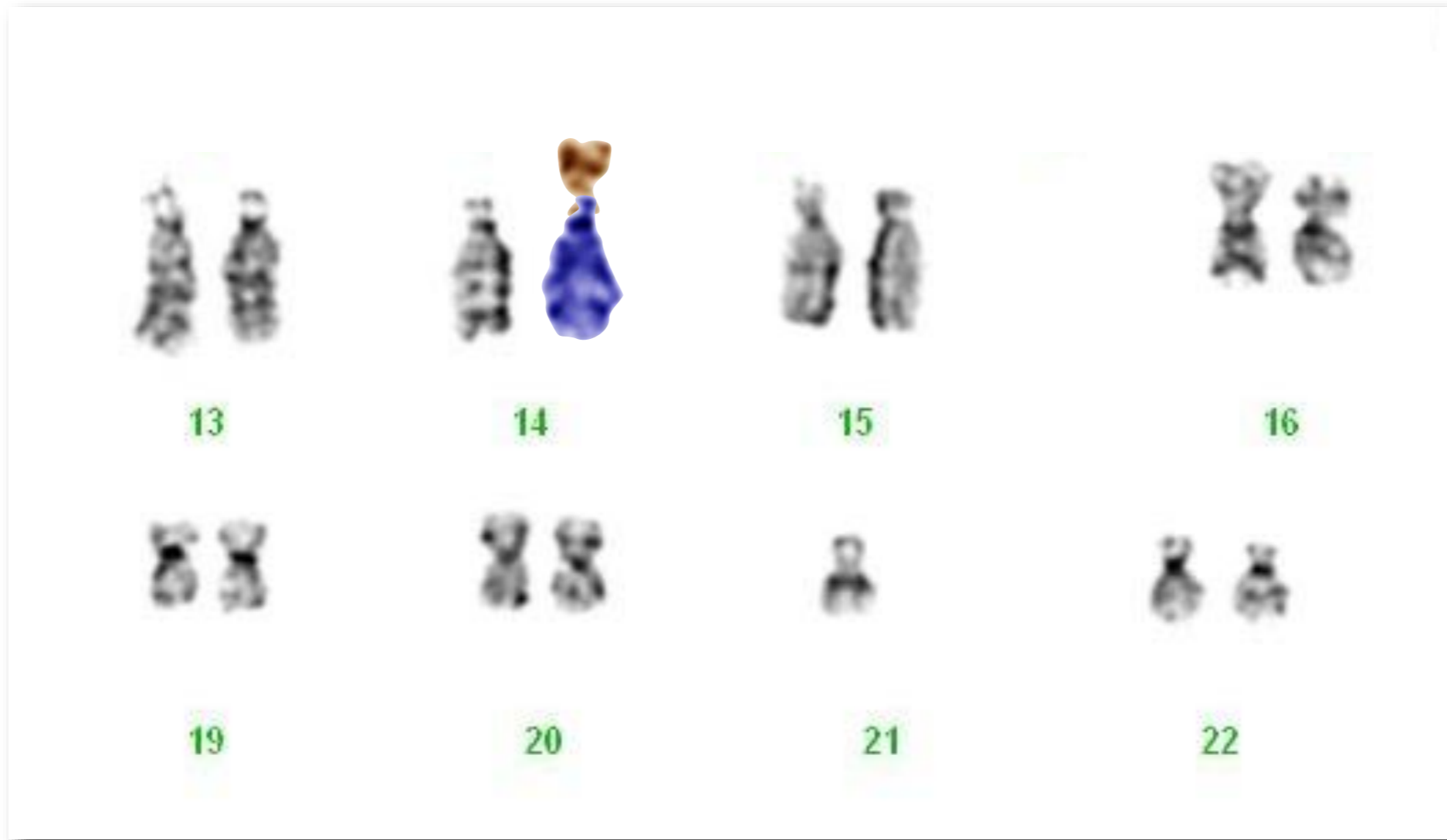
Translocation Robertsonienne



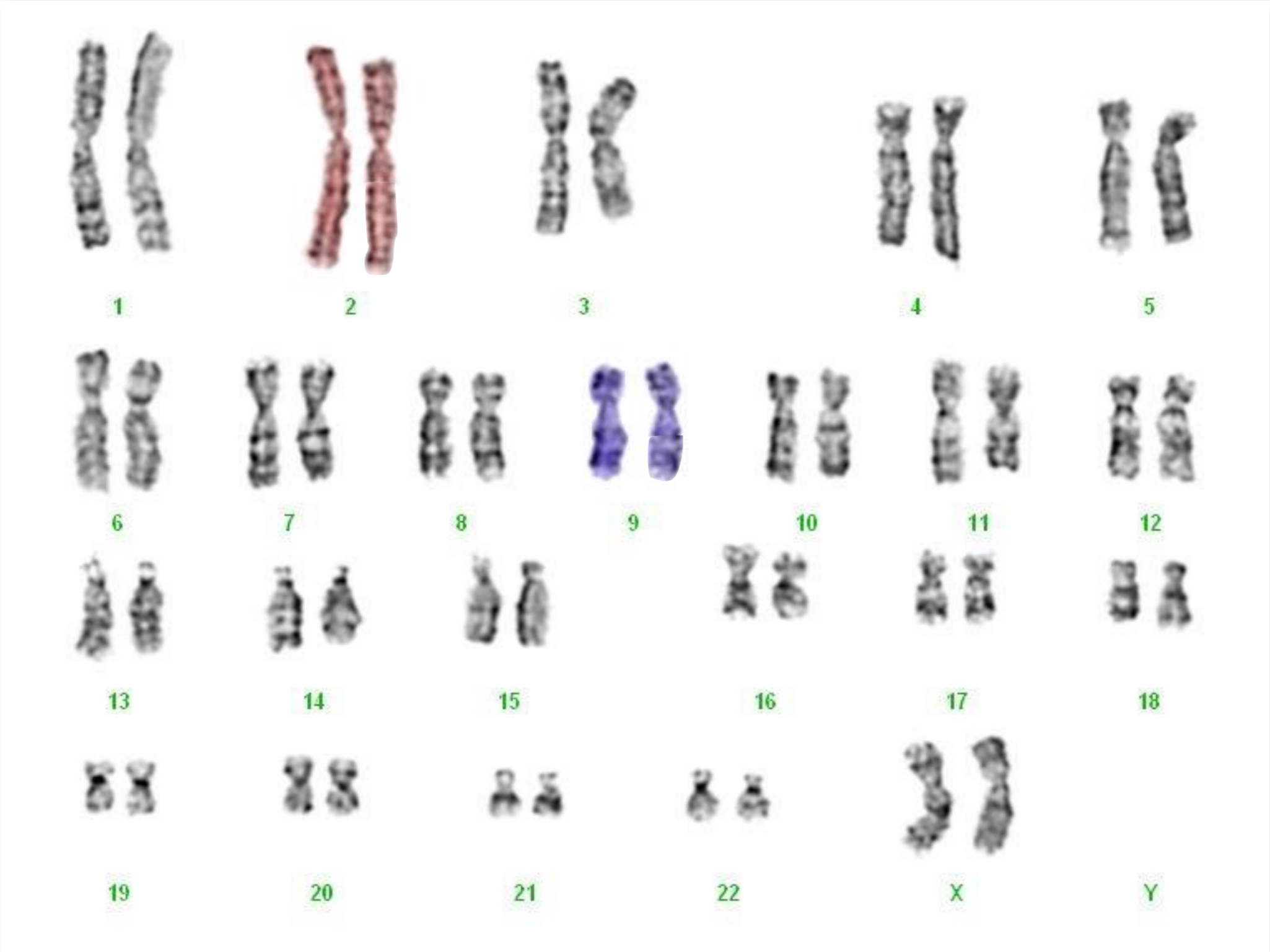
Translocation Robertsonienne



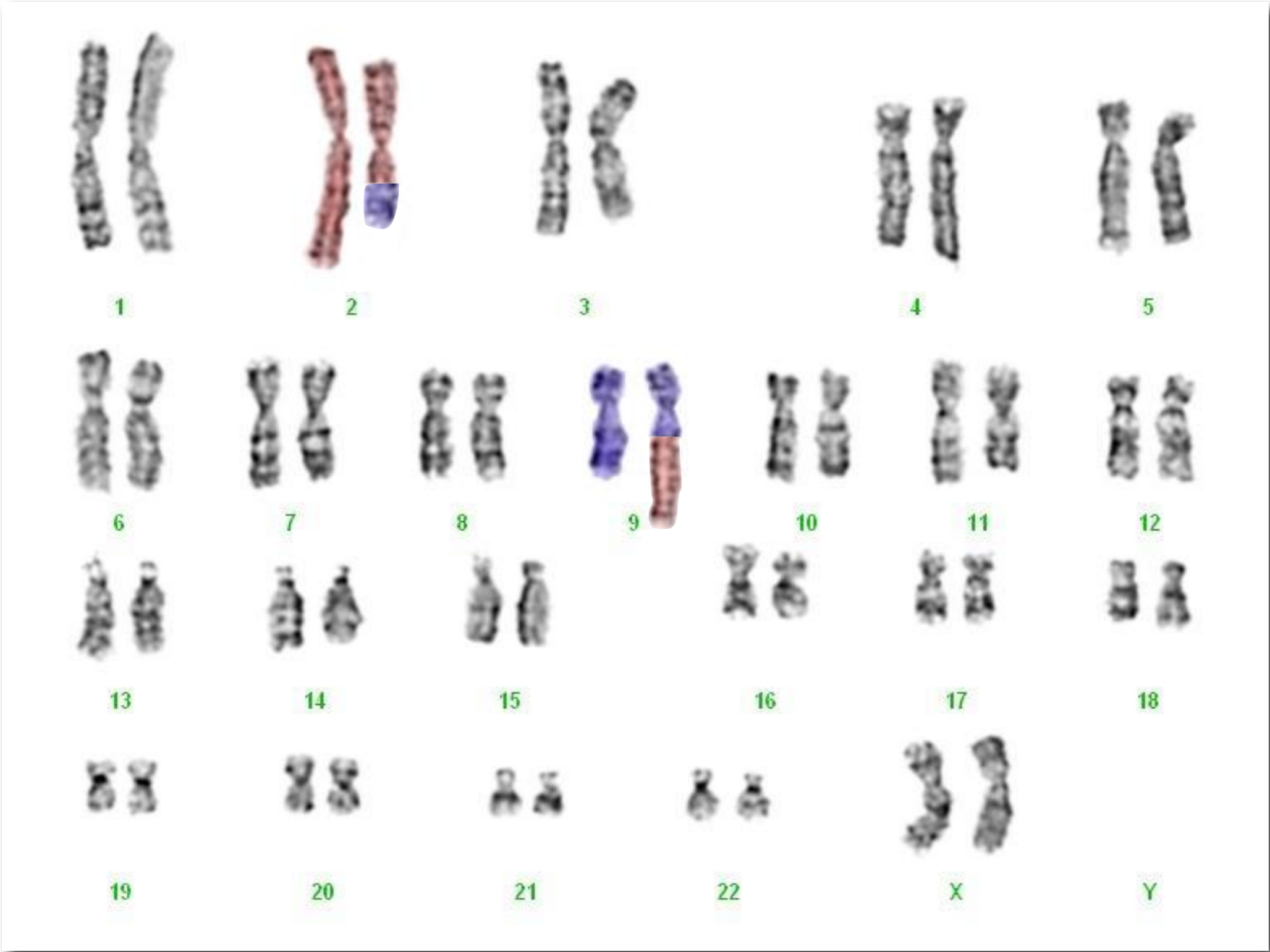
Translocation Robertsonienne



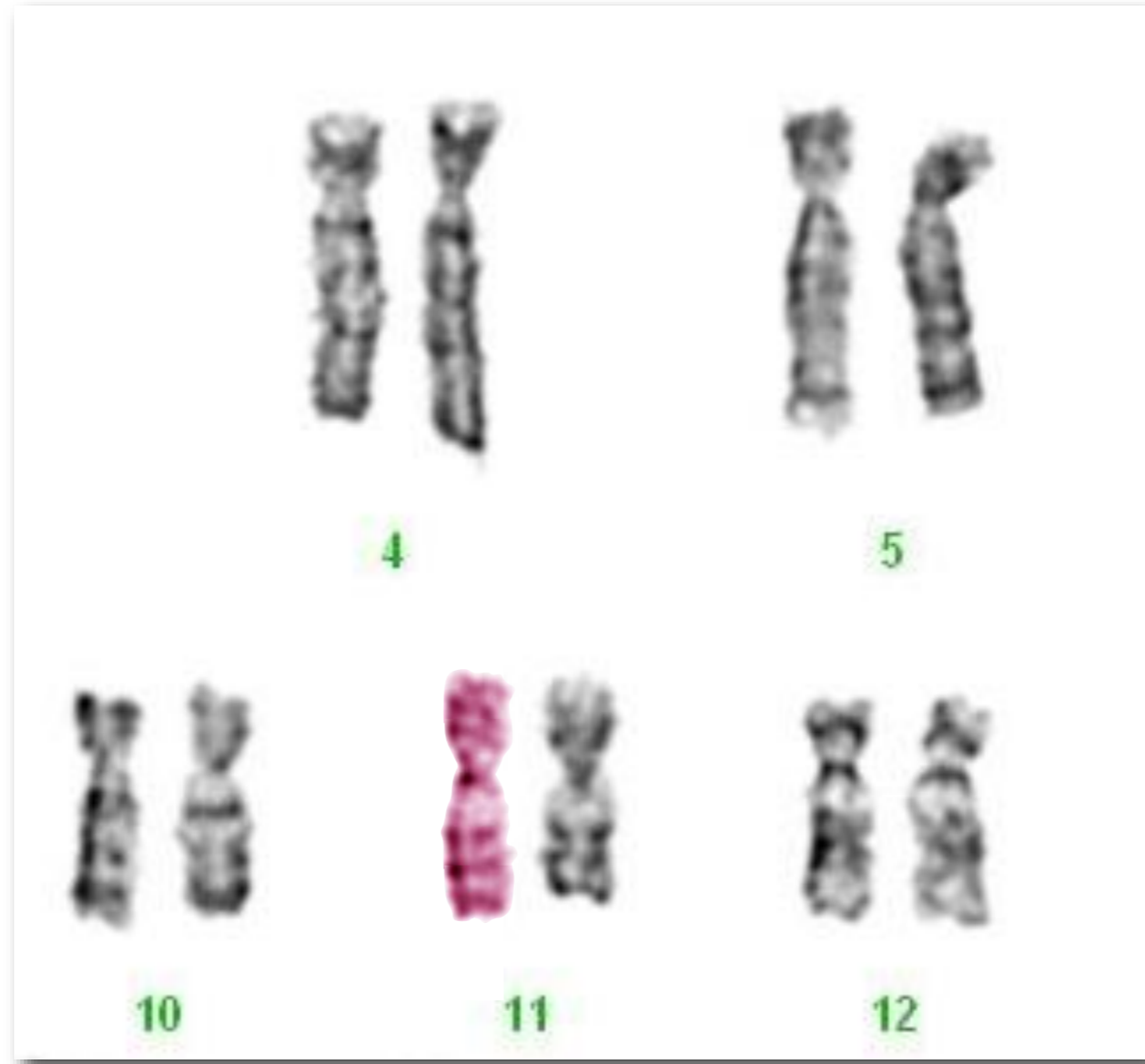
Translocation réciproque



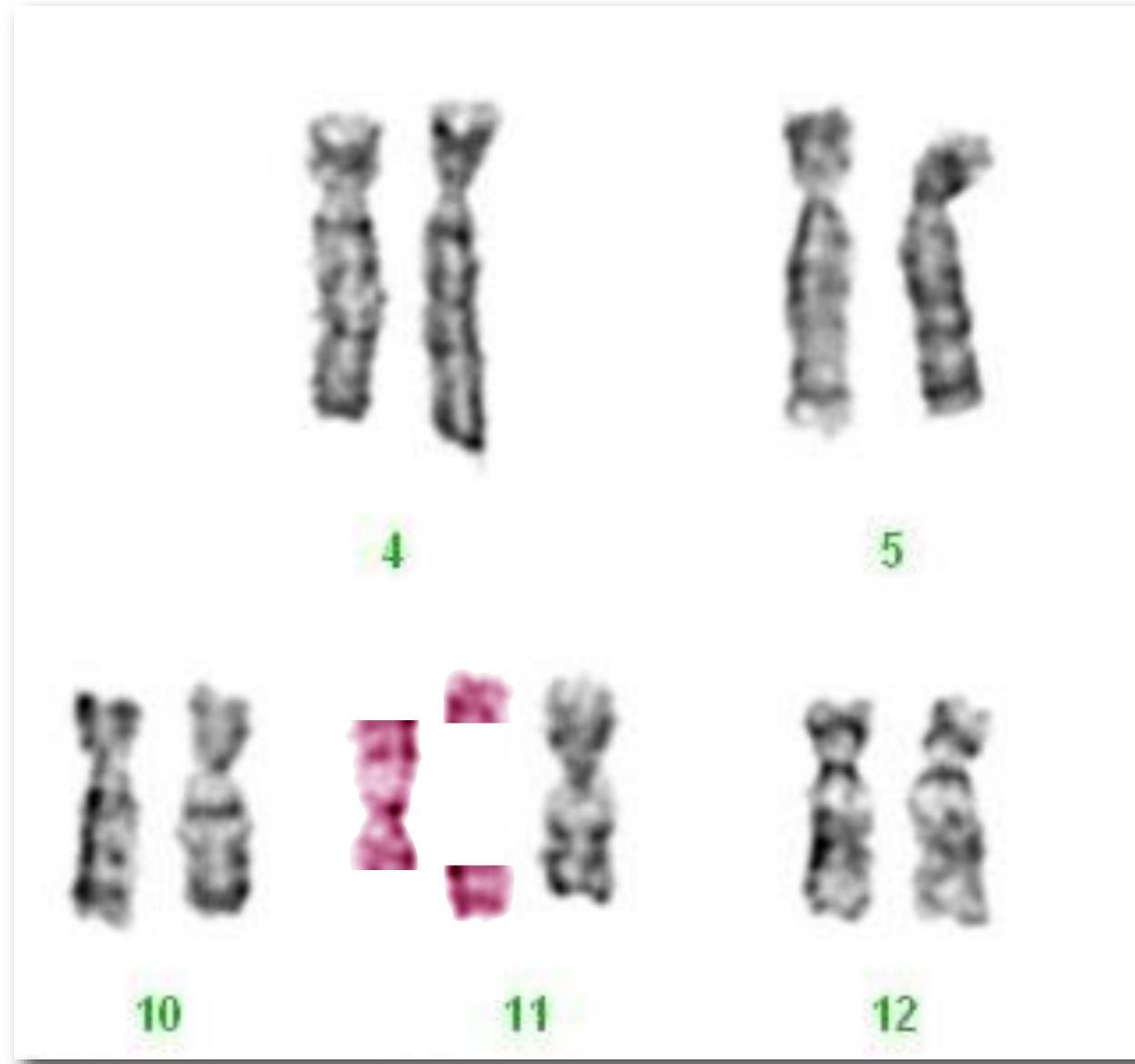
Translocation réciproque



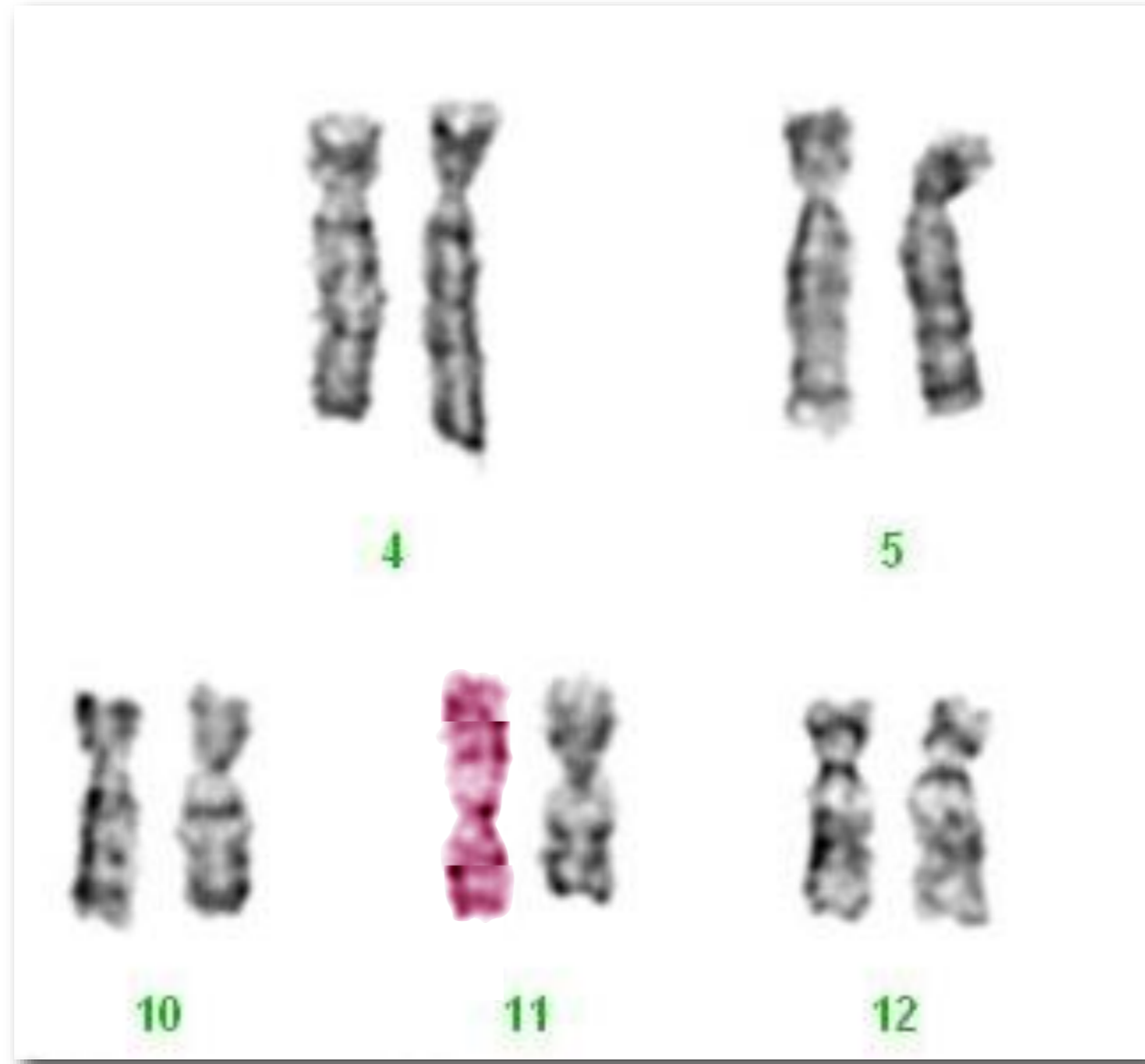
Inversion péricentrique



Inversion péricentrique



Inversion péricentrique



Phénotype normal

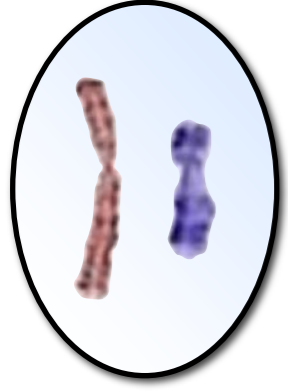
Car anomalie équilibrée

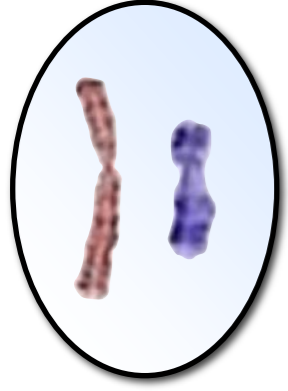
Reproduction

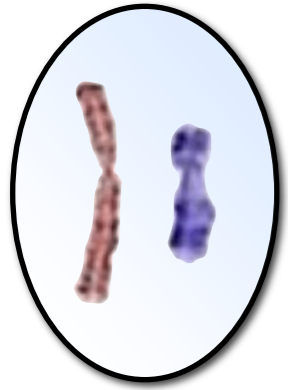
- Parfois, OATS/azoospermie ou IOP
- Toujours, malségrégation chromosomique

Ségrégation chromosomique : translocation réciproque

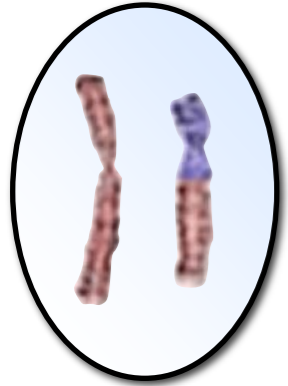
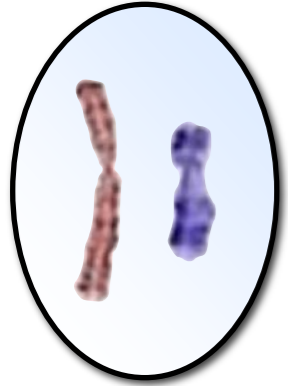




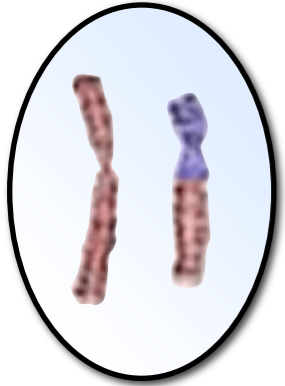
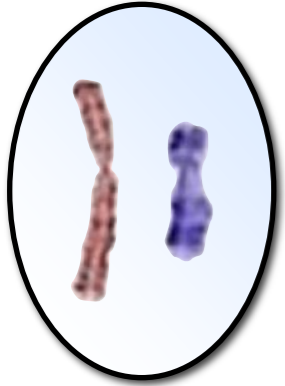




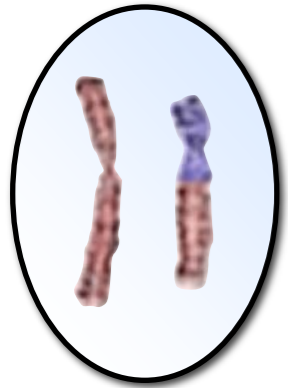
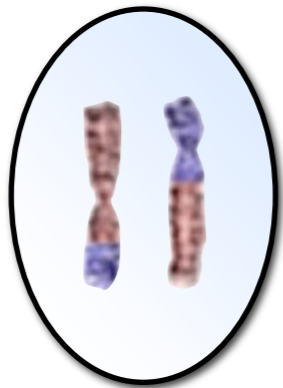
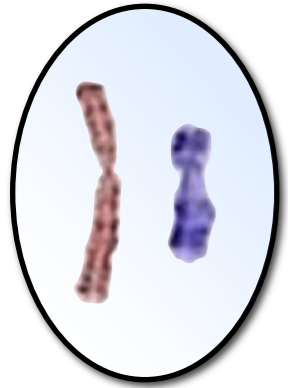
Mode Alterne



Mode Alterne

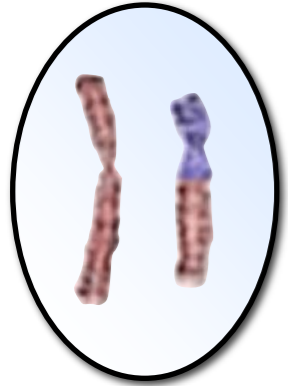
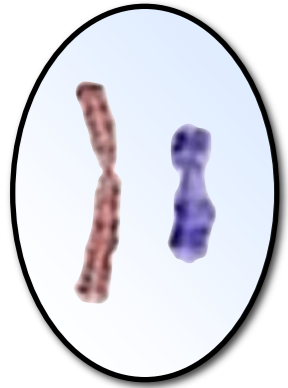


Mode Alterne



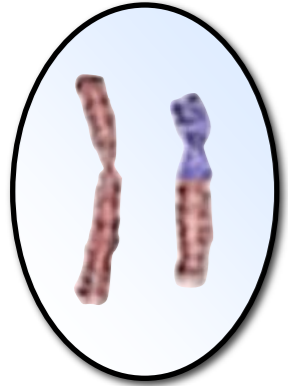
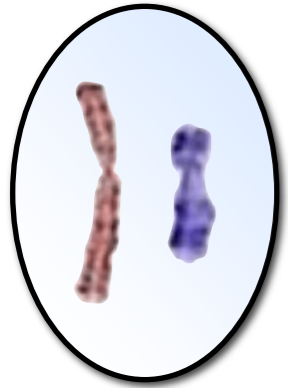
Mode Alterne

Mode Adjacent I



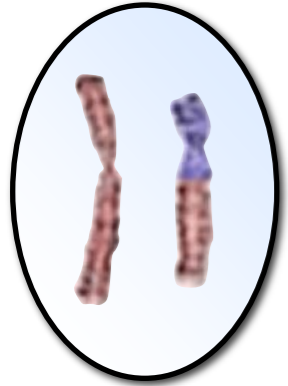
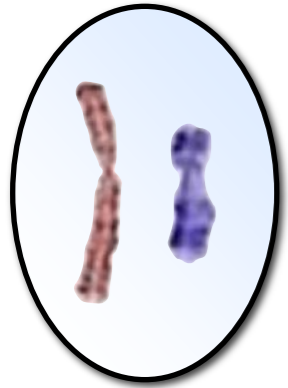
Mode Alterne

Mode Adjacent I



Mode Alterne

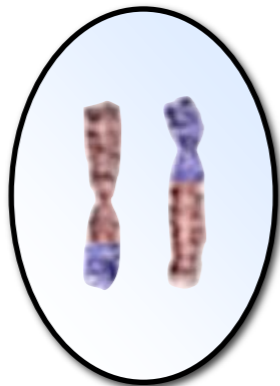
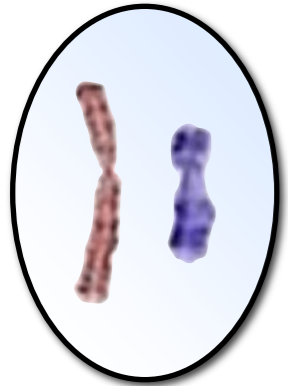
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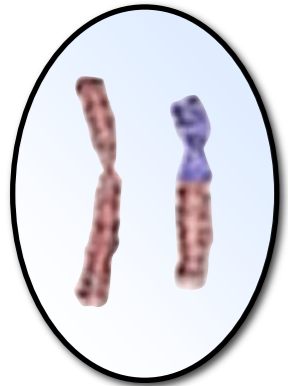
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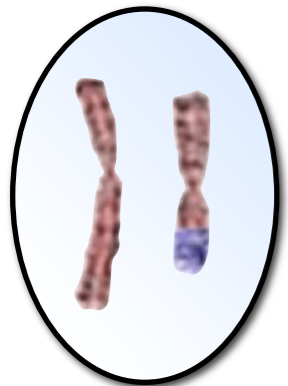
Mode Adjacent II



Mode Alterne

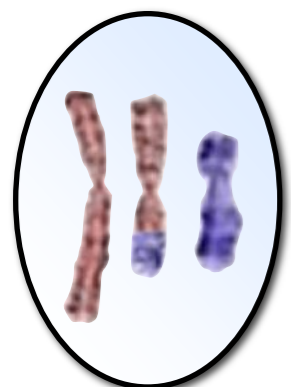
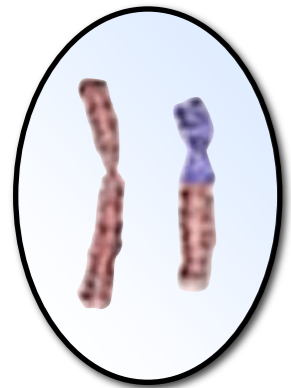
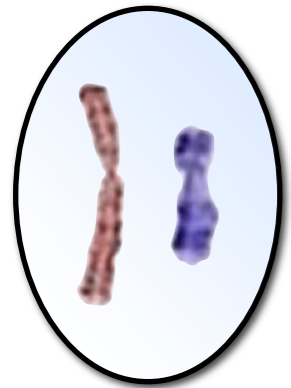


Mode Adjacent I



Mode Adjacent II

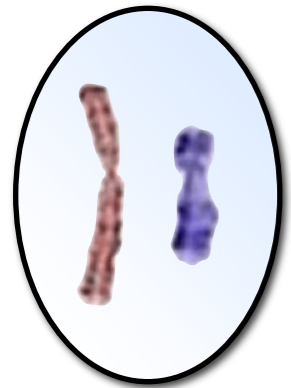




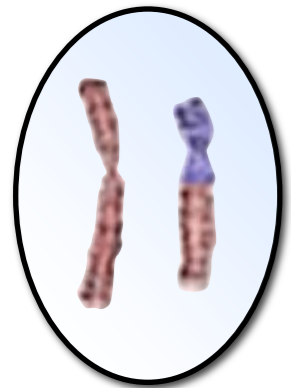
Mode Alterne

Mode Adjacent I

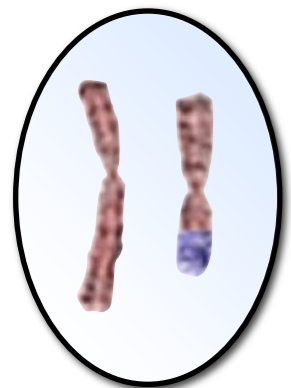
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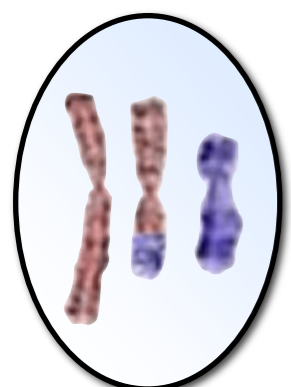
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Mode Adjacent I



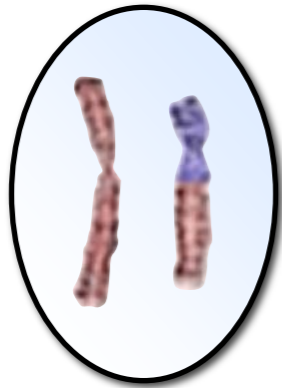
Mode Adjacent II



Mode 3:1



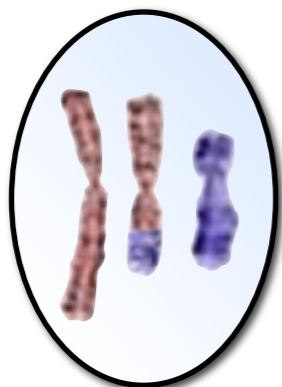
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Mode Adjacent I

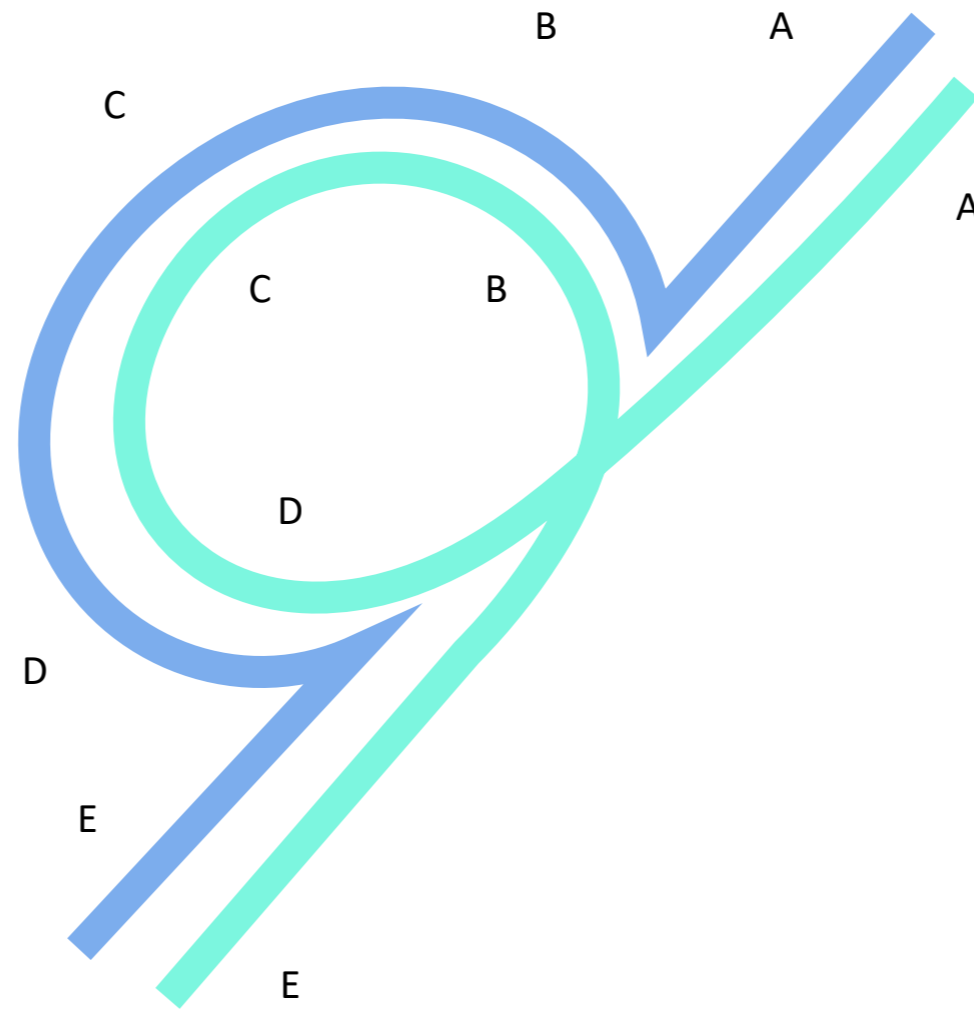
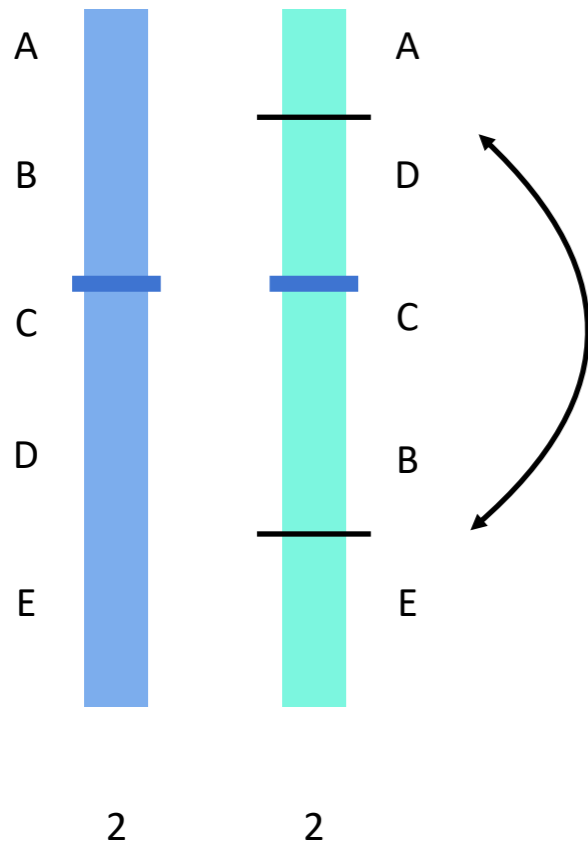


Mode Adjacent II



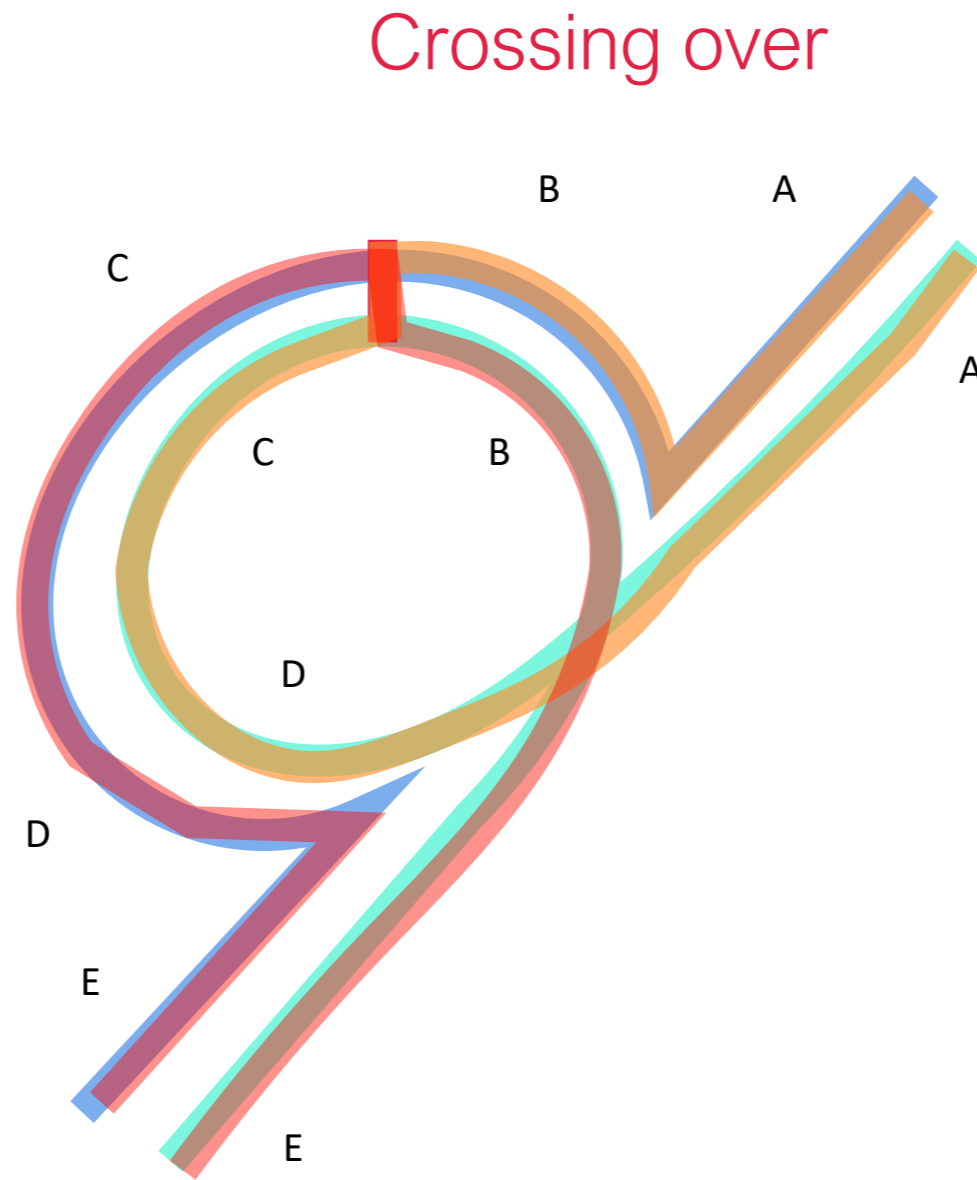
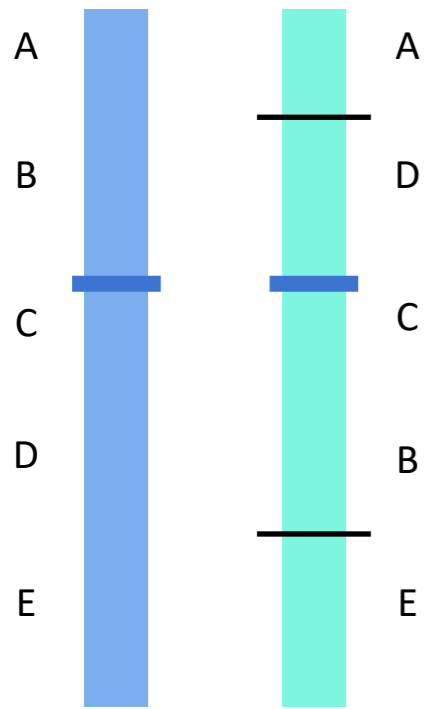
Mode 3:1

Recombinaison en méiose : inversions péricentriques



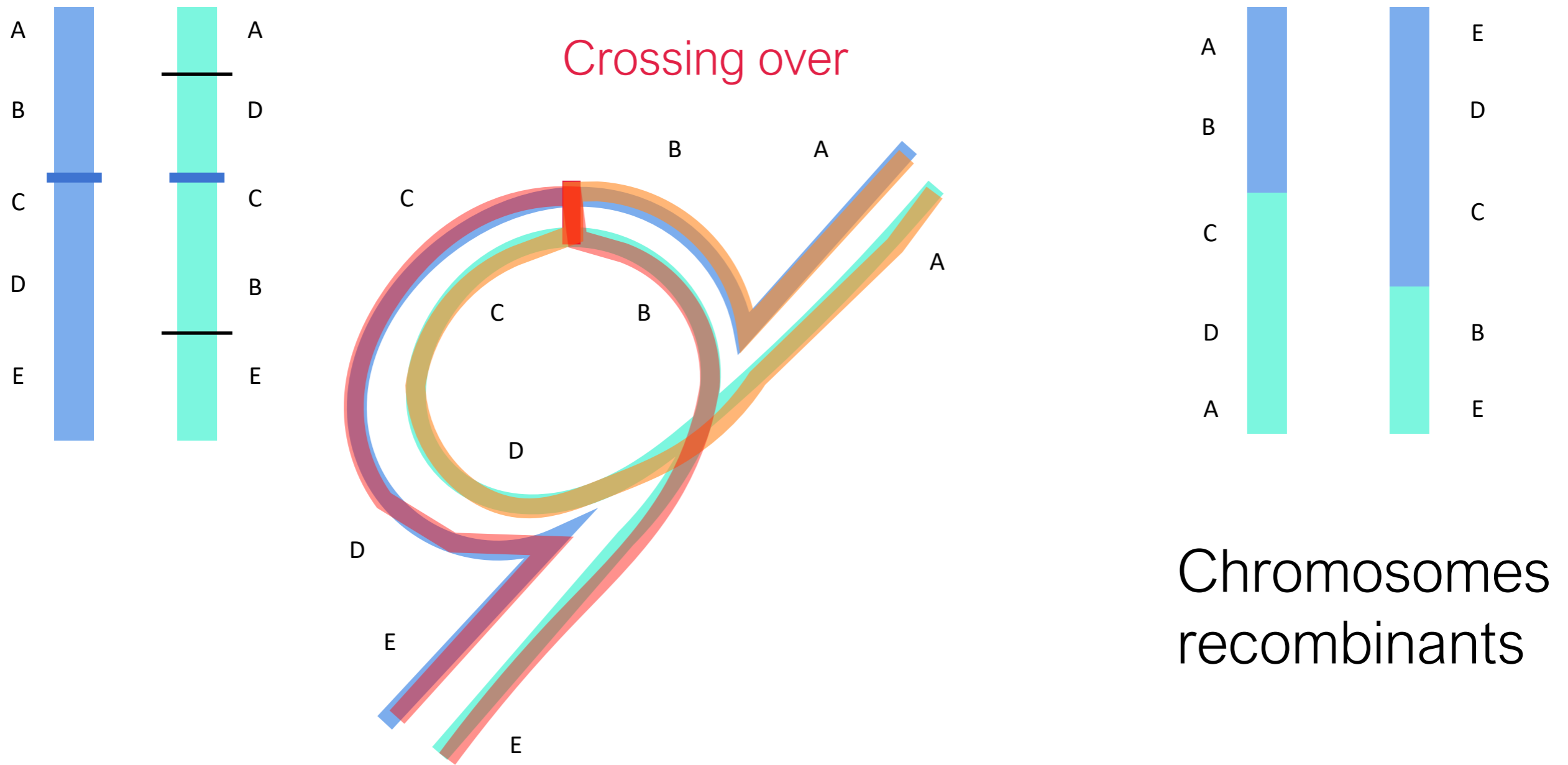
Boucle d'inversion

Recombinaison en méiose : inversions péricentriques

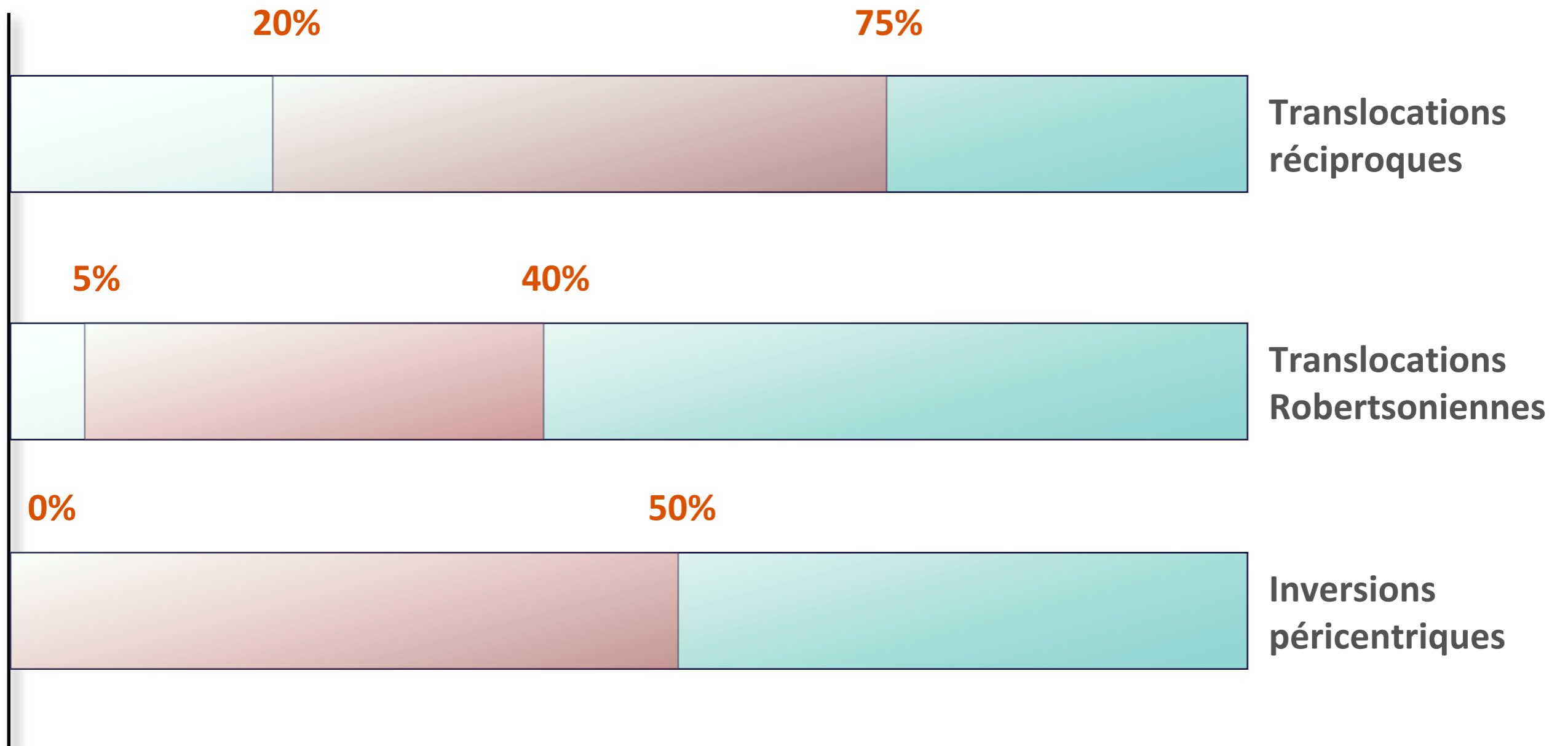


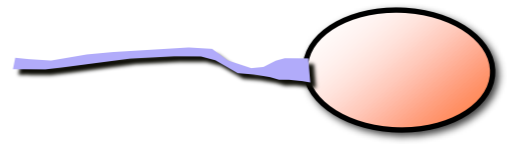
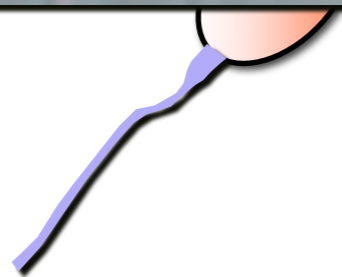
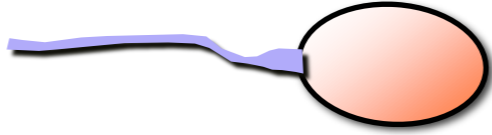
Boucle d'inversion

Recombinaison en méiose : inversions péricentriques



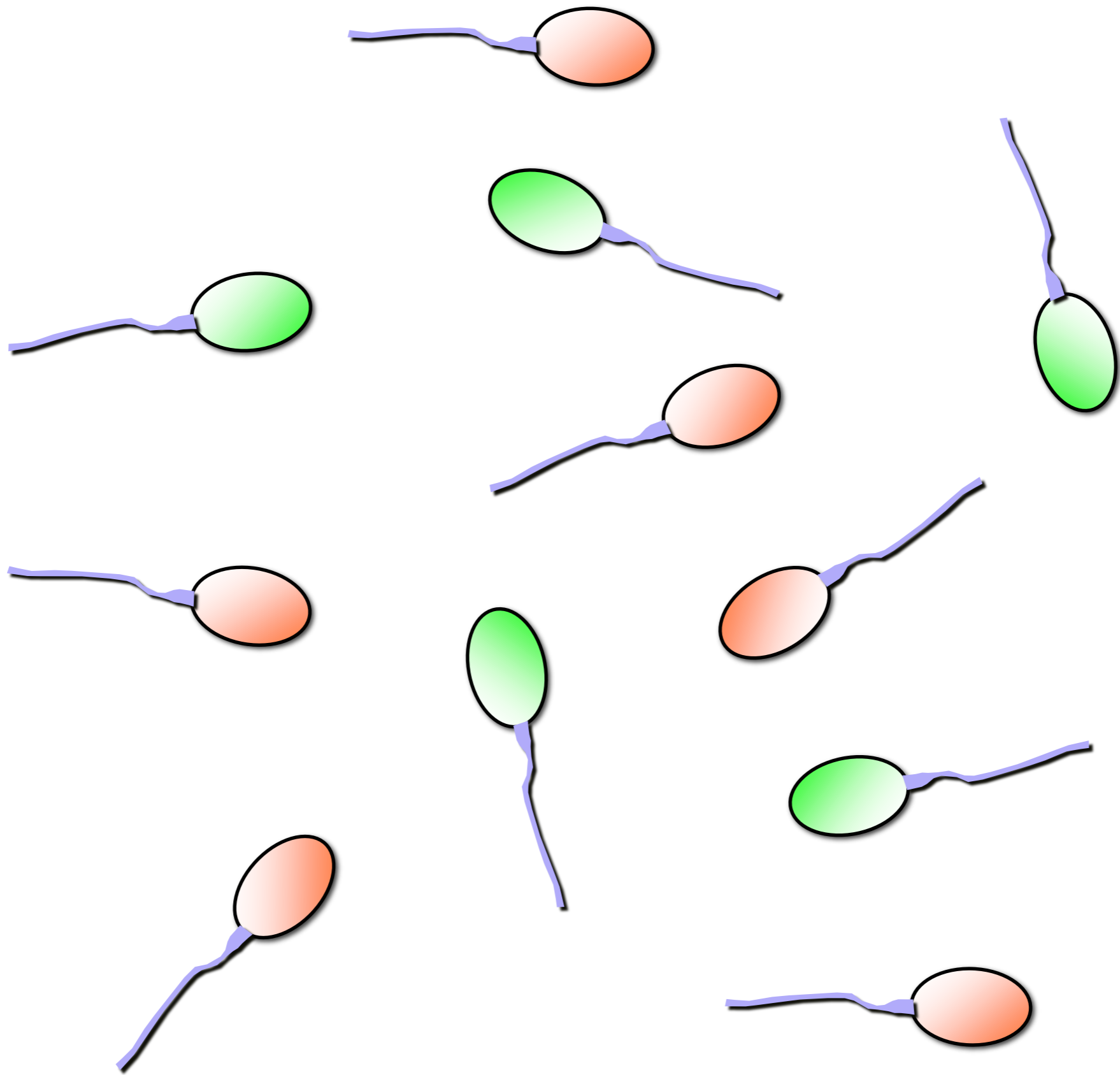
Proportions de spermatozoides déséquilibrés



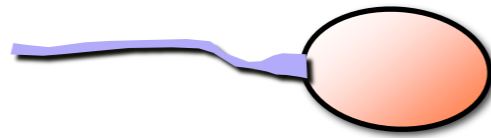


Prise en charge

- Conception naturelle avec diagnostic prénatal (DPN)
- Diagnostic préimplantatoire (DPI)



Spermatozoïdes déséquilibrés



- **Davantage de fragmentation de l'ADN** (Rouen *et al.*, 2013)

- **Éliminés partiellement par le TMS (- 26%)** (Rouen *et al.*, 2013)

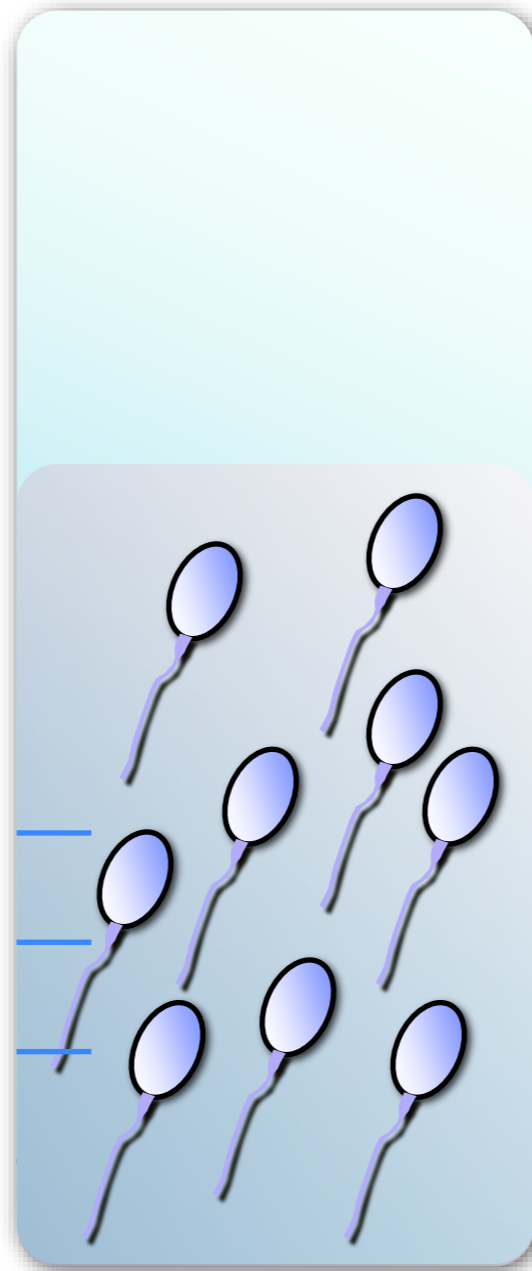
Donc moins dense

- **Volume un peu plus important en microscopie confocale** (Rouen *et al.*, 2015)

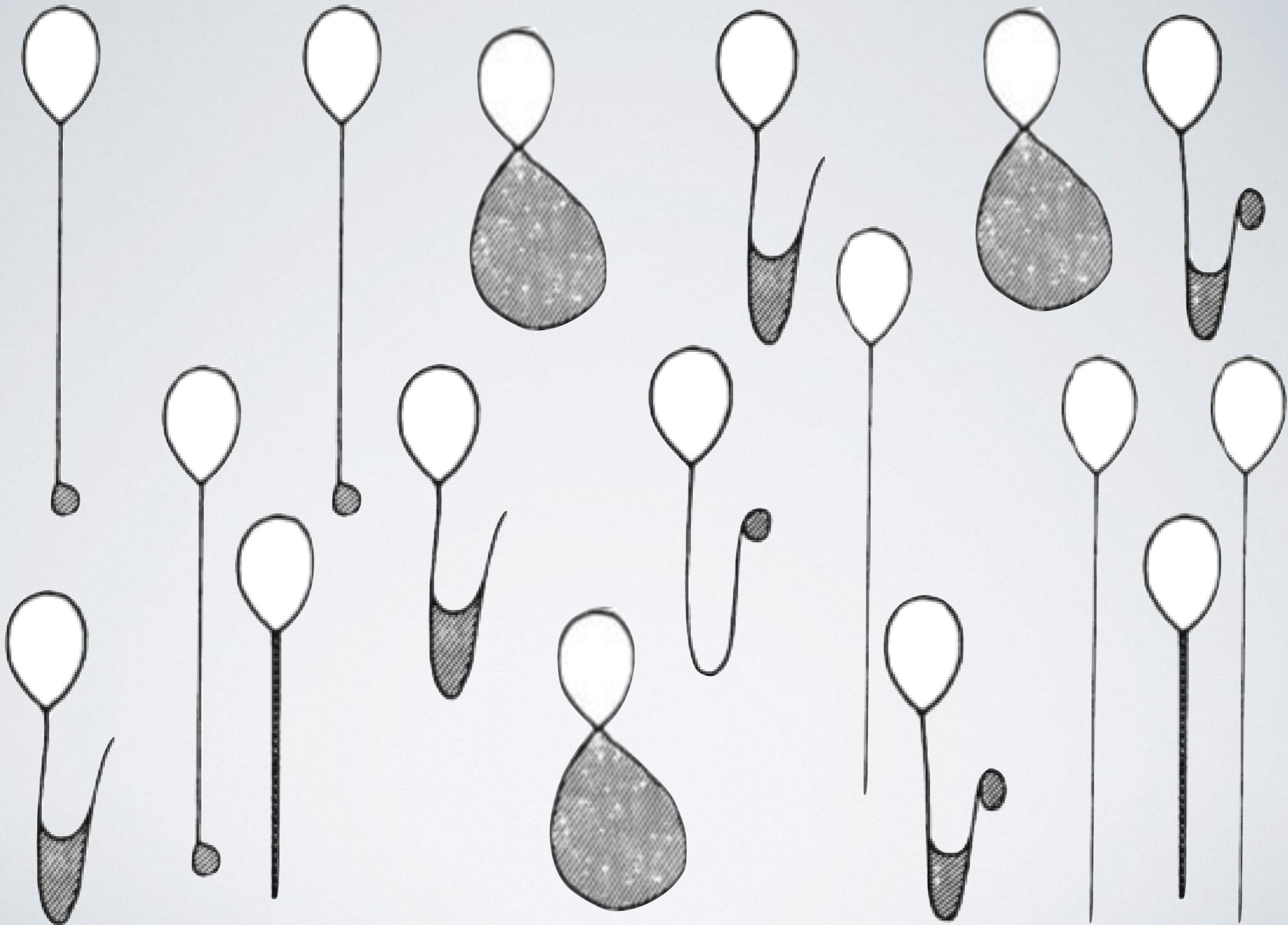
Hypo-Osmotic Swelling Test (HOST)

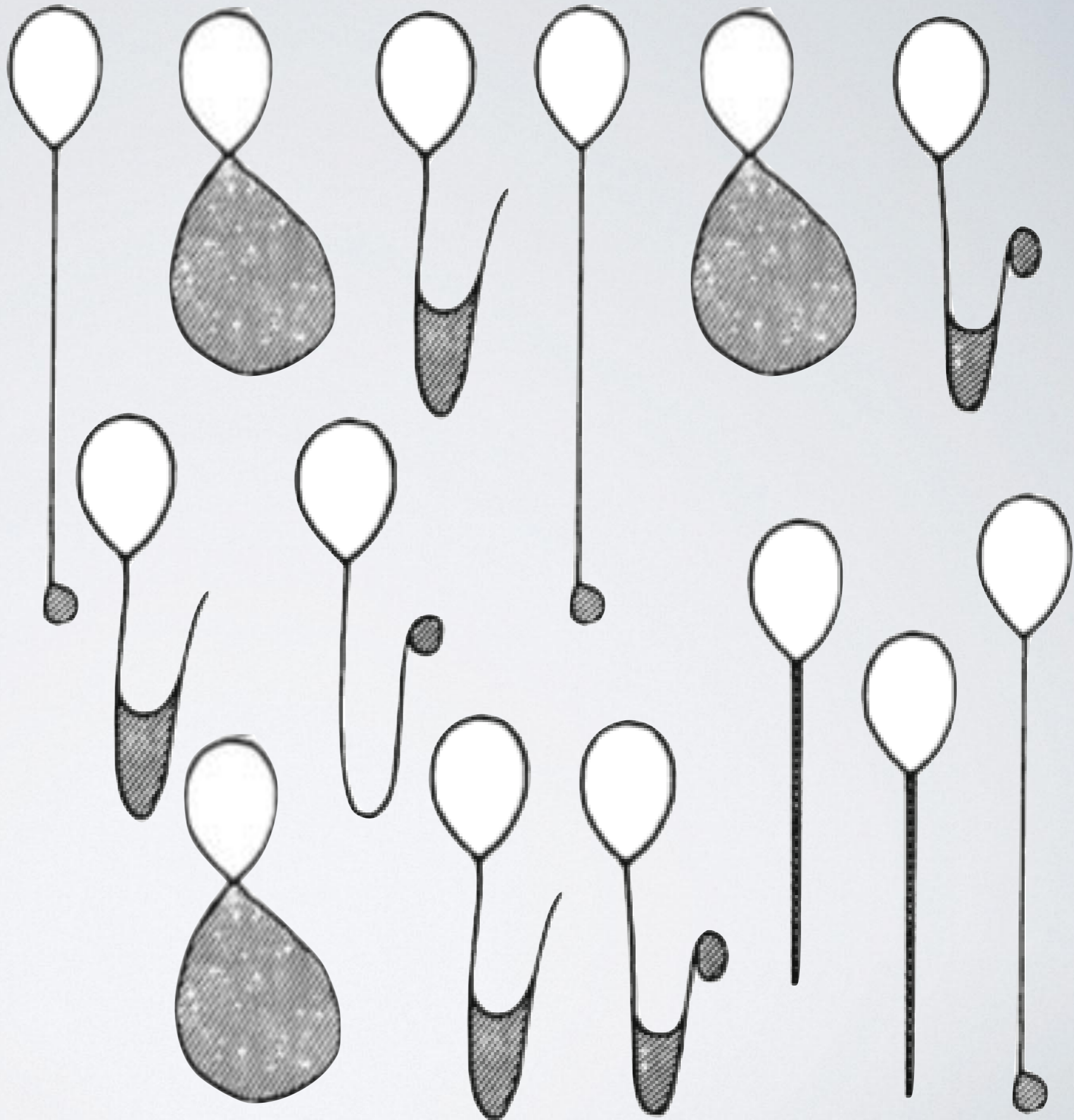
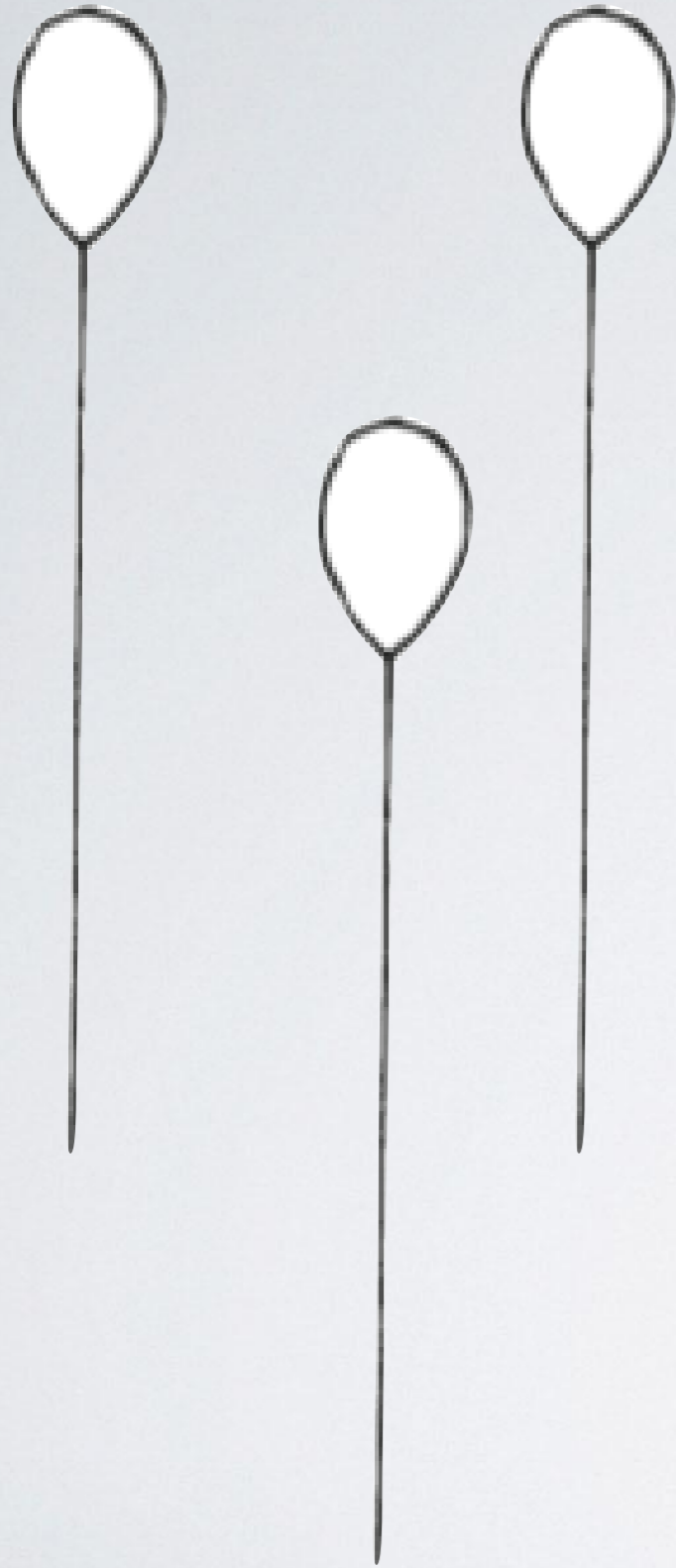


Hypo-Osmotic Swelling Test (HOST)

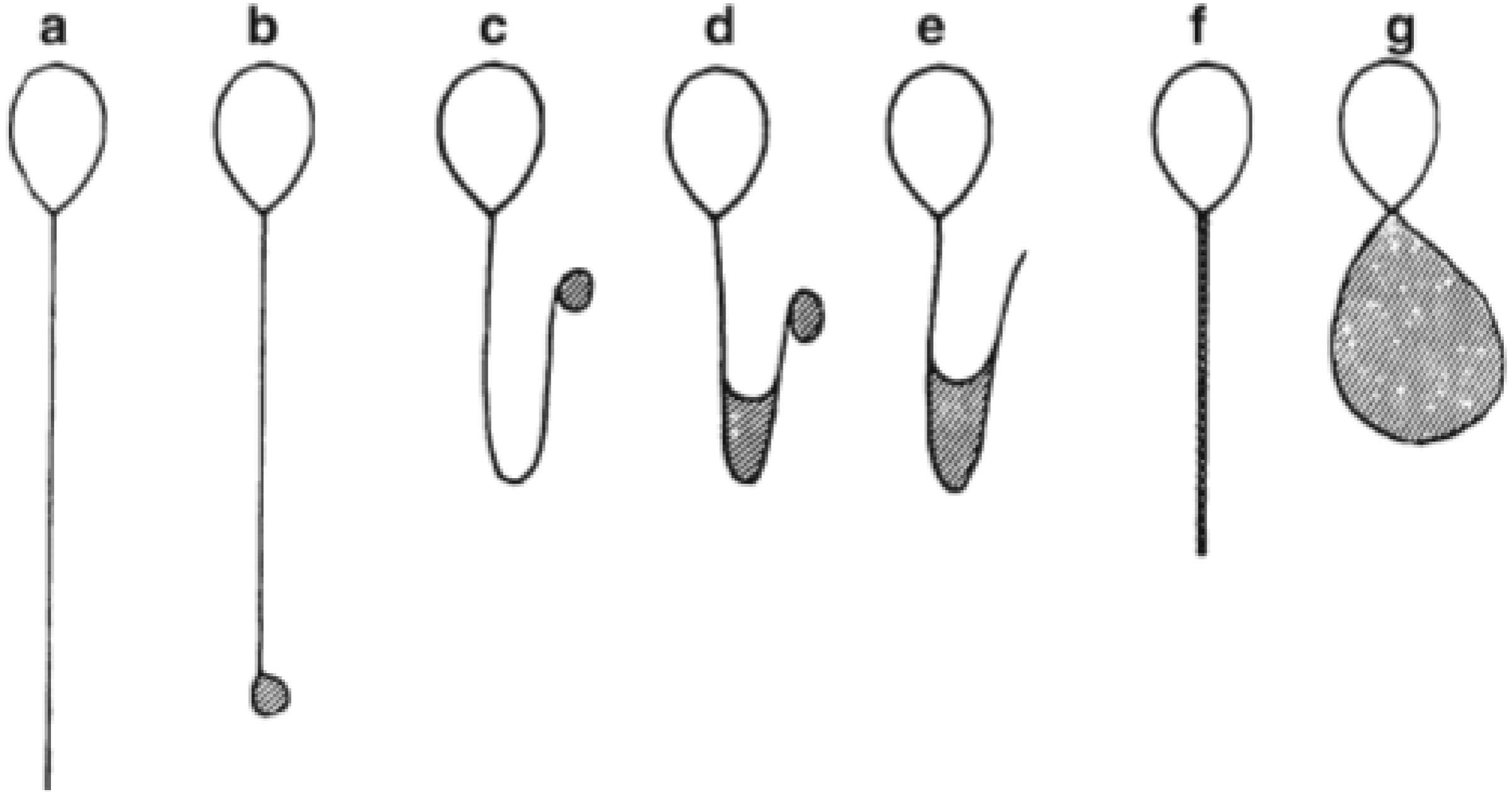


**Solution hypo-osmotique
(NaCl dilué au demi)**

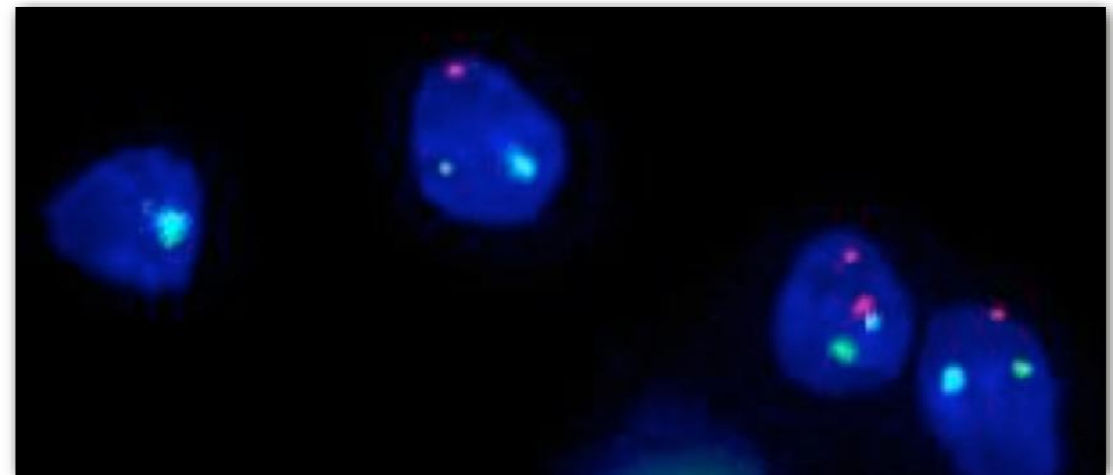
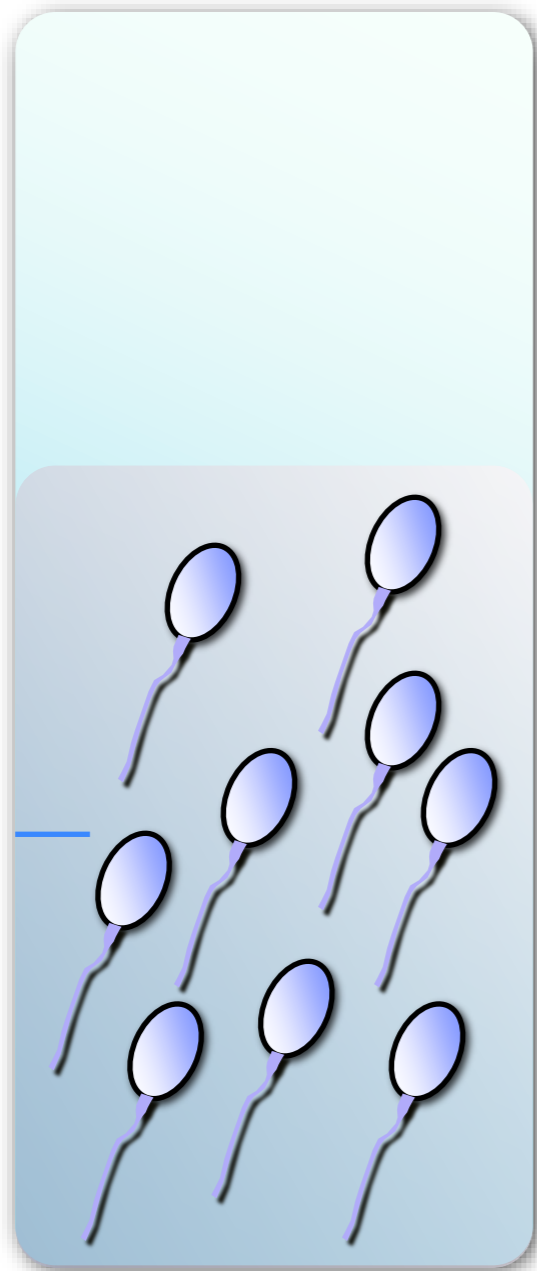




Hypo-Osmotic Swelling Test (HOST)



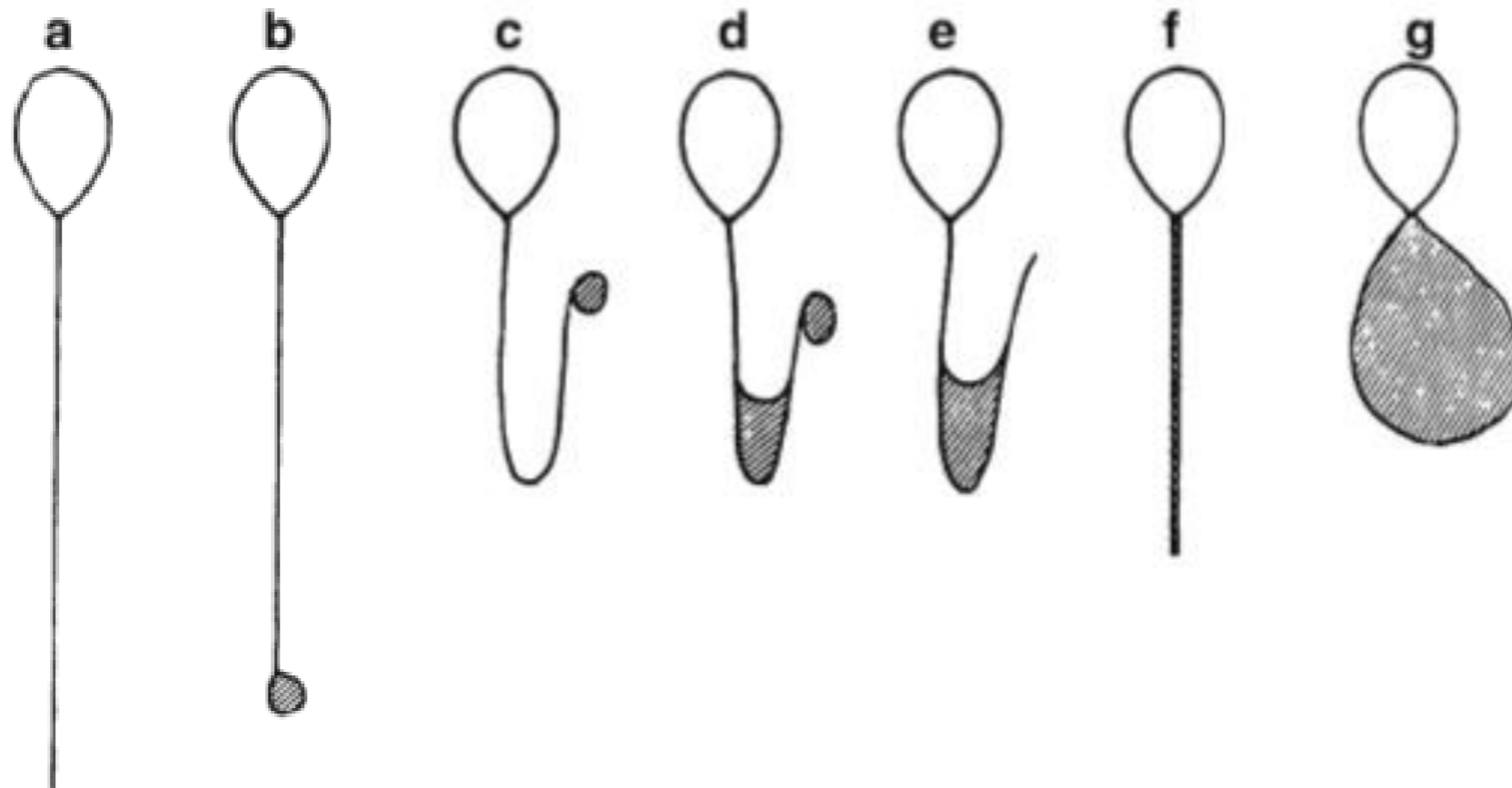
Hypo-Osmotic Swelling Test (HOST)



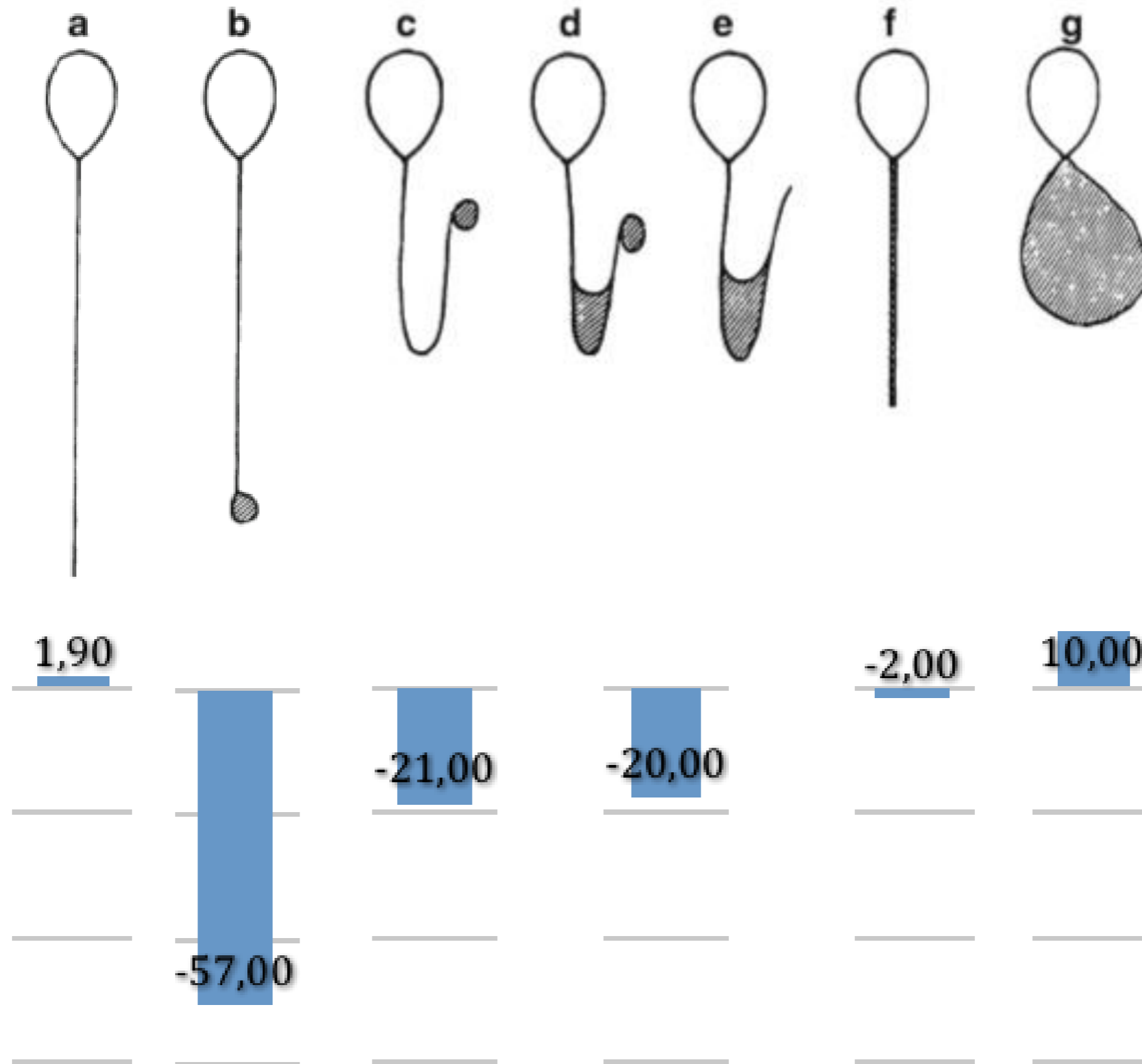
Hypo-Osmotic Swelling Test (HOST)

% global de spermatozoïdes déséquilibrés

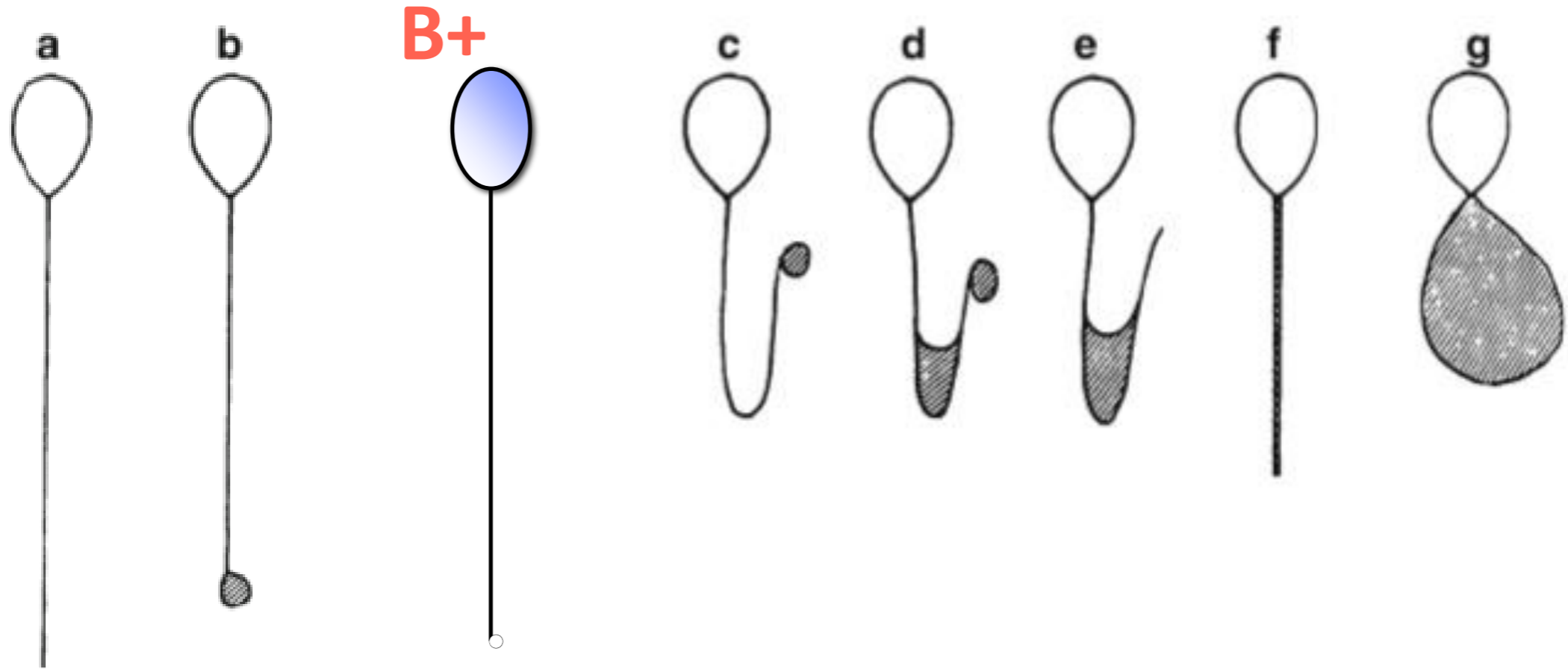
vs.



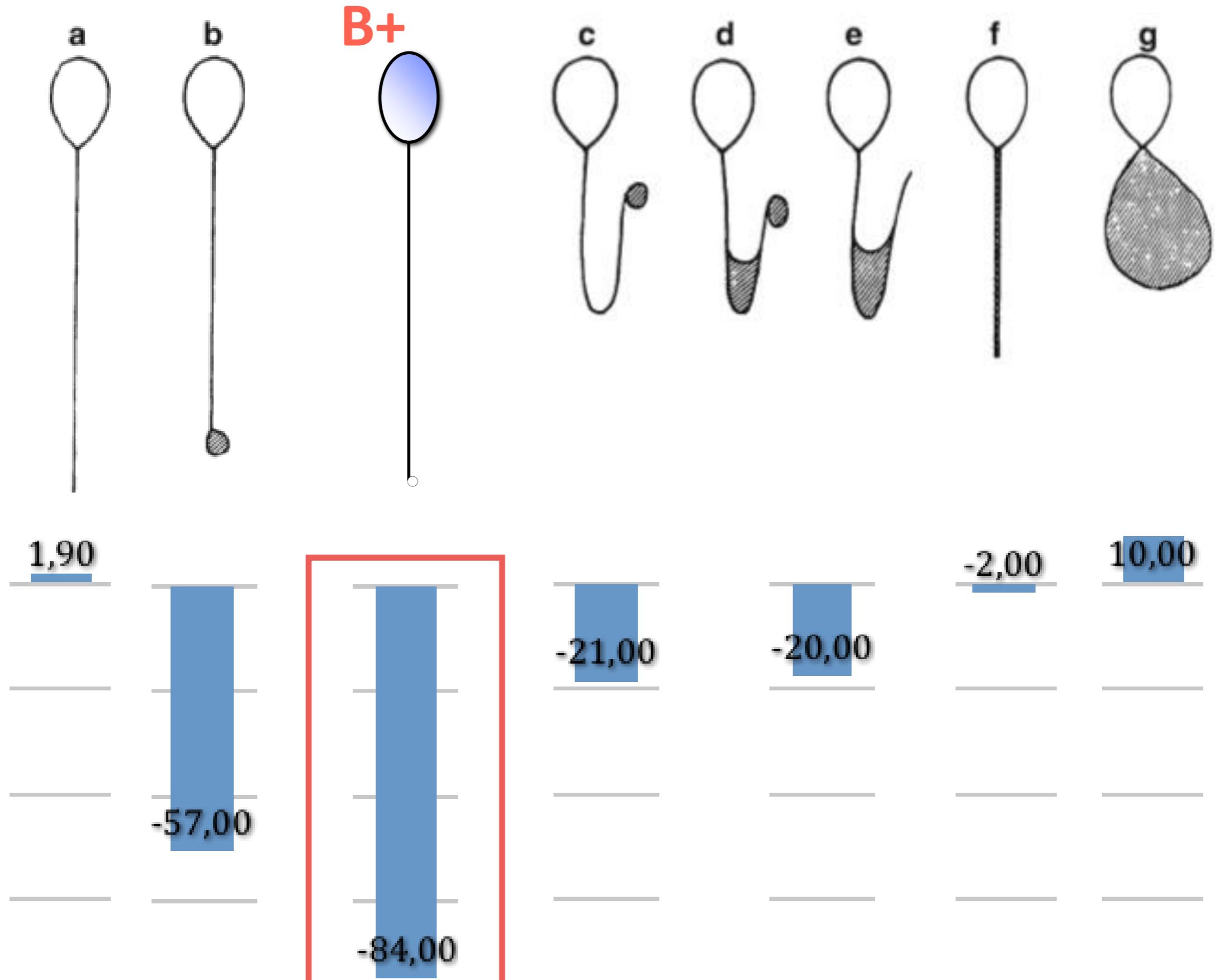
Hypo-Osmotic Swelling Test (HOST)

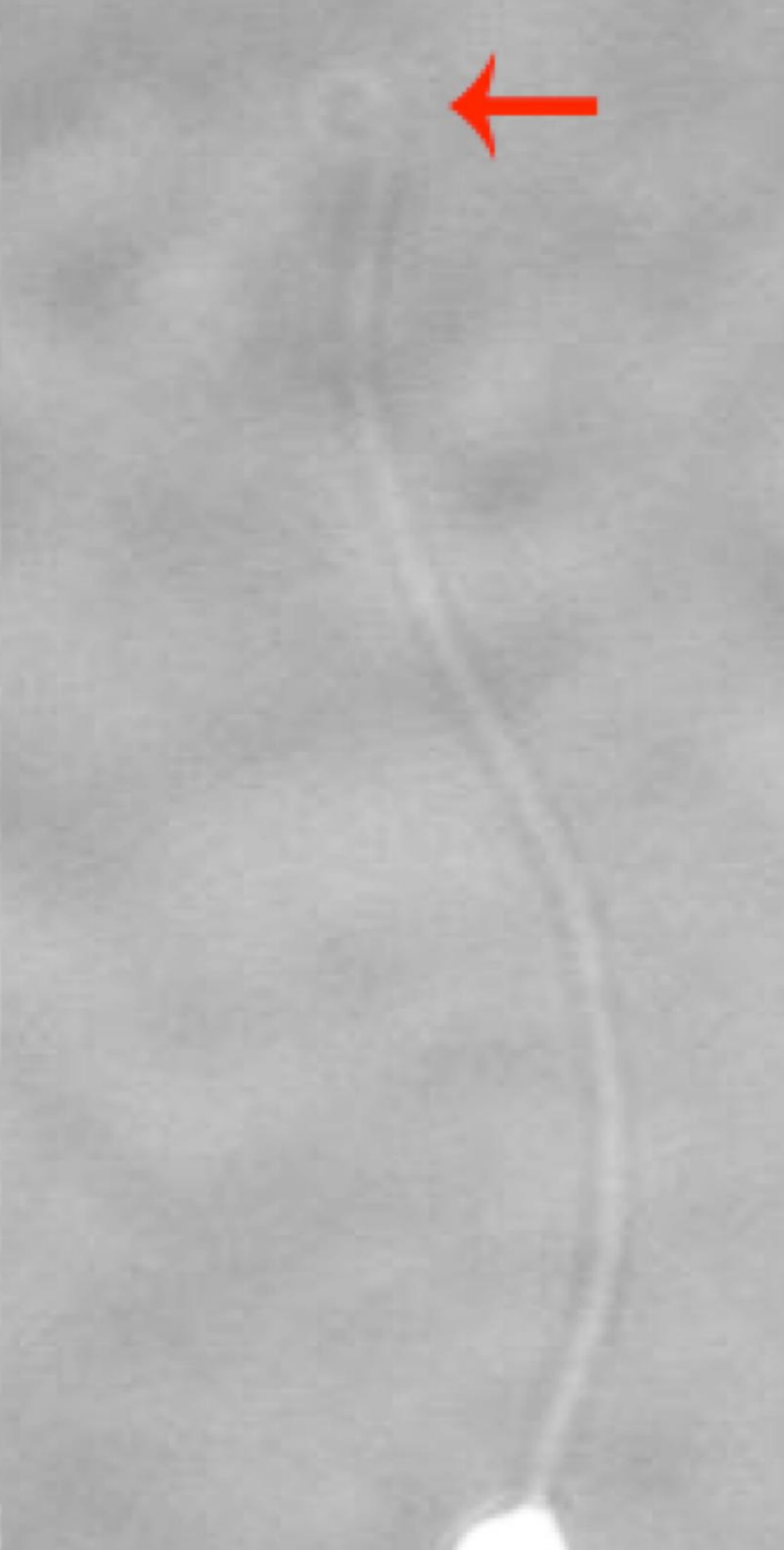
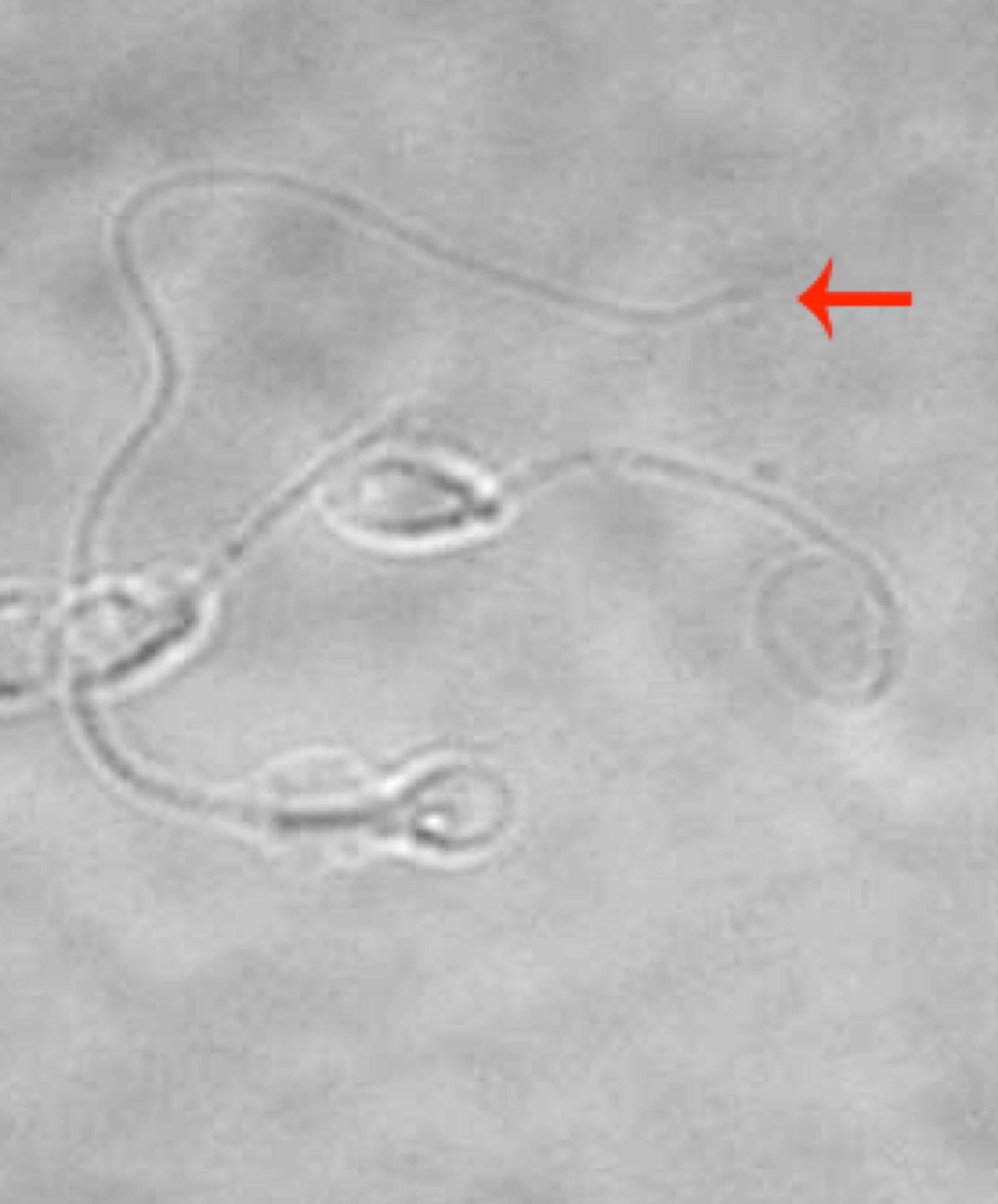


Hypo-Osmotic Swelling Test (HOST)

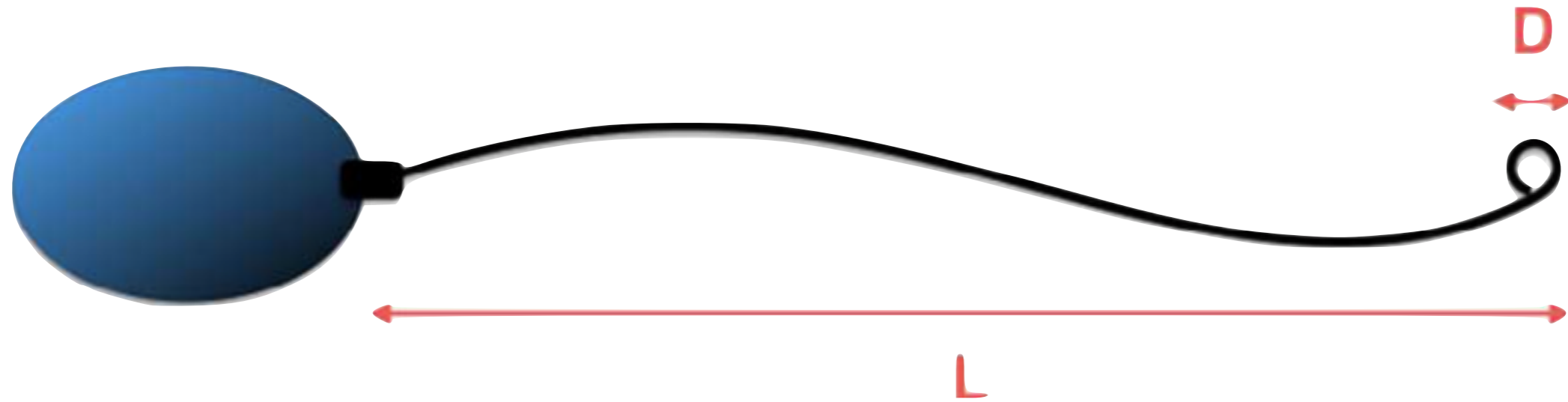


Hypo-Osmotic Swelling Test (HOST)





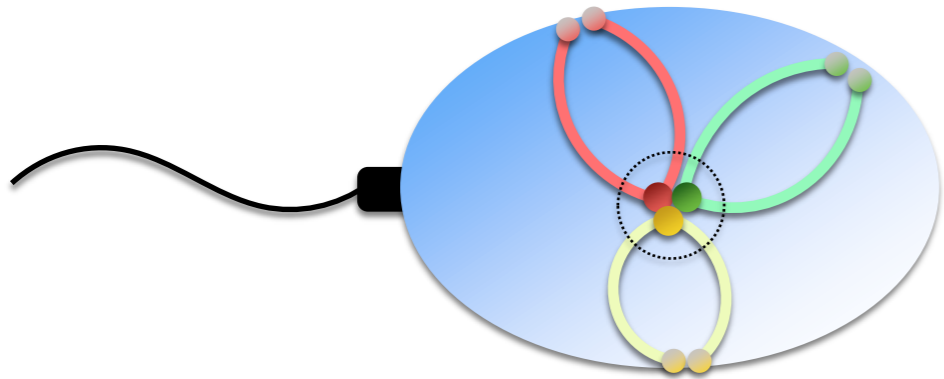
Hypo-Osmotic Swelling Test (HOST)



$$L/D > 20$$

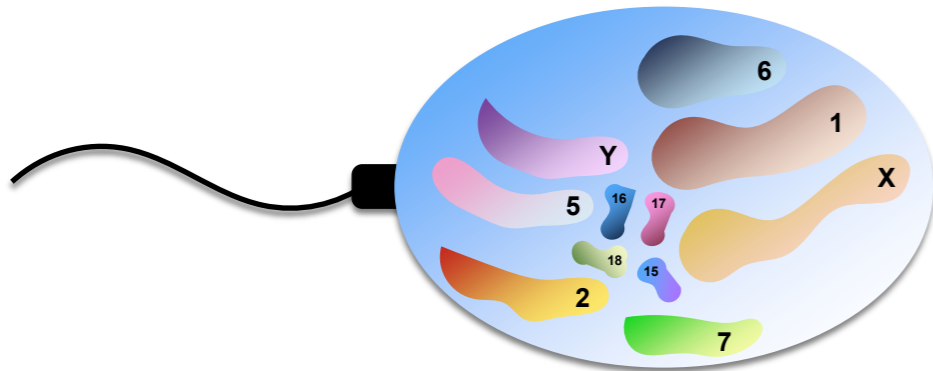
Hypo-Osmotic Swelling Test (HOST)

Physiopathologie



Spermatozoïdes déséquilibrés

- Volume nucléaire augmenté
 - Densité diminuée
 - Davantage de fragmentation de l'ADN
- => apoptose précoce



HOST

Intégrité membranaire

Marqueur d'apoptose précoce

Hypo-Osmotic Swelling Test (HOST)

Hypo-Osmotic Swelling Test (HOST)

Potential selection of genetically balanced spermatozoa based on the hypo-osmotic swelling test in chromosomal rearrangement carriers

**Alexandre Rouen ^{a,*}, Léa Carlier ^a, Solveig Heide ^a, Matthieu Egloff ^a,
Pauline Marzin ^a, Flavie Ader ^a, Mathias Schwartz ^a, Eli Rogers ^a,
Nicole Joyé ^a, Richard Balet ^b, Nathalie Lédée ^b, Laura Prat-Ellenberg ^b,
Nino Guy Cassuto ^c, Jean-Pierre Siffroi ^a**

(Rouen *et al.*, 2017)

Hypo-Osmotic Swelling Test (HOST)

Discontinuous gradient centrifugation (DGC) B-SCOPE (B+ Selection after Conditioned Osmotic Processing and Evaluation): meiotic segregation results from 34 balanced chromosomal carriers in our center over 7 years.

Marine Domart, MD,^{1,2} Capucine Rossi, BS,¹ Eli J Rogers, MD,¹ Nino Guy Cassuto, MD,³ Léa Ruoso, PharmD,³ Laura Prat-Ellenberg, MD,² Jean-Pierre Siffroi, MD, PhD,¹ Pierre Lévy, MD,⁴ Alexandre Rouen*, MD, PhD^{1,2,5}

(Domart *et al.*, soumis pour publication)

Hypo-Osmotic Swelling Test (HOST)

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(Domart et al., soumis pour publication)

Translocations réciproques: - 72%

Translocations Robertsoniennes: - 84%

Inversions péricentriques: - 88%

Chromosomal segregation analysis and HOST-based sperm selection in a complex reciprocal translocation carrier

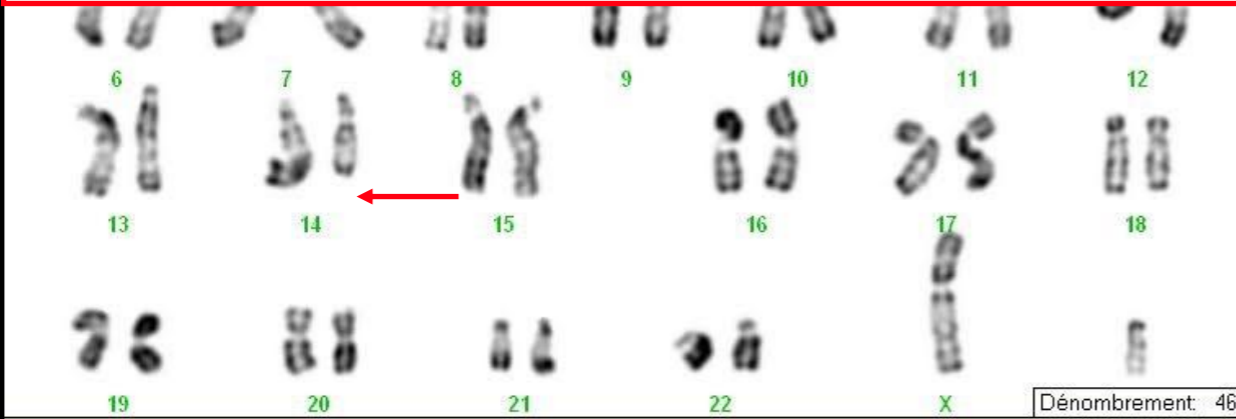
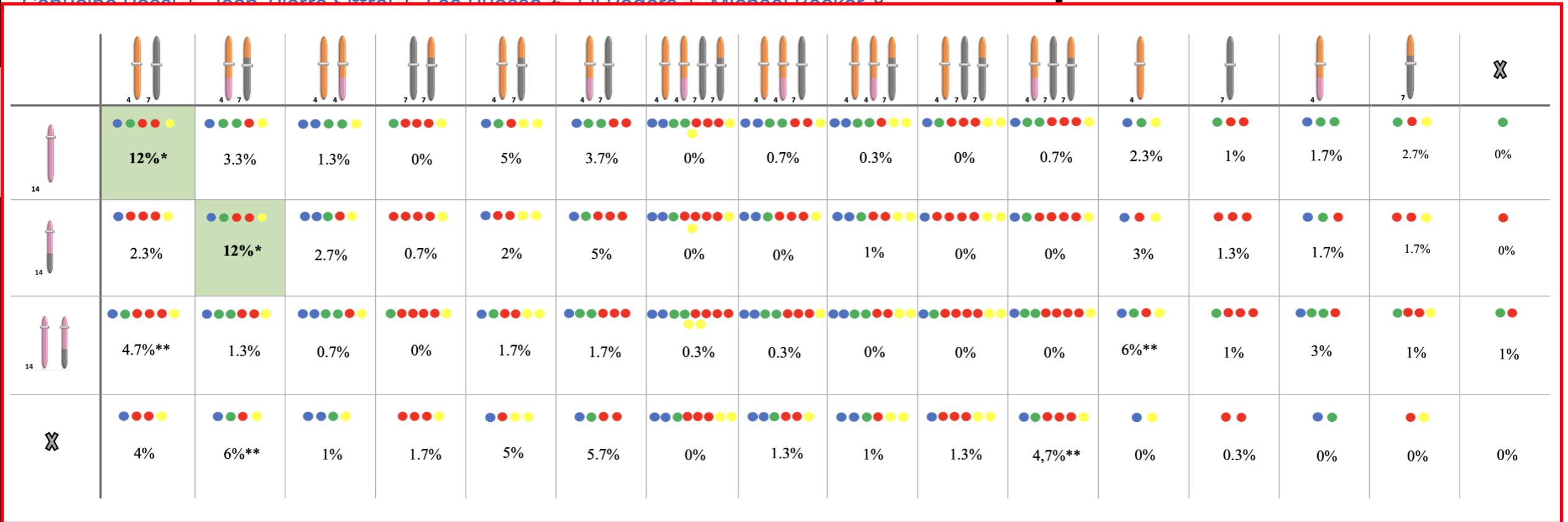
Capucine Rossi¹, Jean-Pierre Siffroi¹, Léa Ruosso², Eli Rogers¹, Michael Becker³,
Nino Guy Cassuto², Laura Prat-Ellenberg⁴, Alexandre Rouen^{5 6 7}

(Rossi *et al.*, 2023)

Hypo-Osmotic Swelling Test (HOST)

Chromosomal segregation analysis and HOST-based sperm selection in a complex reciprocal translocation carrier

Caruana Rossi 1, Jean-Denis Siffroi 1, Léo Dupont 2, Eli Rogers 1, Michael Becker 3



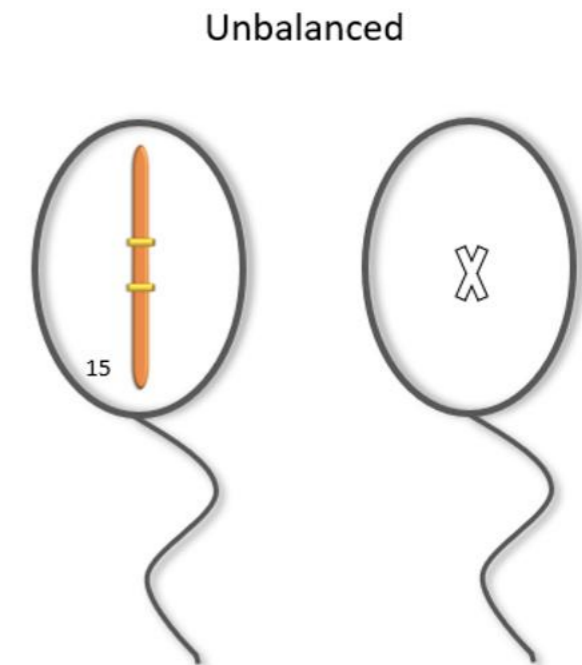
Sélection par HOST: 15% déséquilibrés

Hypo-Osmotic Swelling Test (HOST)

HOST-based sperm selection in a homologous Robertsonian translocation carrier : a case report.

Capucine Rossi, BS, Jean-Pierre Siffroi, MD, PhD, Léa Ruoso, PharmD, Nino Guy Cassuto, MD ; Laura Prat-Ellenberg, MD ; Alexandre Rouen, MD, PhD

(Rossi et al., en cours de rédaction)

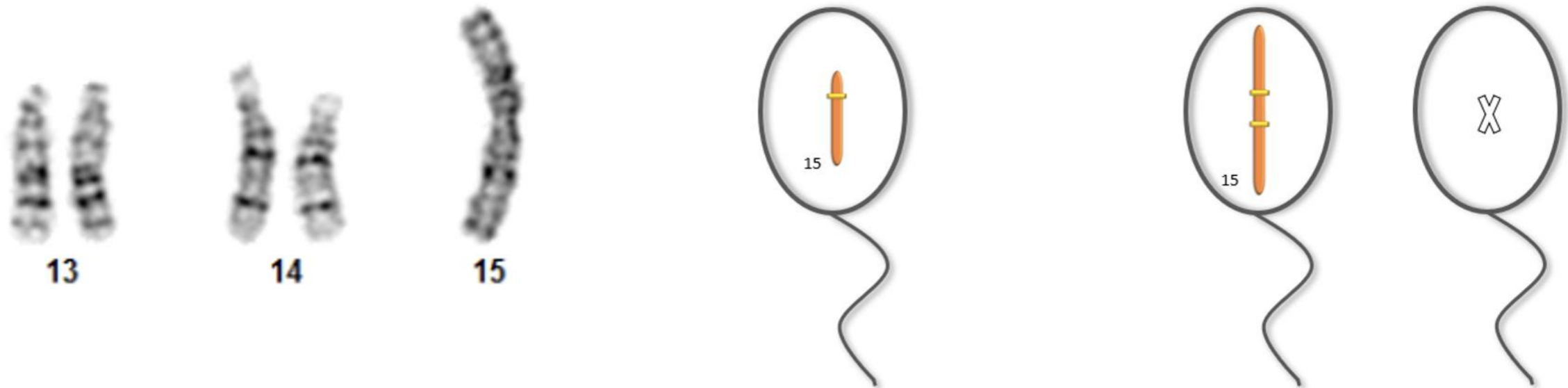


Hypo-Osmotic Swelling Test (HOST)

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(Rossi et al., en cours de rédaction)



Hypo-Osmotic Swelling Test (HOST)

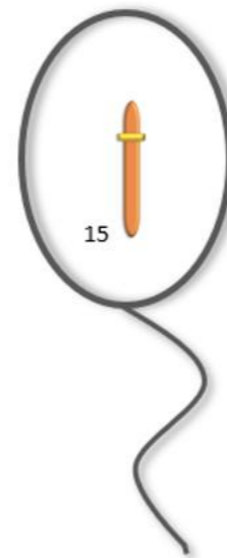
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Capucine Rossi, BS, Jean-Pierre Siffroi, MD, PhD, Léa Ruoso, PharmD, Nino Guy Cassuto, MD ; Laura Prat-Ellenberg, MD ; Alexandre Rouen, MD, PhD

(Rossi *et al.*, *en cours de rédaction*)



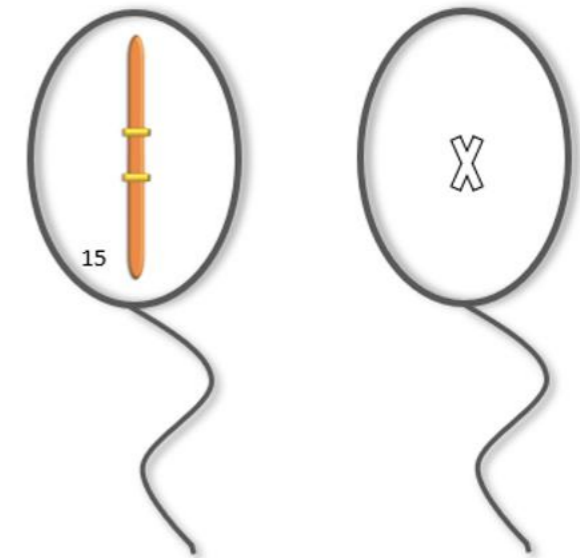
Balanced



Initial : 4.5%

HOST: 54%

Unbalanced



Algorithme décisionnel

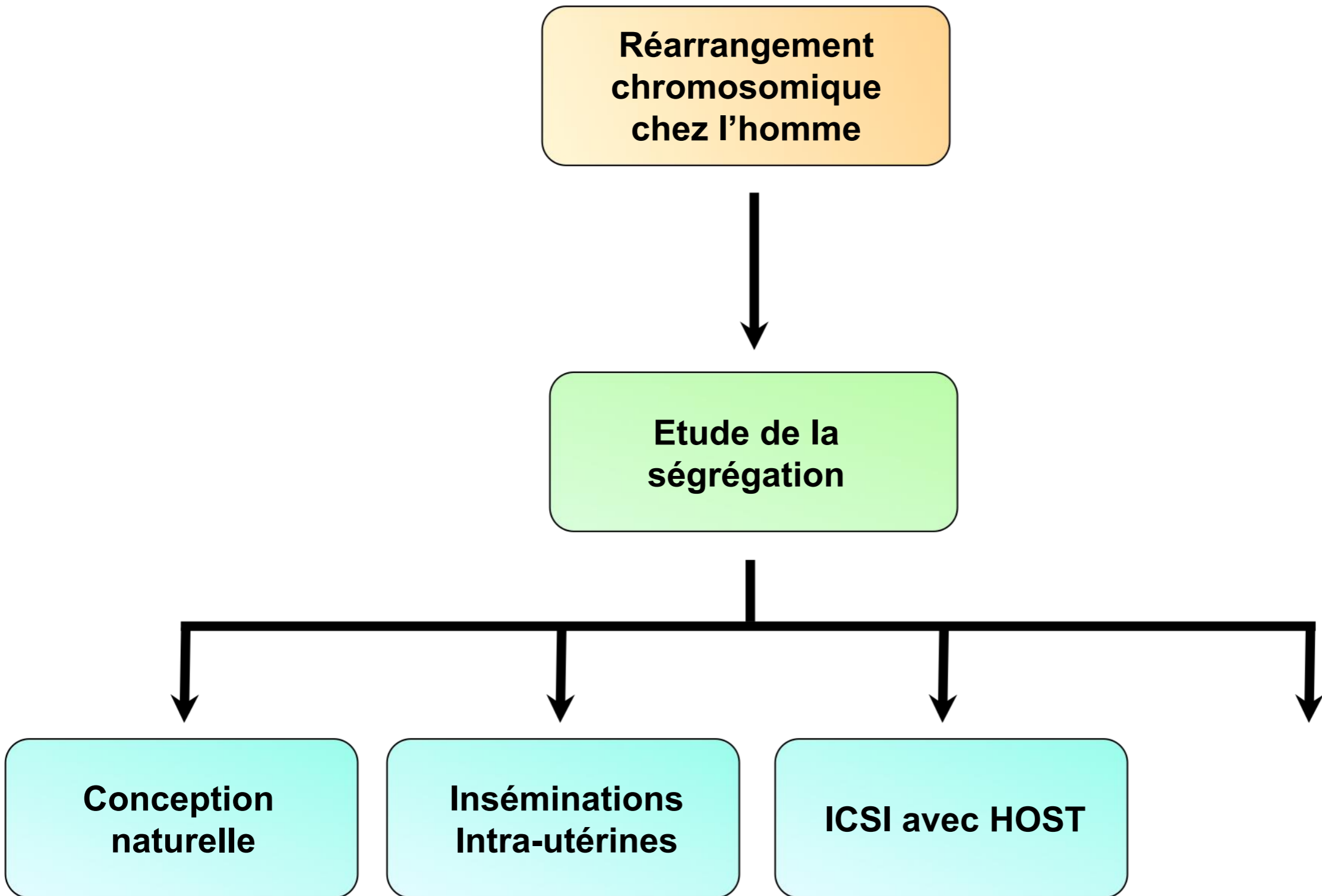
**Réarrangement
chromosomique
chez l'homme**

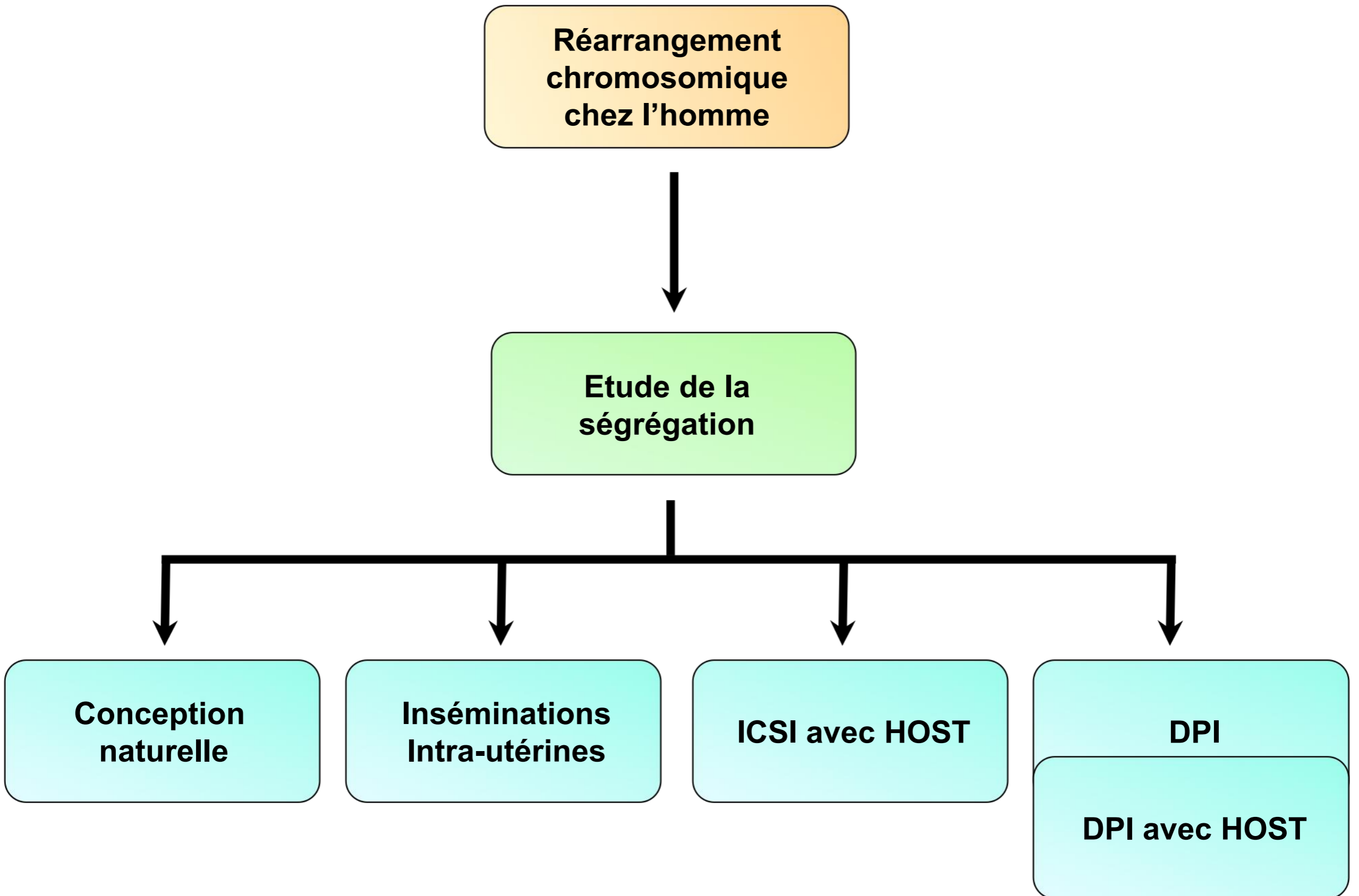


**Etude de la
ségrégation**

FISH sur spermatozoïdes

- % initial
- % après TMS
- % après HOST





**Réarrangement
chromosomique
chez l'homme**

**Etude de la
ségrégation**

**Conception
naturelle**

**Inséminations
Intra-utérines**

ICSI avec HOST

DPI

DPI avec HOST

Merci

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