

مرحبا بكم





اقراء باسم ربك الذي خلق
الخطاط محمد الحسنى

٢٥ / ١٤٤٤



CLONING

Dr. Mohsen AGAG

الجائية 29

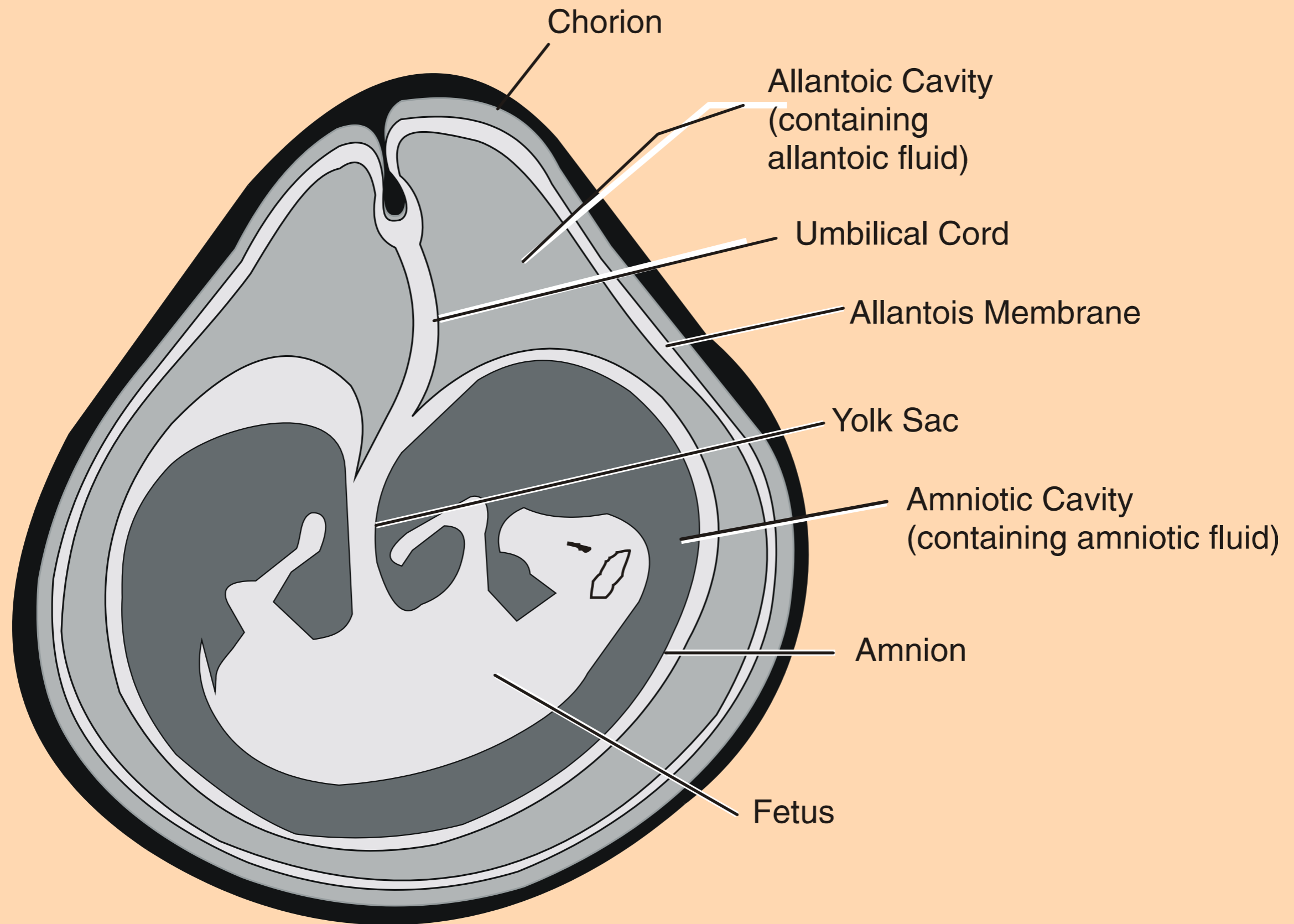
«إنا كنا نستنسخ ما كنتم تعملون»

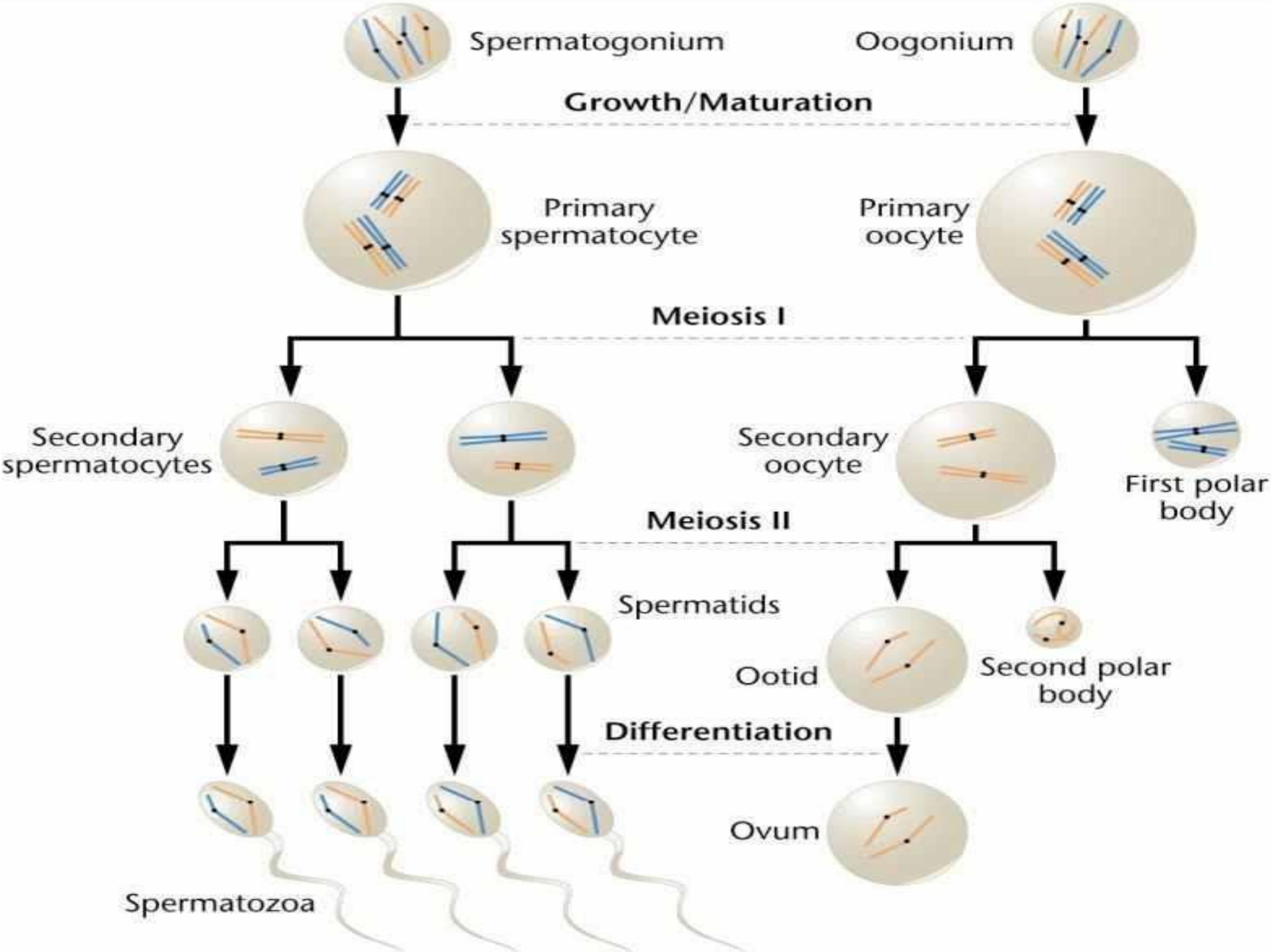


بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

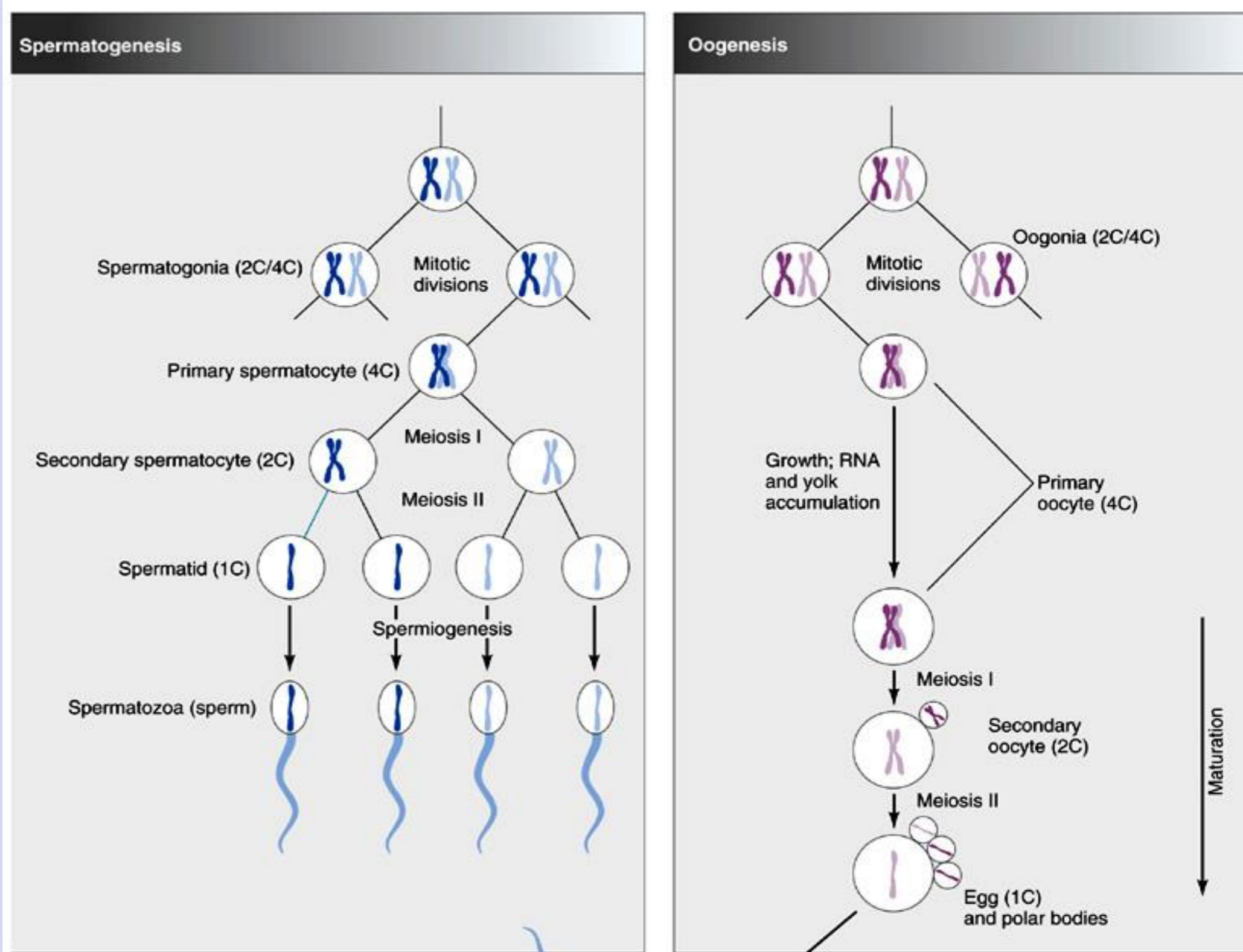
قضت حكمة الخالق ان يختار للتكاثر أسلوباً أرقى وهو التزاوج بين الإناث والذكور، لينشأ عنه انساقاً متنوعة من النسل .. فحفلت الحياة بتعددية رائعة الأشكال والأنساق فاختلقت الإخوة في الأشكال .. وتحولت الحياة الى **متحف بديع ثرى من الأشكال والألوان والأنواع والأصناف** .. فأصبح للعنكبوت مائة ألف صنف .. والخنافس مائتان وسبعون ألف صنف .. واصبحت الحياة ولادة، تلقى بالجديد في كل لحظة في غنى وثناء وتناسق وتوازن لتدل على قدرة الخالق العظيم

Biological diversity

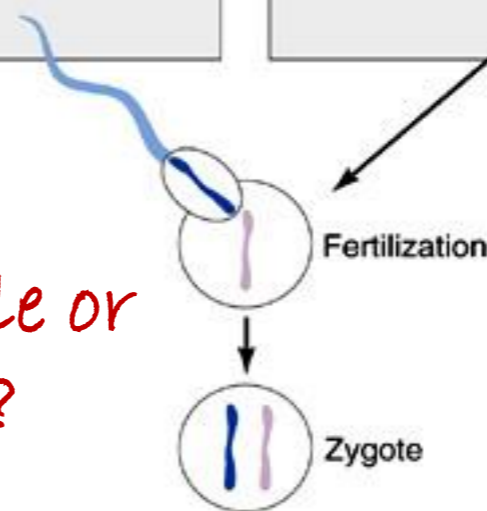




Meiosis generates tremendous genetic diversity.

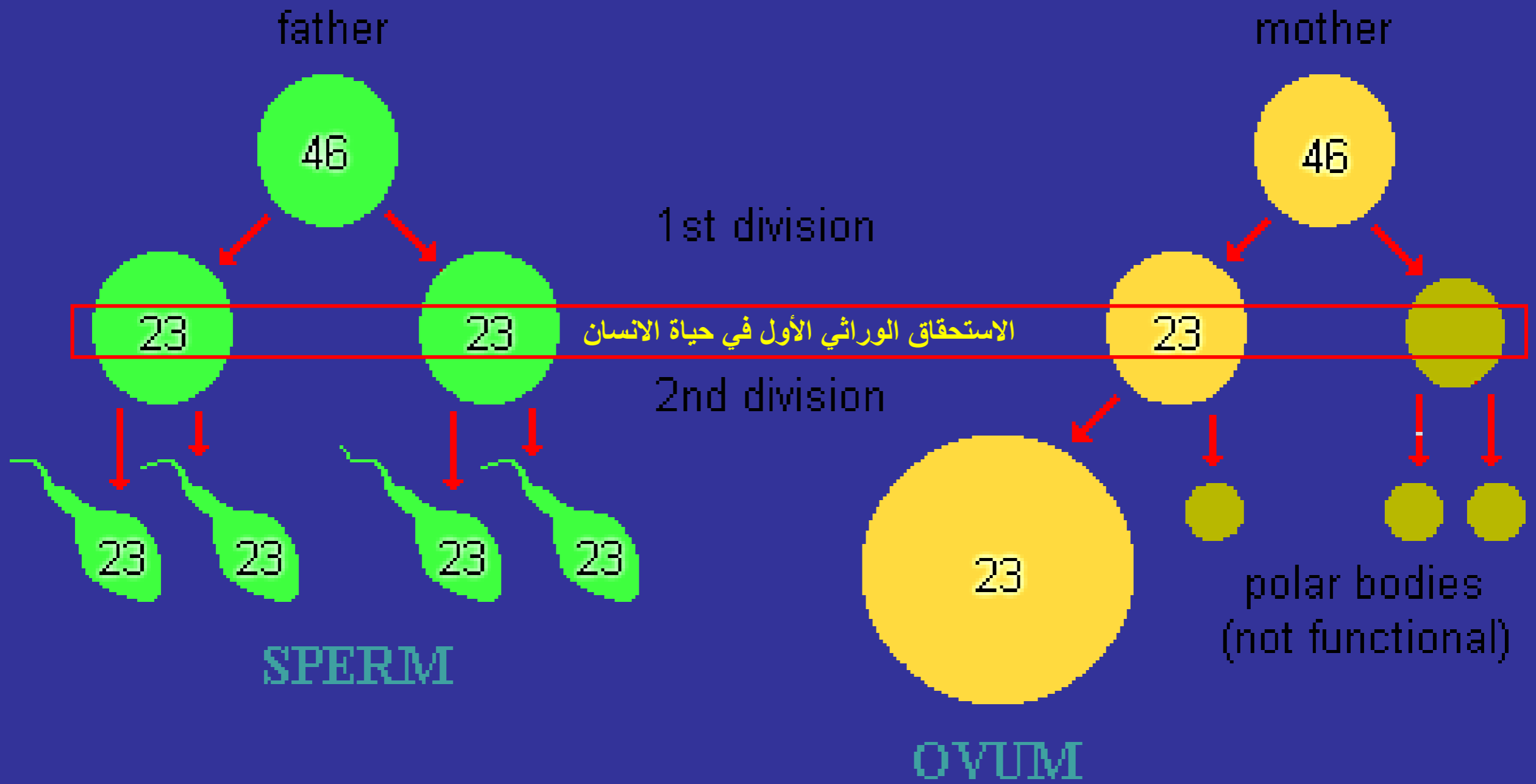


How many different types of gametes can be generated by an individual (male or female) with 23 different chromosomes?



How many different types of gametes can be generated by an individual (male or female) with 23 different chromosomes?

**More than 2^{23} or
8,388,608
different gametes**



جودة الحياة



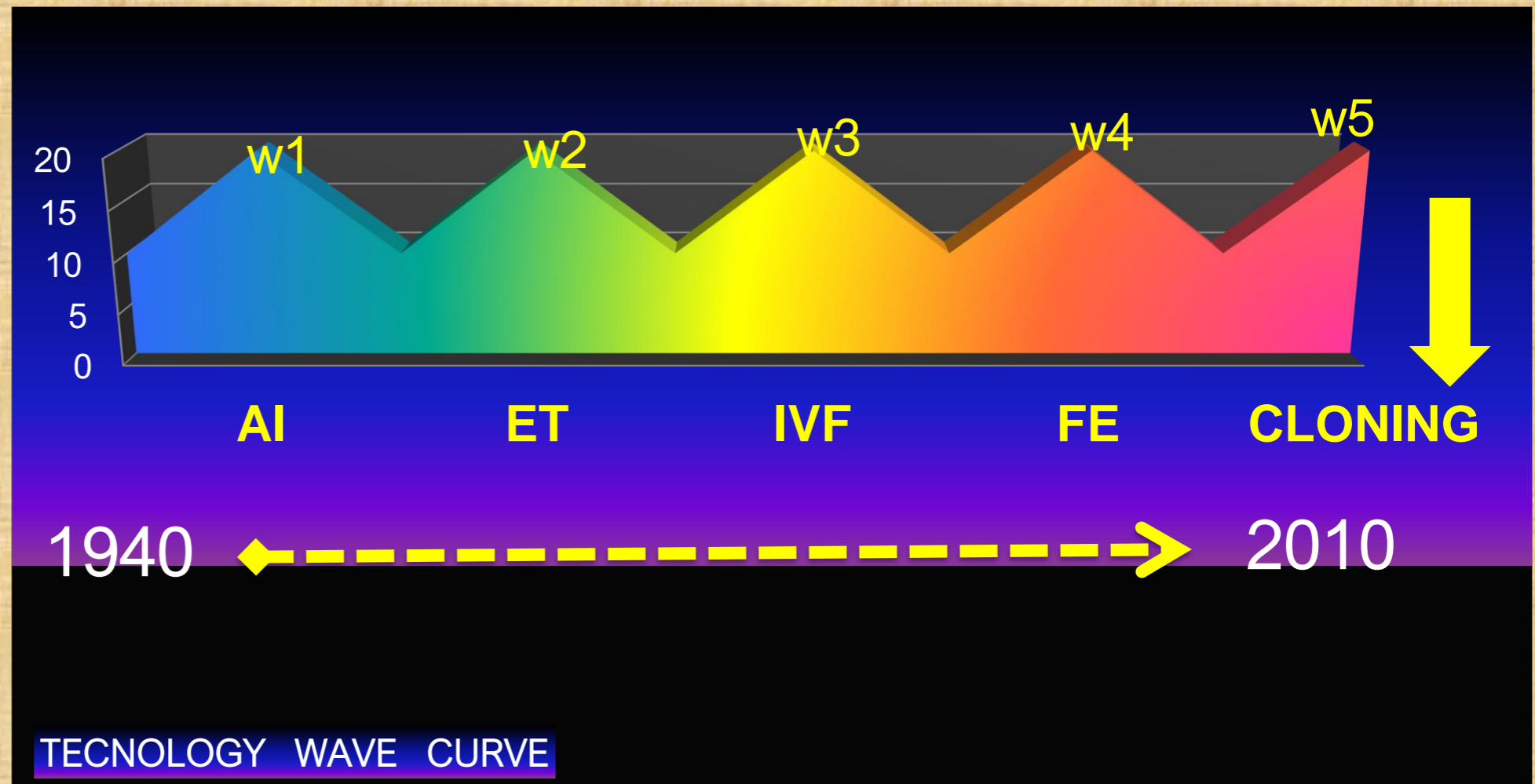
الفجوة العلمية التراكمية

تتضاعف الفجوة

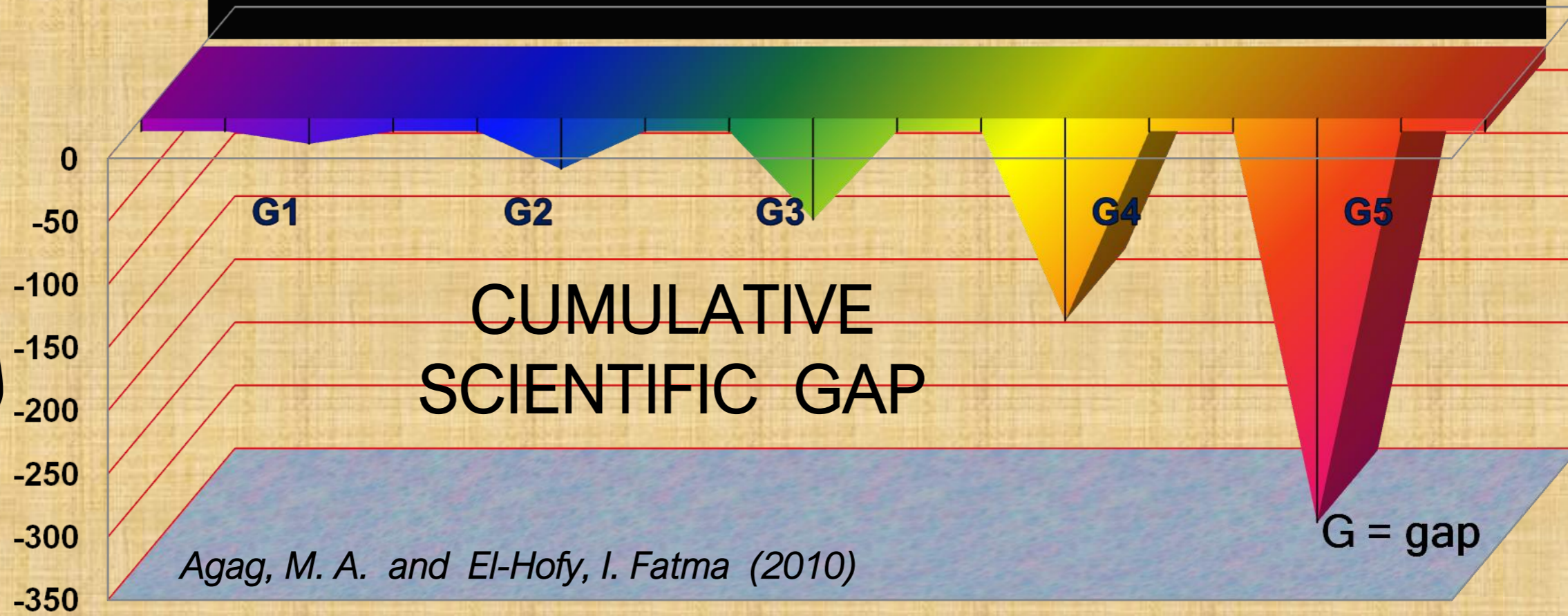
كل 15 إلى 20 عاما طبقا

لمنحى الموجة التراكمية

Cumulative Scientific
Gap between
the West
&
the Arab World



الفجوة
العلمية
التراكمية





CLONING



Q.:

Can you expect, If the cloned animal carries the same characters of parents or not ..?

Ans.: At the end of the lecture



Define cloning

**The process of
making identical genomic copies
of an original animal.**



Define cloning

An individual organism that was grown from a single body cell of one parent and that is genetically identical to it.



Define cloning

- Cloning in biology is the process of producing similar populations of genetically identical individuals. Cloning in biotechnology refers to processes used to create copies of DNA fragments (molecular cloning), cells (cell cloning), or organisms. The term also refers to the production of multiple copies of a product such as digital media or software.

History of cloning

- 1952 Northern leopard frogs cloned.
- 1953 Structure of DNA discovered.



Brief History of Cloning

- ◆ 1902 :Walter Sutton proves chromosomes hold genetic information.
- ◆ 1902 :German scientist Hans Spemann divides a salamander embryo.
- ◆ 1932 :Spemann proposes a “fantastical experiment”
- 1952:Briggs and King clone tadpoles.
- 1953 :Watson and Crick find the structure of DNA.
- 1962 :John Gurdon clones frogs from differentiated cells.
- 1963 :J.B.S. Haldane coins the term ‘clone.’
- ◆ 1977 :Karl Illmensee produce mice with only one parent,
- ◆ 1984 :Twinning- create genetic copies from embryonic cells.
- ◆ 1996 :First animal cloned from adult cells is born.



Does a nucleus from a differentiated cell retain the know-how to construct an entire organism ?



“fantastical experiment”

Remove the nucleus from an unfertilized egg and replace it with one from a differentiated cell.

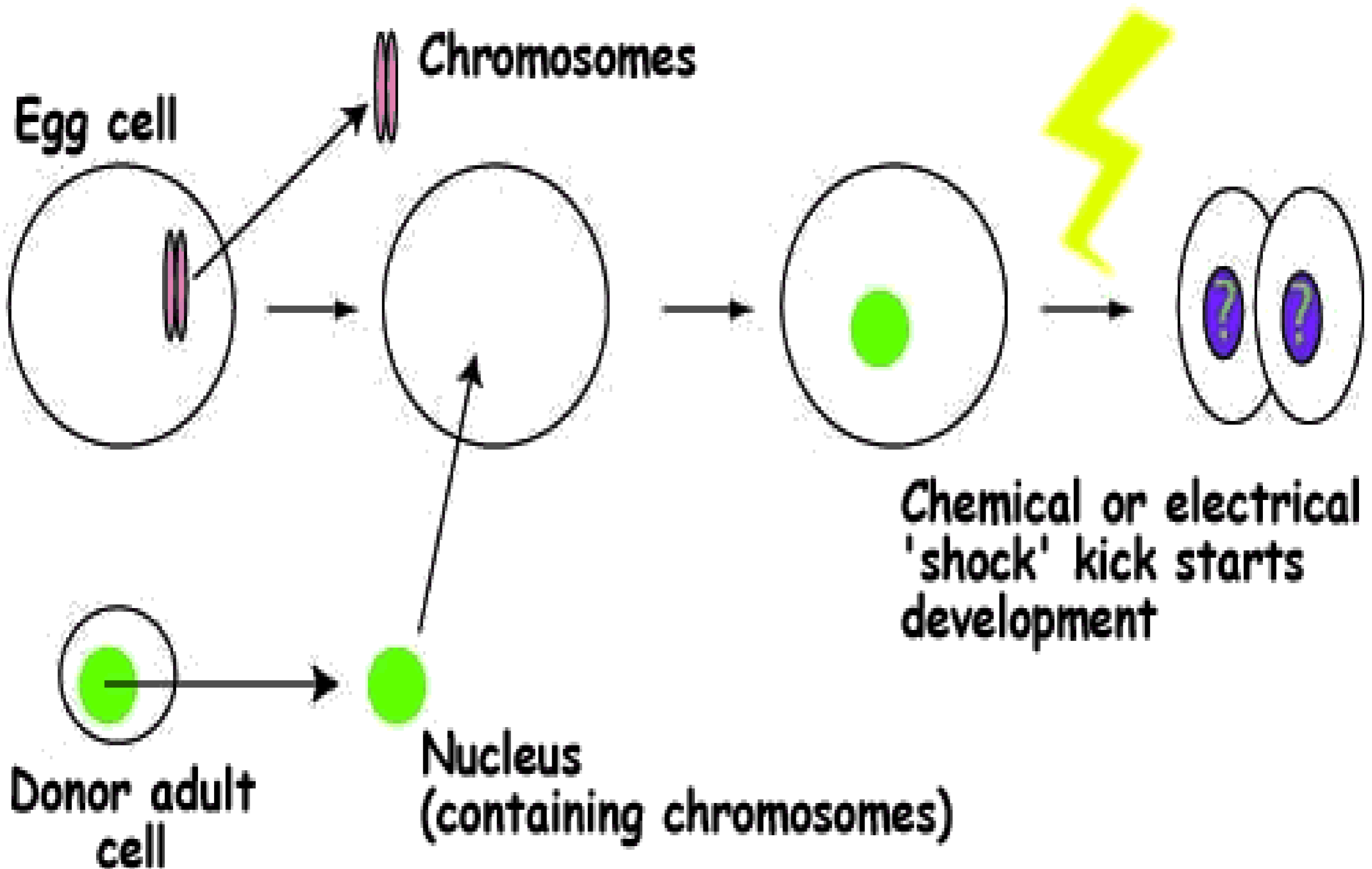


SCNT

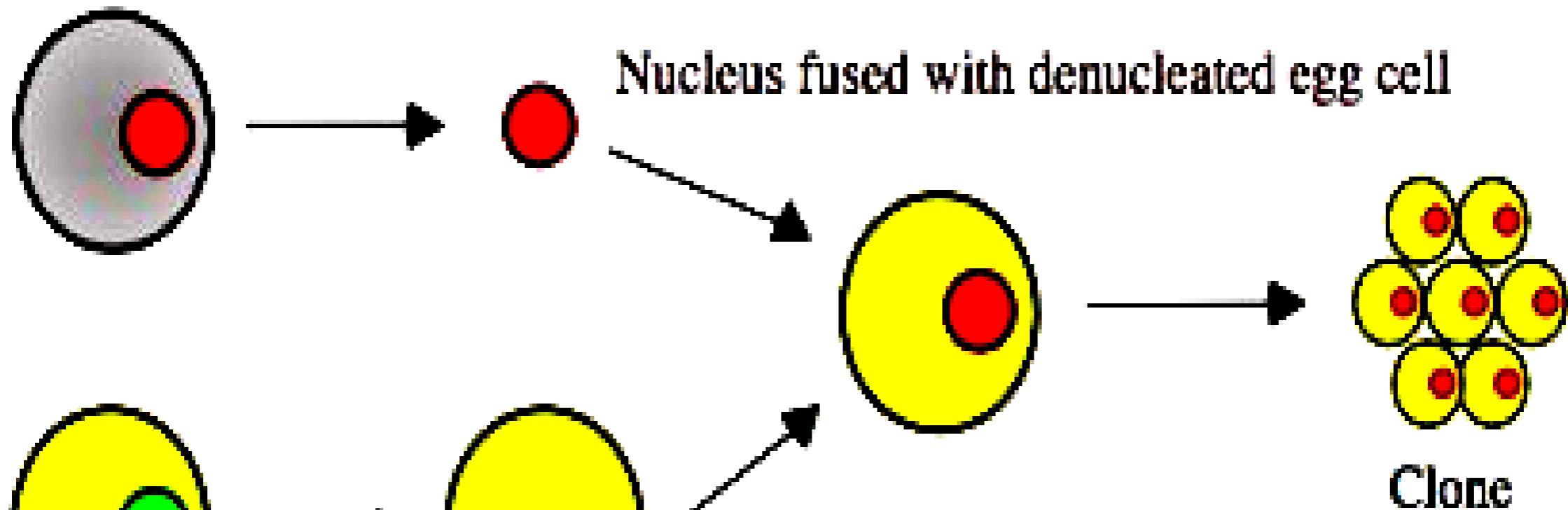


SCNT is a laboratory strategy means somatic cell nuclear transference for creating a viable embryo from a body cell and an egg cell. It is used in both therapeutic and reproductive cloning. The technique consists of enucleation of oocyte with a donor nucleus from a somatic cell.

The process of Cloning



Somatic body cell with desired genes

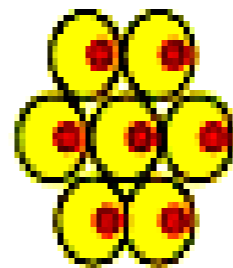


Egg cell

Nucleus removed

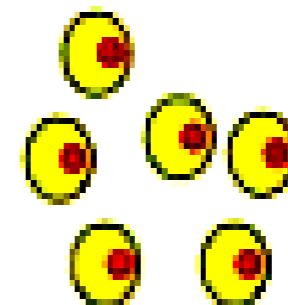
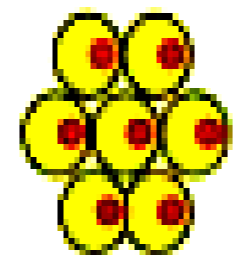
Clone

REPRODUCTIVE CLONING



Surrogate Mother

THERAPEUTIC CLONING



Tissue Culture

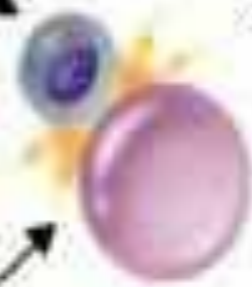
A donor cell is taken from a sheep's udder.



Donor Nucleus



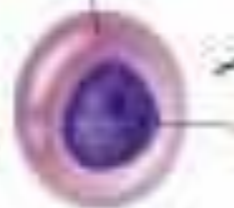
These two cells are fused using an electric shock.



Egg Cell



An egg cell is taken from an adult female sheep.



The nucleus of the egg cell is removed.



The fused cell begins dividing normally.



Embryo

The embryo is placed in the uterus of a foster mother.

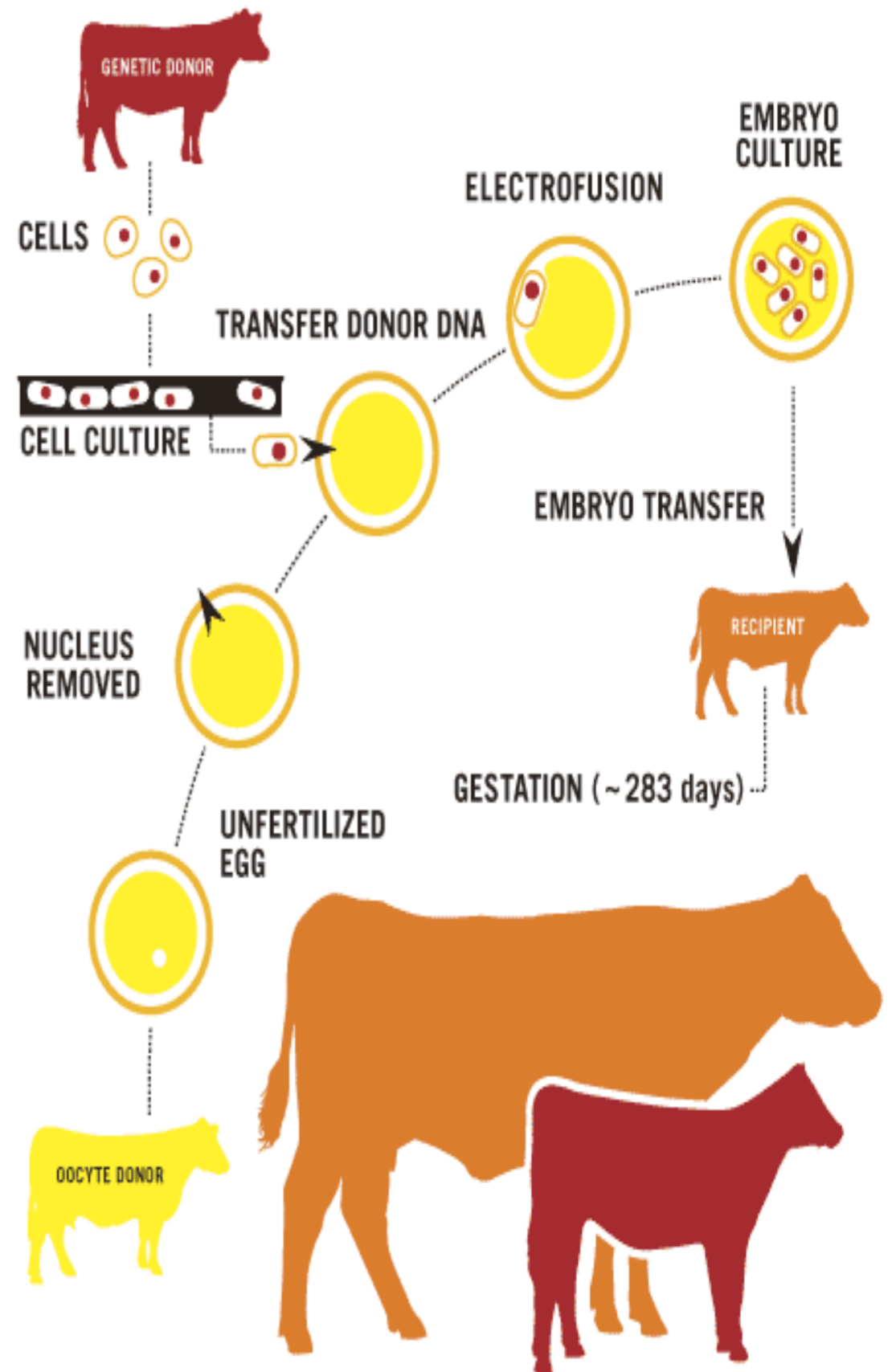
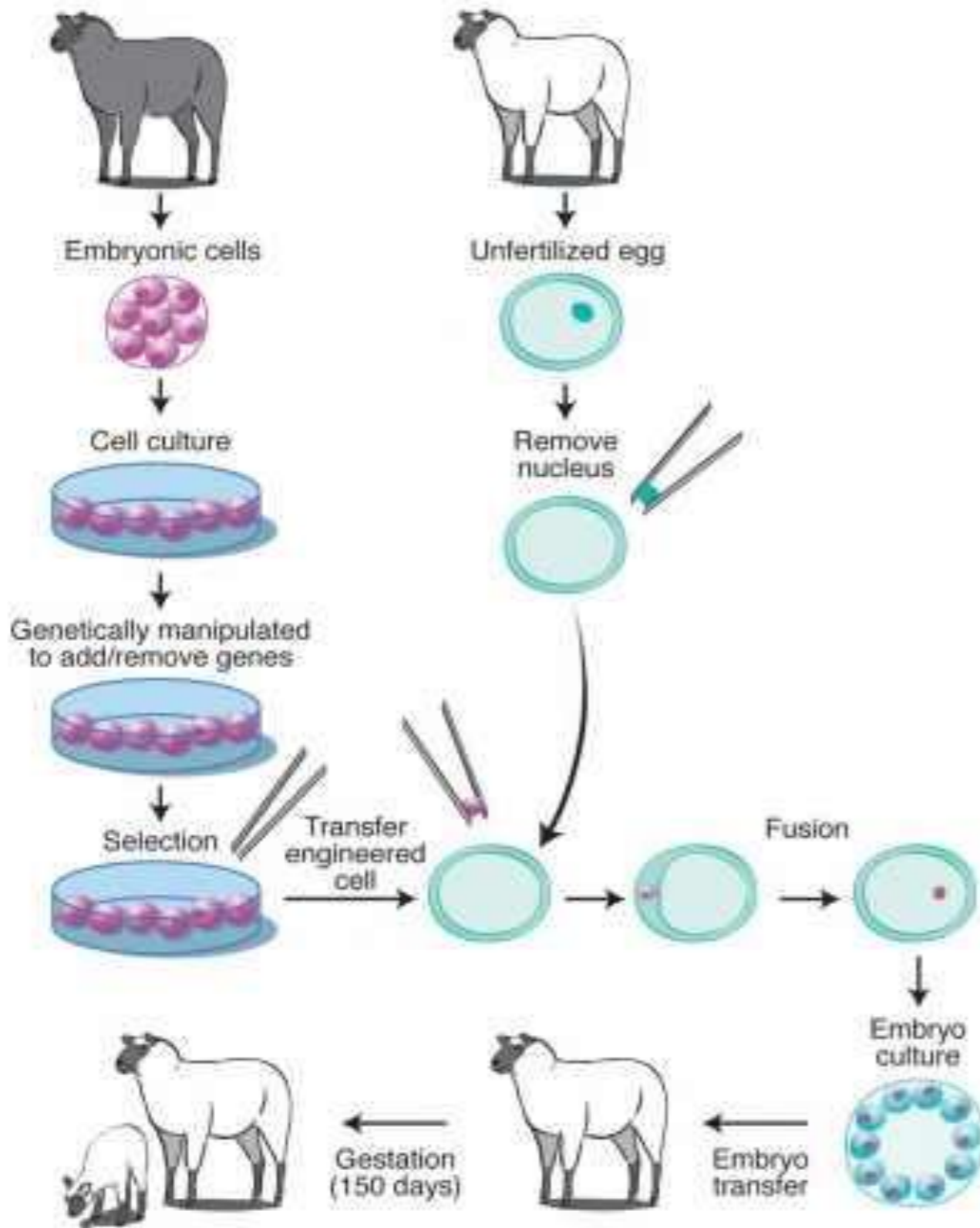
Cloned Lamb

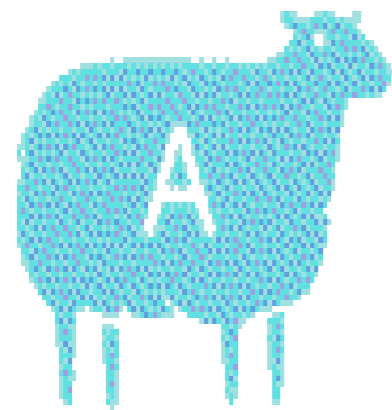


The embryo develops normally into a lamb—Dolly

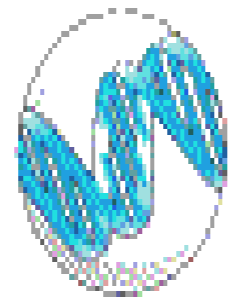


Making a Pharm Animal

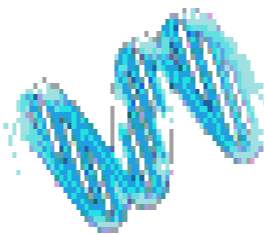
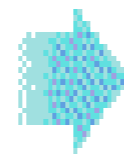




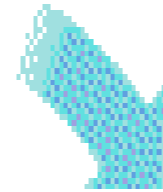
Female



Body cell taken from Sheep A



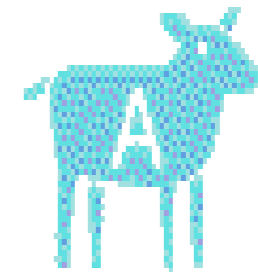
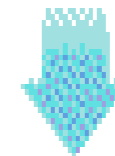
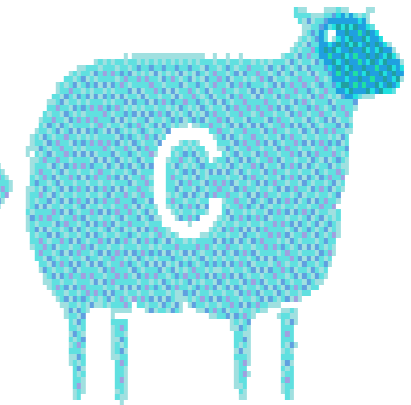
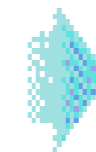
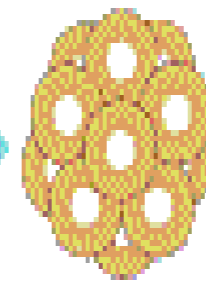
DNA extracted



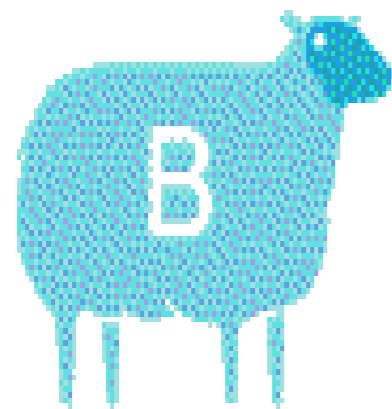
Fused cell develops into embryo which is placed in uterus of foster mother



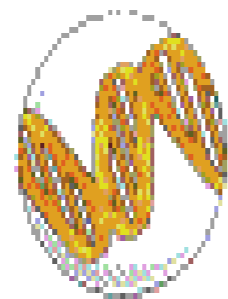
DNA from Sheep A fused with egg cell from Sheep B



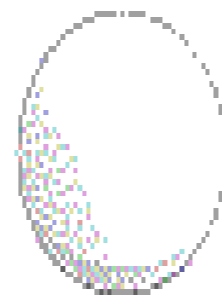
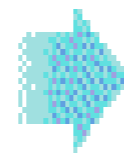
Lamb is clone of Sheep A



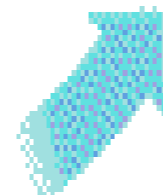
Female



Egg cell taken from Sheep B



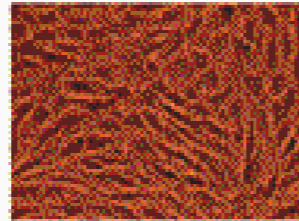
Nucleus removed



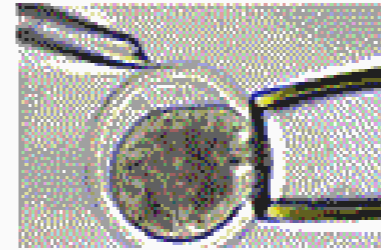
Cloning by Nuclear Transfer



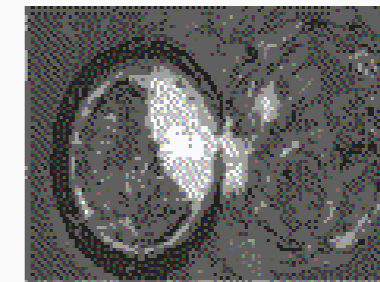
Tissue biopsy is taken from donor cow



Donor cells are grown in tissue culture



Donor cell nucleus is transferred to recipient egg

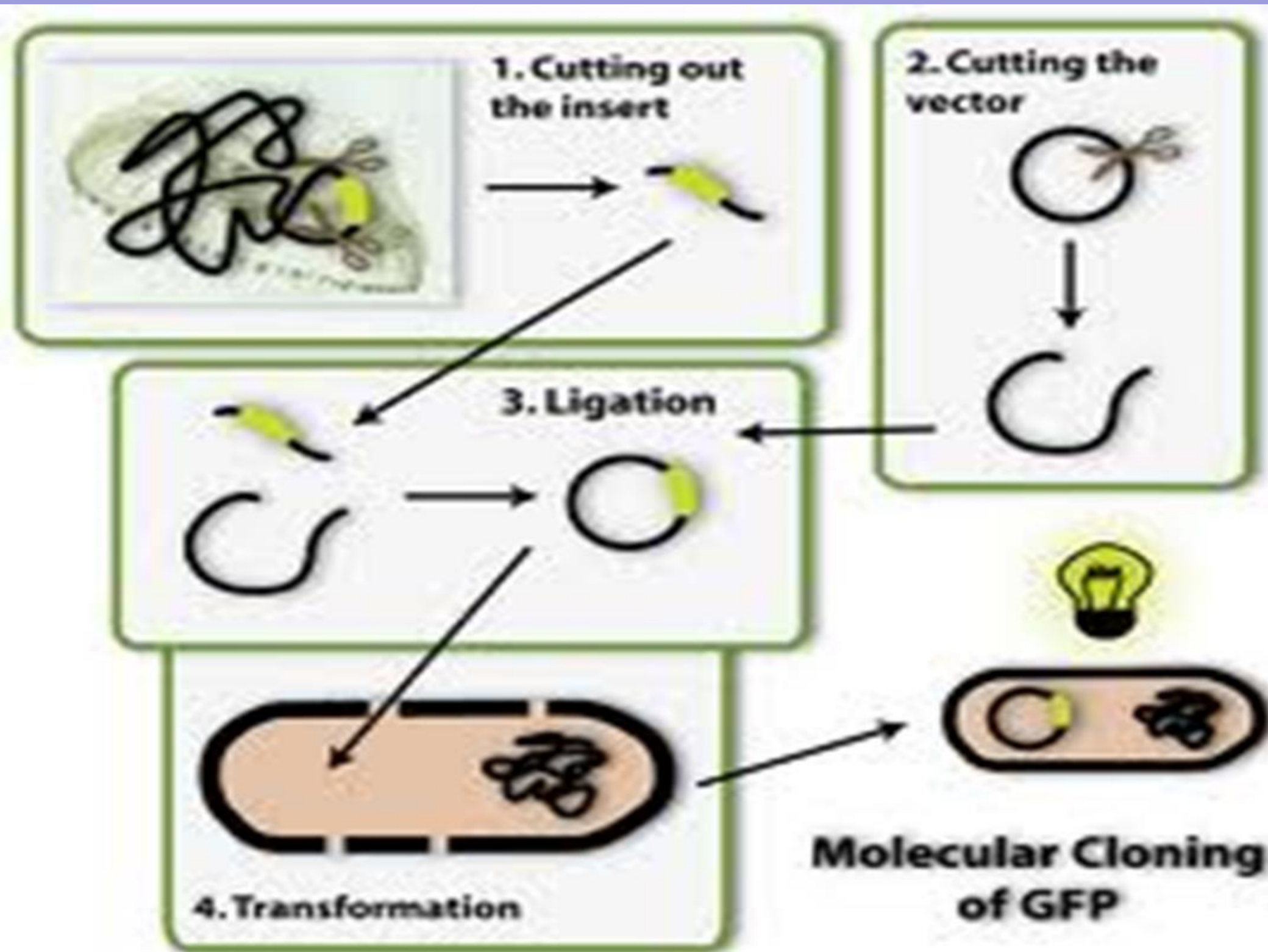


Cloned embryo is transferred to surrogate mother



Pregnancy is monitored by ultrasound

Molecular Cloning



WORLDWIDE CLONING RESEARCH LEGISLATION

Country	Human cloning	Therapeutic Cloning	Create/Use of embryo
Germany	Illegal	Illegal	Illegal
UK	Illegal	Legal	OK
Japan	Illegal	Legal	Legal
Canada	Illegal	Legal	Sterility only
US	Illegal	Legal	Private company only
China	Illegal	Legal	Therapeutic

متى تنفخ الروح في الجنين

روى البخاري ومسلم وغيرهما عن عبد الله بن مسعود رضى الله عنه قال:

حَدَّثَنَا رَسُولُ اللَّهِ صَلَّى اللَّهُ عَلَيْهِ وَسَلَّمَ وَهُوَ الصَّادِقُ الْمَصْدُوقُ قَالَ
 إِنَّ أَحَدَكُمْ يَجْمَعُ خَلْقَهُ فِي بَطْنِ أُمِّهِ أَرْبَعِينَ يَوْمًا ثُمَّ يَكُونُ
 عَلَقَةً مِثْلَ ذَلِكَ ثُمَّ يَكُونُ مِضْغَةً مِثْلَ ذَلِكَ ثُمَّ يَبْعَثُ اللَّهُ
 مَلَكًا فَيَوْمِرُ بِأَرْبَعِ كَلِمَاتٍ وَيُقَالُ لَهُ اكْتُبْ عَمَلَهُ وَرِزْقَهُ وَأَجَلَهُ
 وَشَعْبَهُ أَوْ سَعِيدَهُ... بالحديث

ثم ينفخ فيه الروح

Why Clone?



Why Clone

- For medical purposes: Lab animals – Stem cell researches (November 2001) – Genetically engineered animals
- Reviving endangered or extinct species
- Reproducing a Pet
- Cloning animals
- Cloning humans

Types of Cloning

- **Therapeutic:** Stem cell researches - Cloned animals for specific hormone production.
- **Reproductive cloning:** SCNT with success rate of 1:277 (Dolly, 277 trials).
- **DNA cloning:** Molecular cloning, Recombinant DNA technology. Aims to gene cloning- Lab animals to overcome individual variations – Genetically engineered animals for high meat and milk production.

Molecular Cloning

Amplifying of DNA seq. (isolation and multiplication)
Cloning of any DNA fragment essentially involves four processes:

fragmentation- breaking apart a strand of DNA

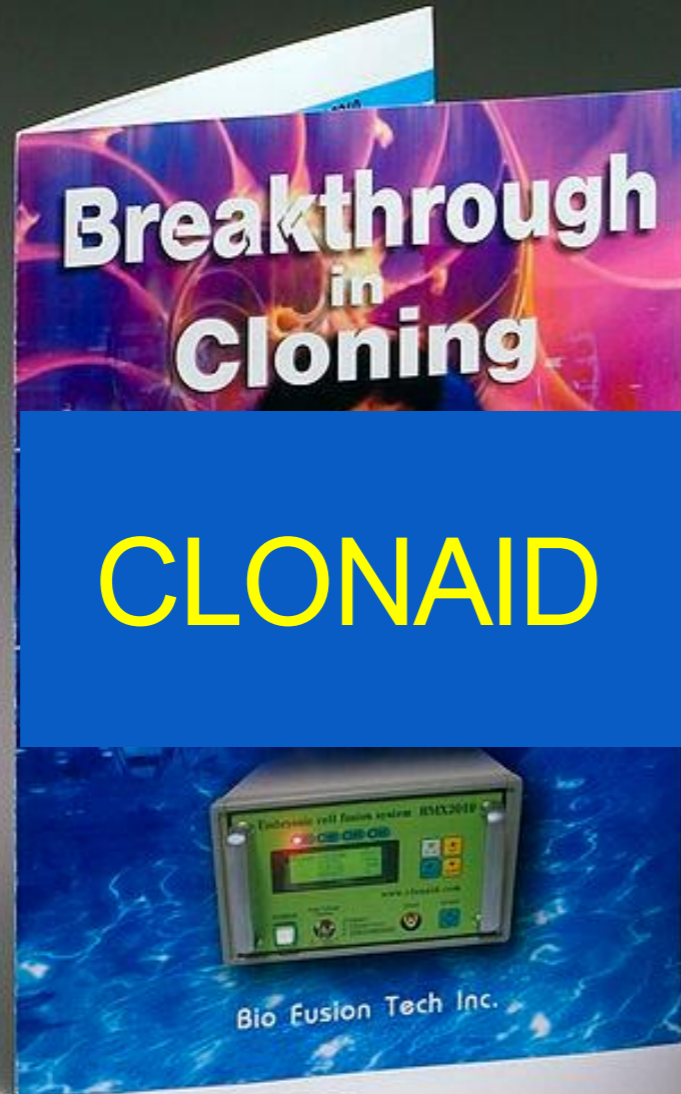
ligation- gluing together pieces of DNA in a desired sequence

transfection- inserting the newly formed pieces of DNA into cells

screening/selection- selecting out the cells that were successfully transfected with the new DNA

A 'Cloning Strategy'

CLONAIID



Clonaid

(Bahamas, 1997)

Service = 200,000\$



- RMX2010

Embryonic Cell Fusion System

by Korean company: BioFusion Tech Inc.

<http://www.clonaid.com>

In a study, the researchers identified a single gene known as SOX17, which is directly responsible for ordering human stem cells to become the cells that will turn into sperm and eggs.

Artificial egg and sperm

Scientists create artificial human eggs and sperm



PROS

1. Cure human diseases using animal organs
2. Produce animals with desirable traits.
3. Create animals that are disease resistant
4. Efficiency of the livestock production
5. More consistent food products
6. Save endangered species
7. Provide children for sterile parents
8. An opportunity to clone a person who has died



CONS

1. Public perception
2. Use complicated technology
3. Decline in genetic diversity.
4. Low survival rate
5. Overweighing of calves at birth
6. Poor development of heart, lung and immune system
7. Mental and emotional problems.
8. Genetic disorders.
9. Expensive.
10. Cloned products cannot be marketed
11. Religious and moral reasons.
12. Physical problems, birth defects.
13. Taking nature into our own hands

Cloning of transgenic animal

- Cloning of a cow containing mad cow disease resistant gene
- In Shangdong, China

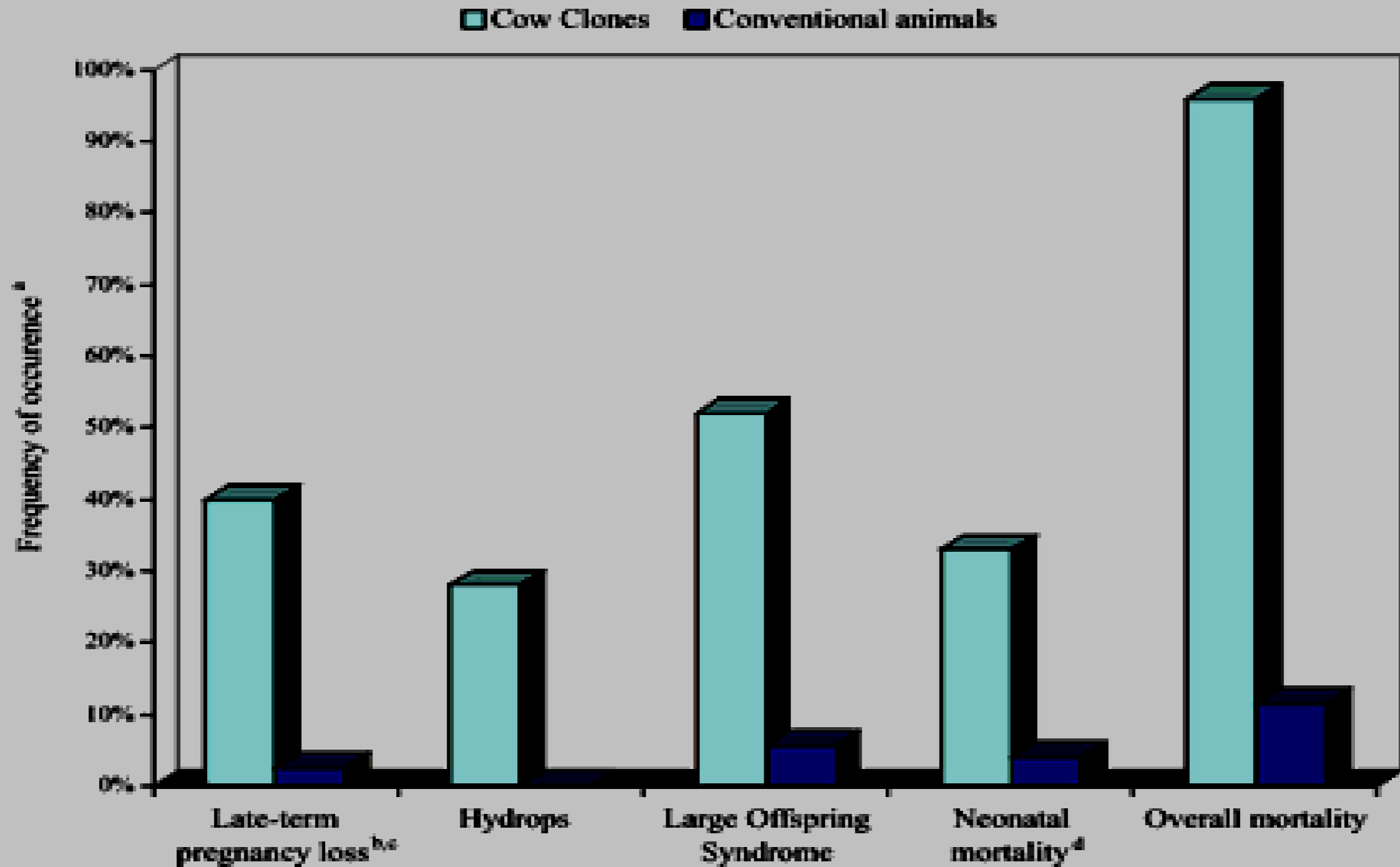


抗瘋牛症希望

◀▲全球首隻帶有抗瘋牛症基因的複製牛25日在山東萊陽農學院出世，若小牛的抗瘋牛症效果日後獲得驗證核實，將為對抗這種可怕疾病帶來新希望。
(法新社)

From Mingpao 28/4/2006

Frequency of Health Problems and Premature Death in Clones vs. Conventional Animals



^a Percentages are approximate and based on data provided in the FDA Risk Assessment, except where otherwise noted.

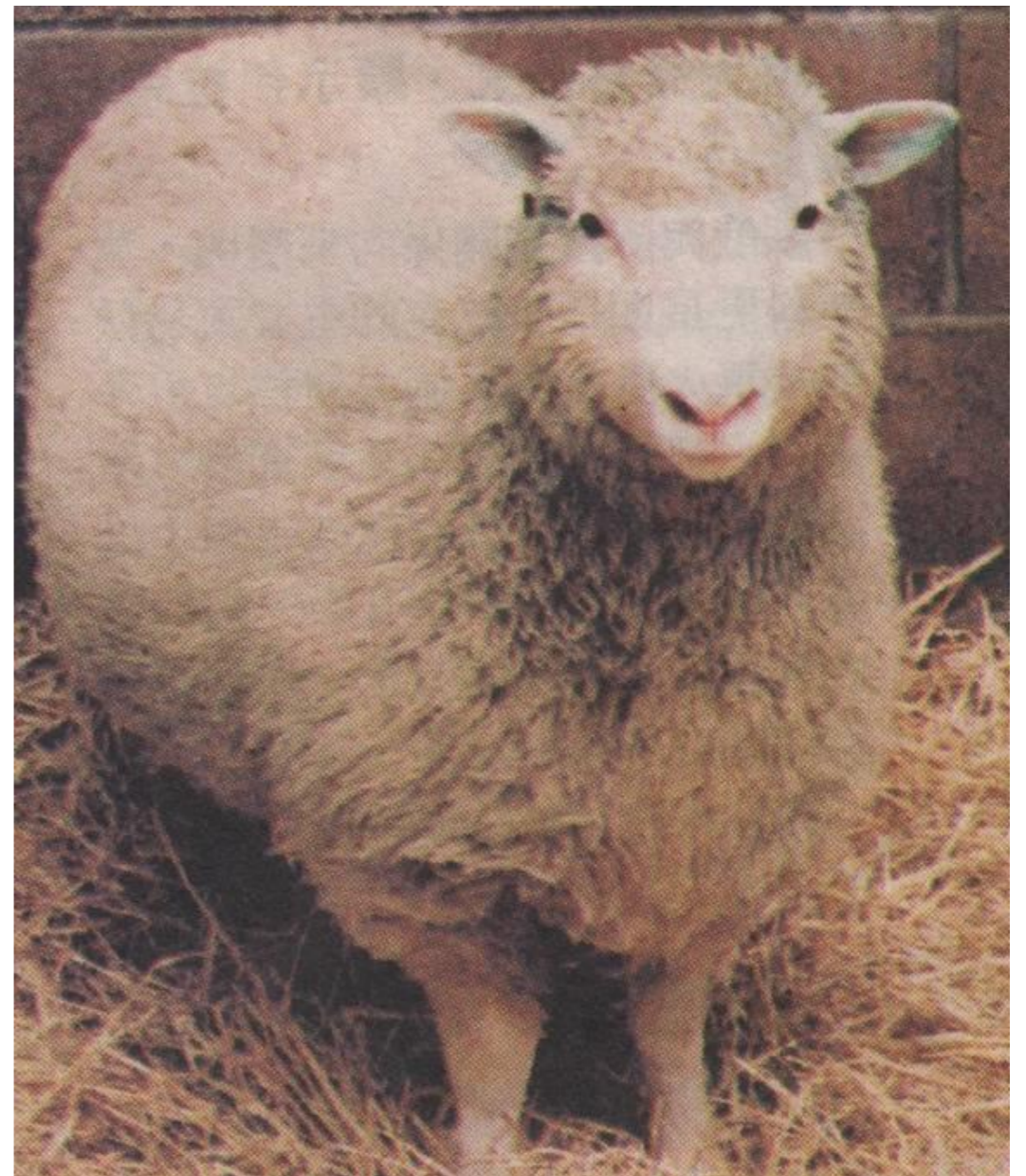
^b Expressed as a percentage of pregnancies confirmed at Day 90 of gestation.

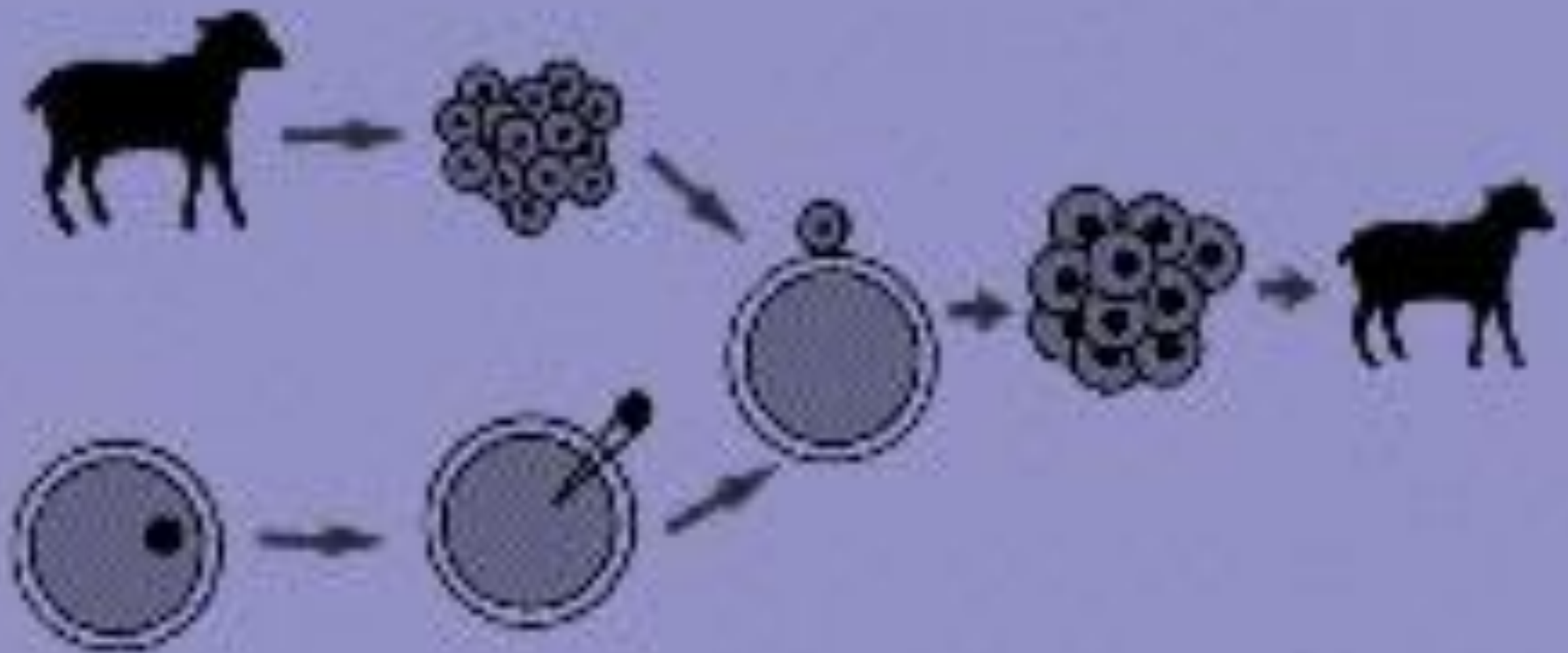
^c Based on data from the FDA RA, Panarace et al. (2007), Lawrence et al. (2005), Heyman et al. (2002), and Wells et al. (1999).

^d Expressed as a percentage of live-born calves.

Dolly - the first mammal cloned using mature cell

- Dolly the Lamb in 1996
- Method: Nuclear transfer
- Organization: Roslin Institute at UK

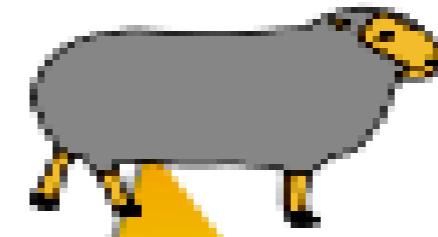




The strategy that made Dolly

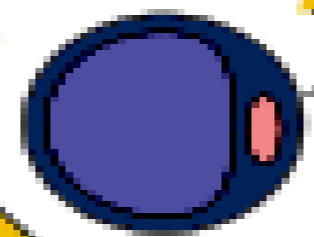
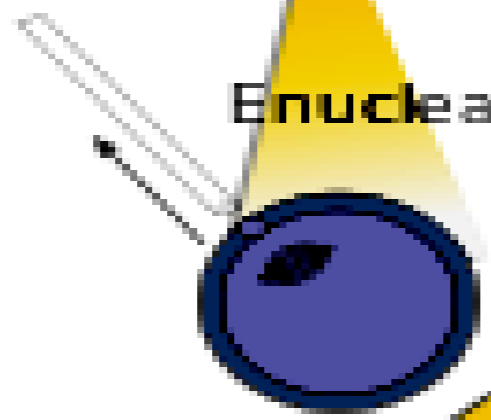
Scottish Blackface
(Cytoplasmic Donor)

Finn-Dorset
(Nuclear Donor)



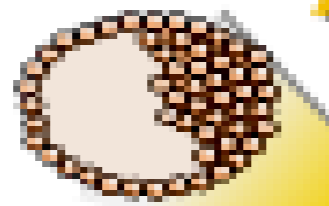
Enucleation

Mammary Cells

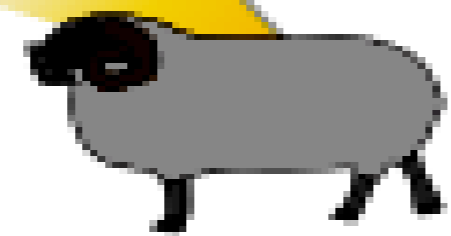


Direct Current Puls

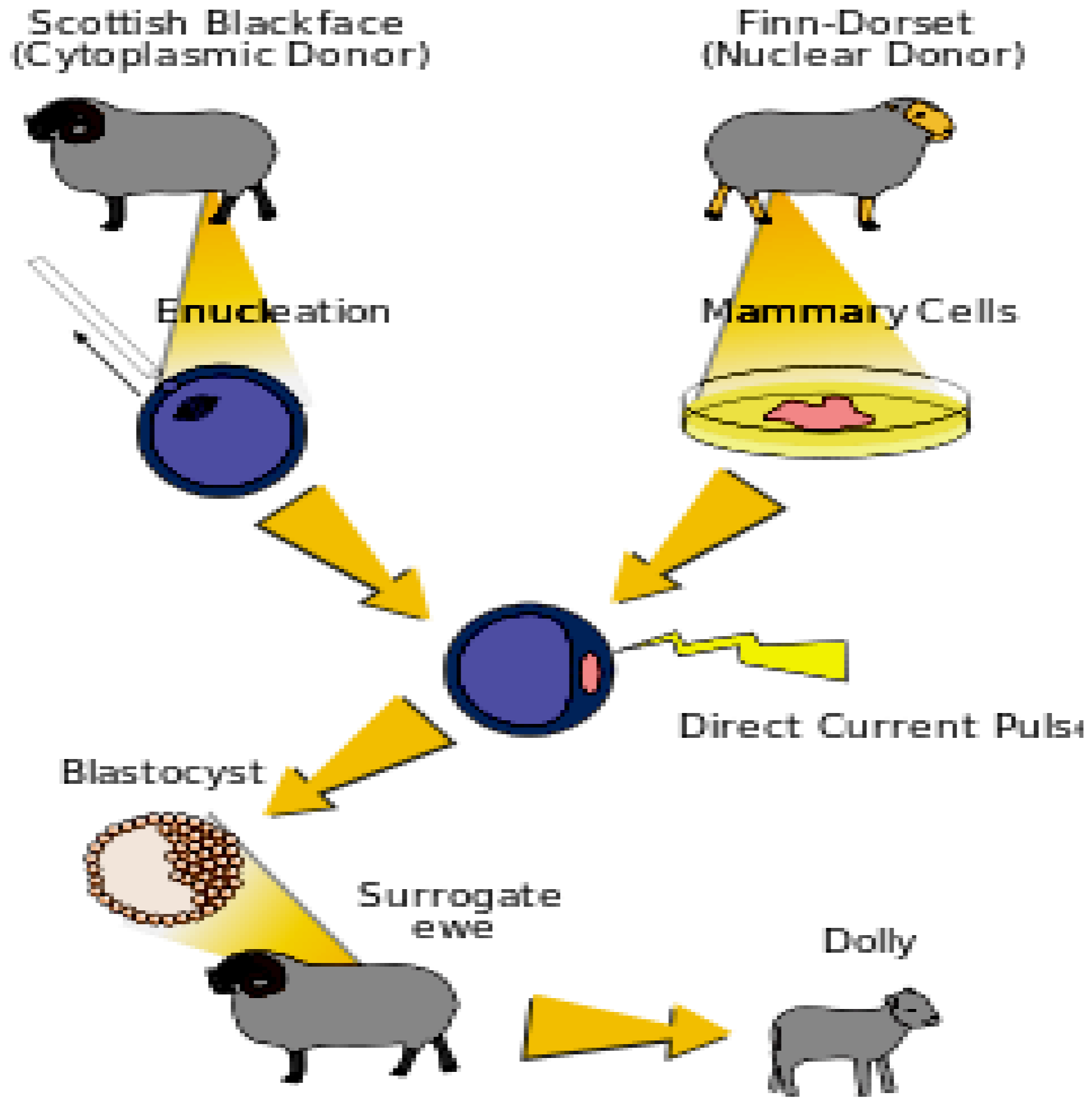
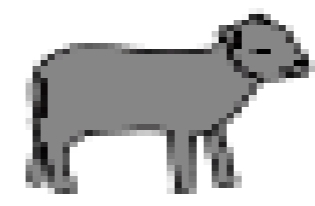
Blastocyst



Surrogate
ewe



Dolly



Dolly gave birth to a female lamb in 1998, but Dolly later died of premature aging in 2003.



複製羊「多莉」上周在蘇格蘭愛丁堡誕下小羊「邦妮」

(美聯社)

證明複製動物能正常生育

複製羊「多莉」誕下健康羊女

【蘇格蘭二十三日美聯社電】英國科學家周四證實，全球首隻複製羊「多莉」成功誕下健康小羊女，母女現況都非常健康。

據複製多莉的羅斯林研究所稱，小羊名為「邦妮」，是一隻雌性羊，於四月十三日在正常分娩下出生。多莉是在與一隻威爾士公羊自然交配下懷孕的，懷孕

後曾接受檢疫隔離，以免出現流產。

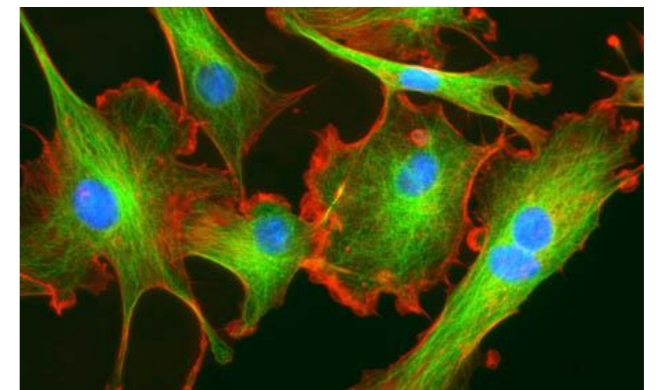
該研究所總裁說：「我們很高興，雖然多莉出身有異，但小羊的出生，證實多莉能夠正常生育，與一般羊無異，可產出健康的下一代。」

研究所前擔心從成年羊細胞複製而來的多莉會出現與年齡有關的不正常疾病，但小邦妮的出生，證明多莉是完全健康的羊隻。該研究所早已證實複製動物有生育能力，經過不同複製程序而來的羊隻梅甘和莫拉格，皆成功誕下了自己的下一代。

How to generate Dolly?

Step 1.

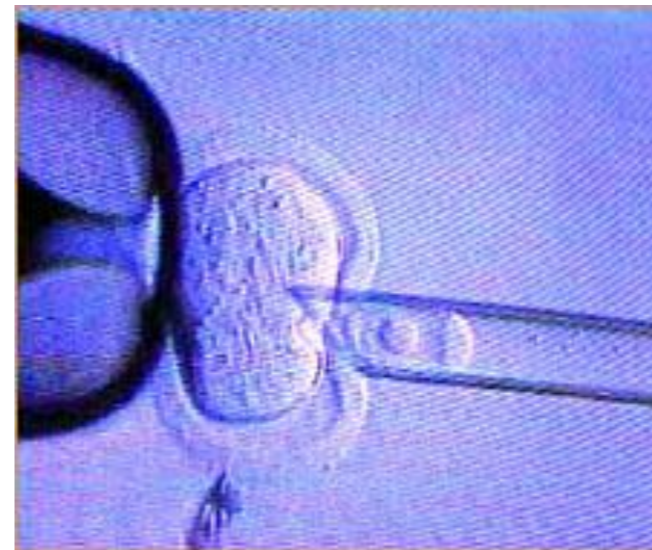
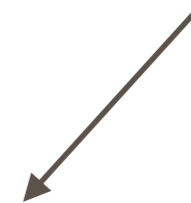
Udder cells were taken from a donor sheep.



How to generate Dolly?

Step 2.

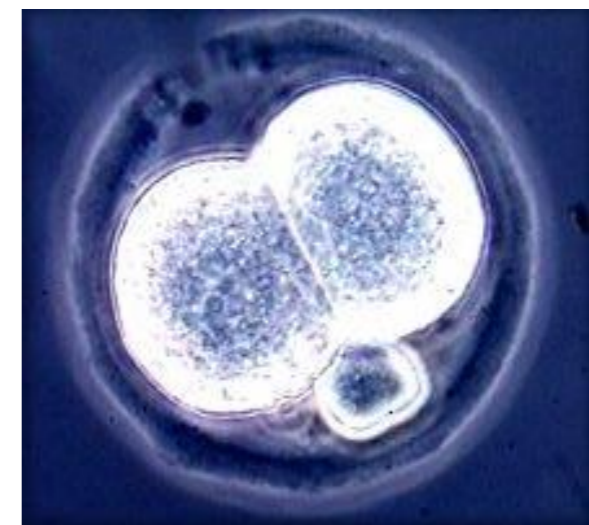
Unfertilized egg cell was taken from another sheep. The nucleus was removed, leaving an empty egg.



How to generate Dolly?

Step 3.

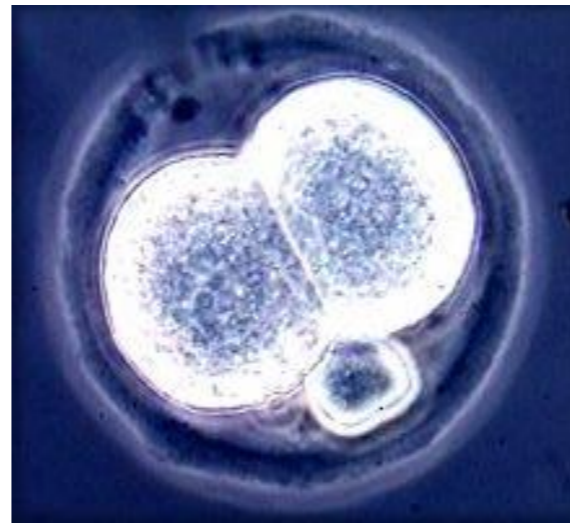
The egg cell without nucleus was fused with the donor cell using a pulse of electricity. A second pulse started the cell division.



How to generate Dolly?

Step 4.

After 6 days, the resulting embryo was implanted into another sheep (surrogate mother).



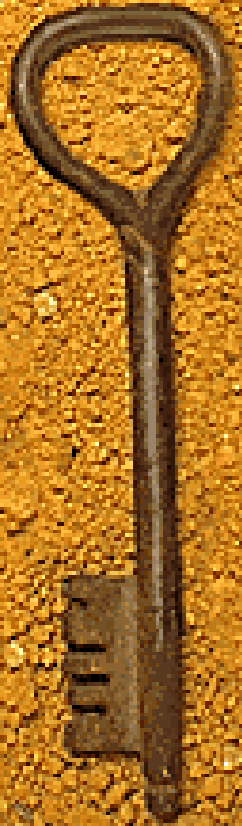
How to generate Dolly?

Step 5.

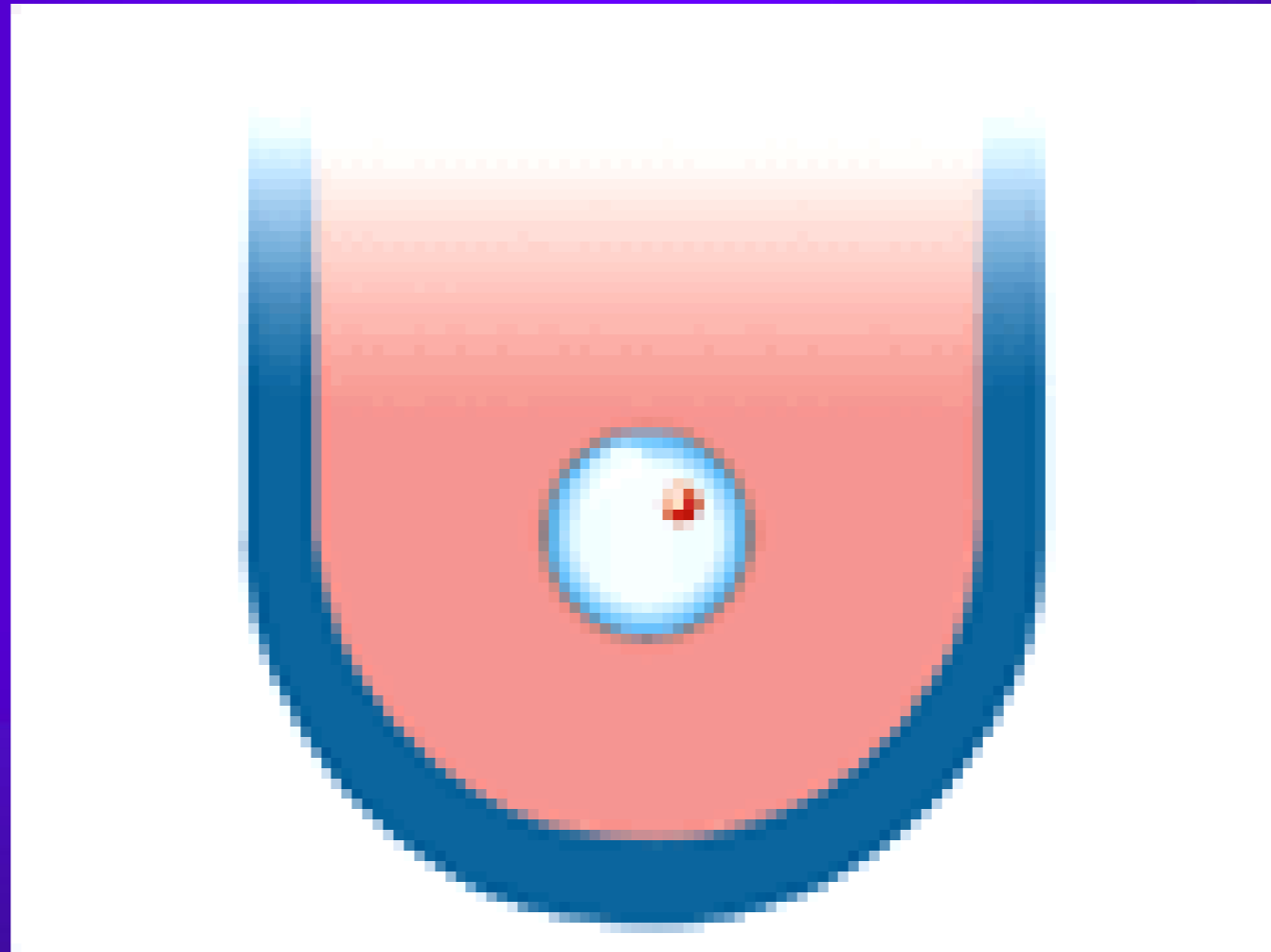
After gestation, the surrogate mother gave birth to Dolly which was identical to the udder cell donor.



Creating Dolly (After Dolly Parton) (5-7-1996) to (14-2-2003), (Roslin Inst. England)

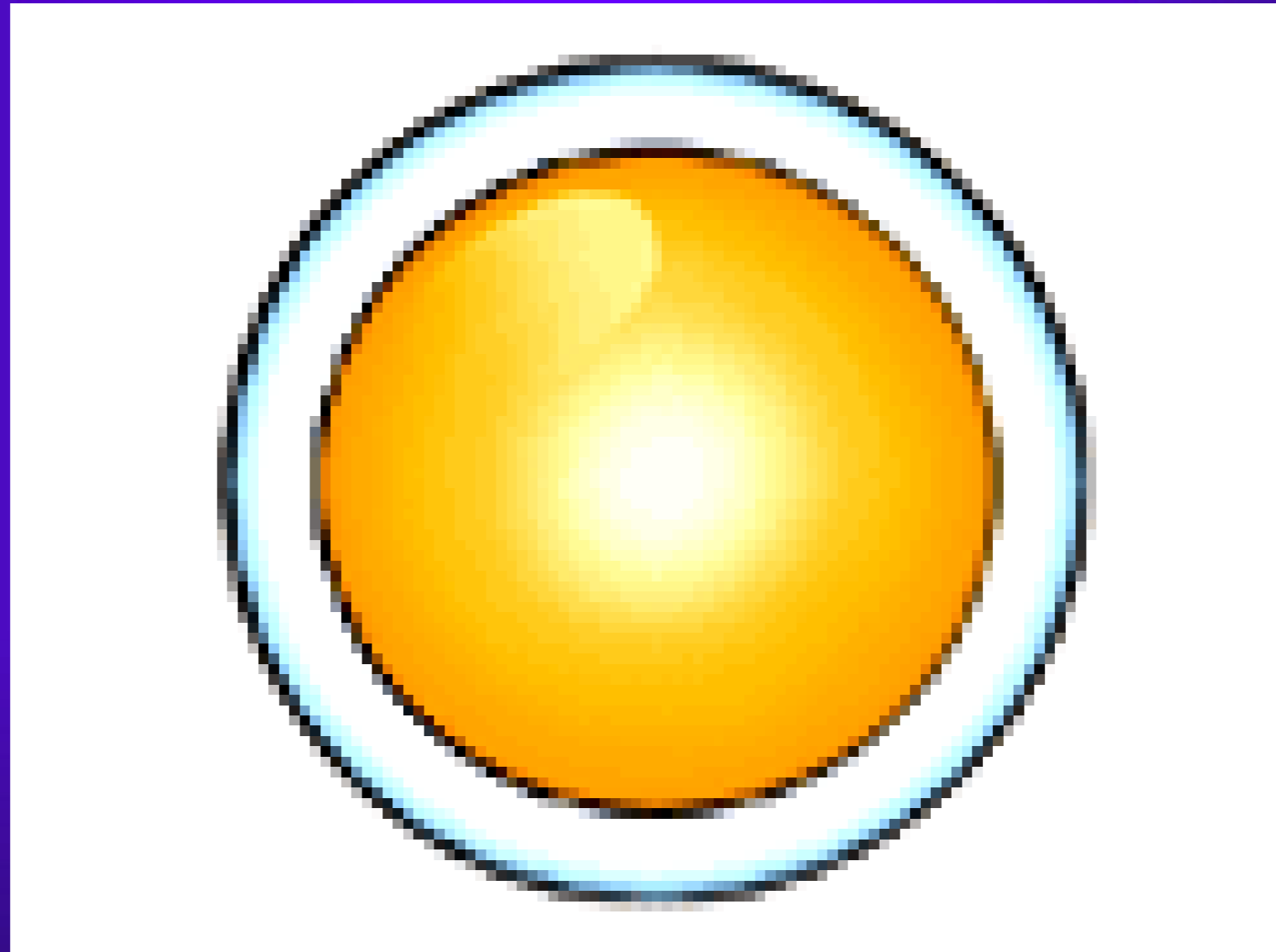


Stage 1



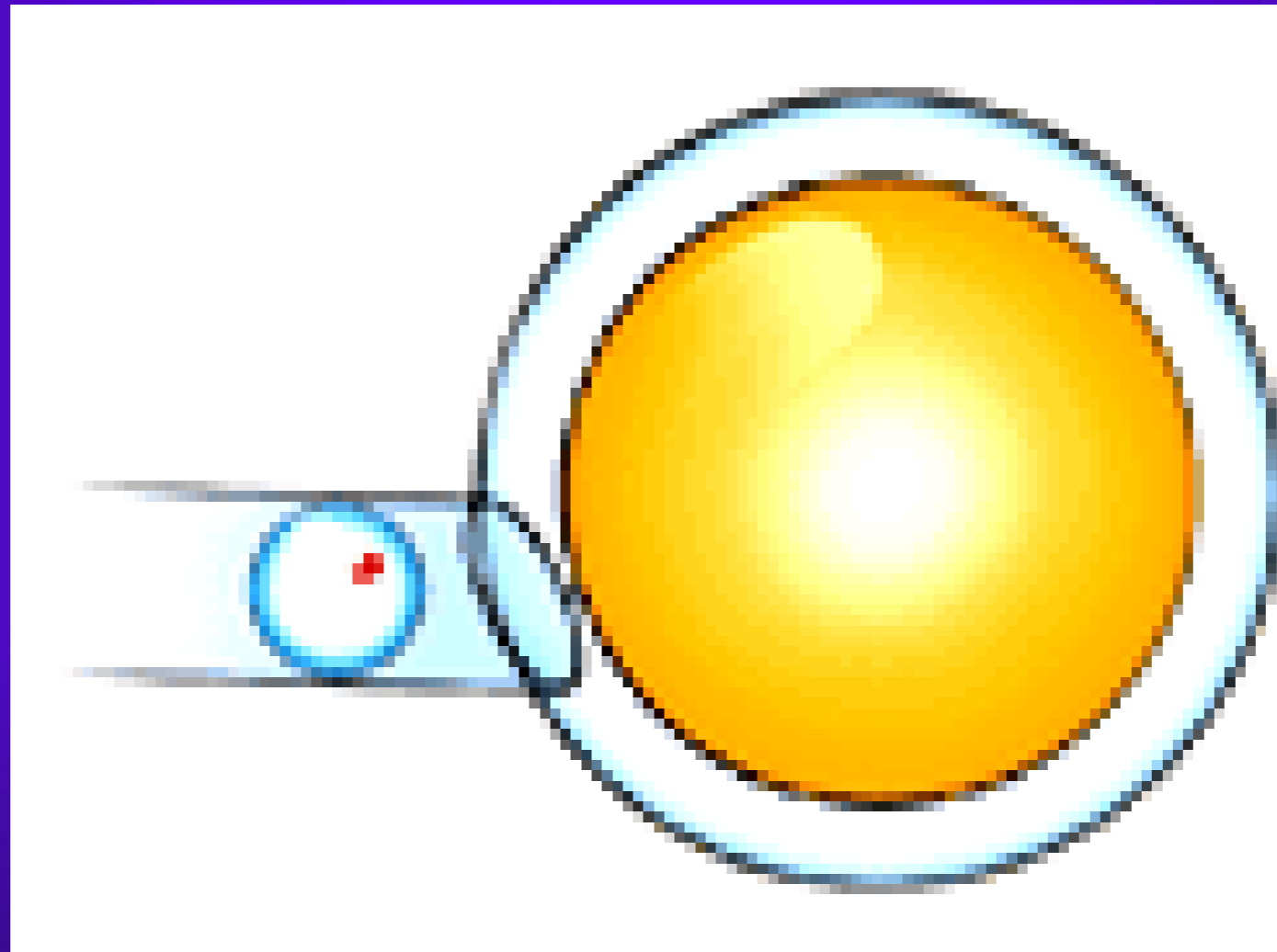
Cell collected from a sheep's udder.

Stage 2



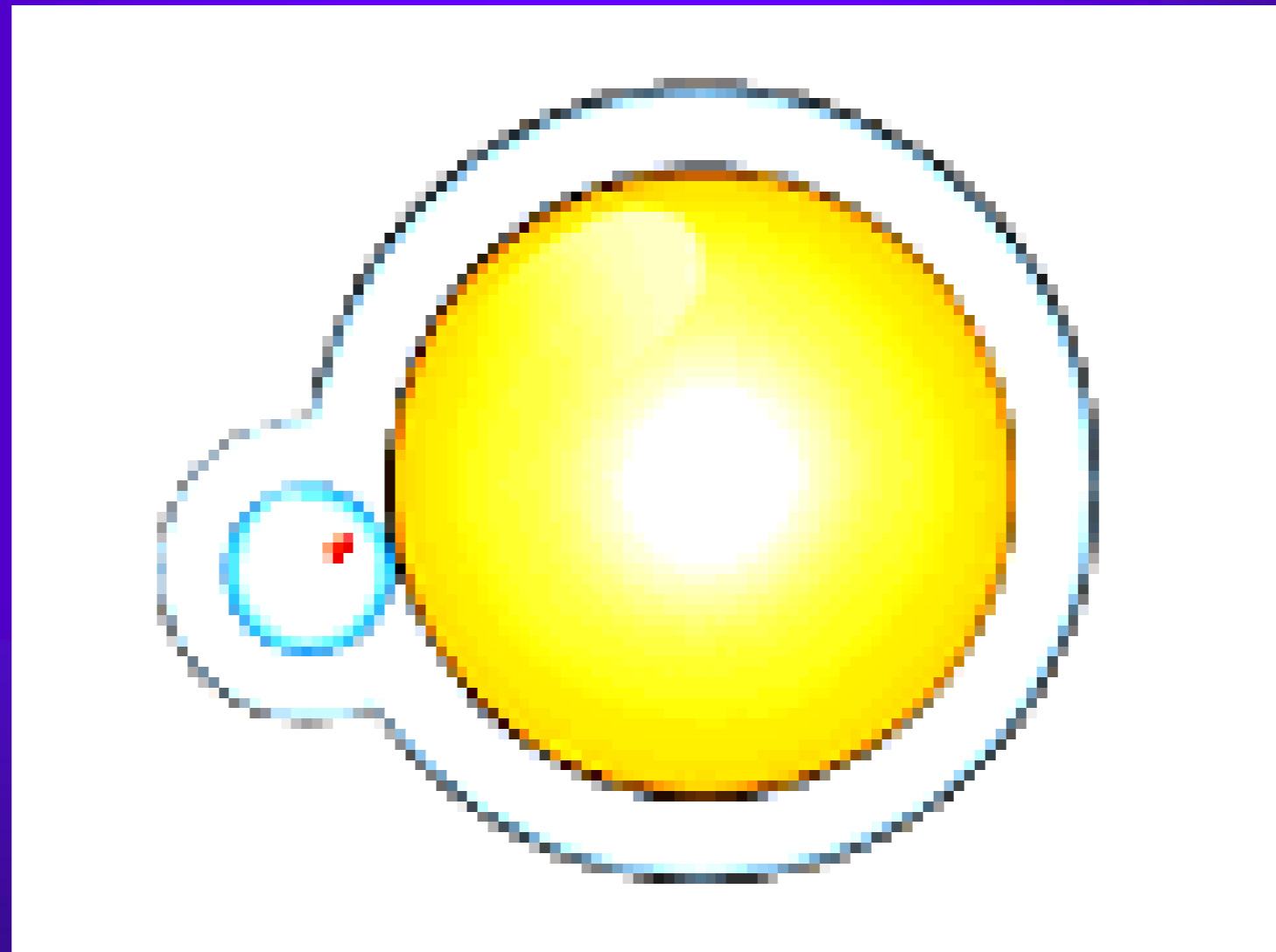
Nucleus is removed from unfertilized egg of second sheep (No. 277).

Stage 3



Udder cell is inserted into egg with no nucleus (277 eggs).

Stage 4



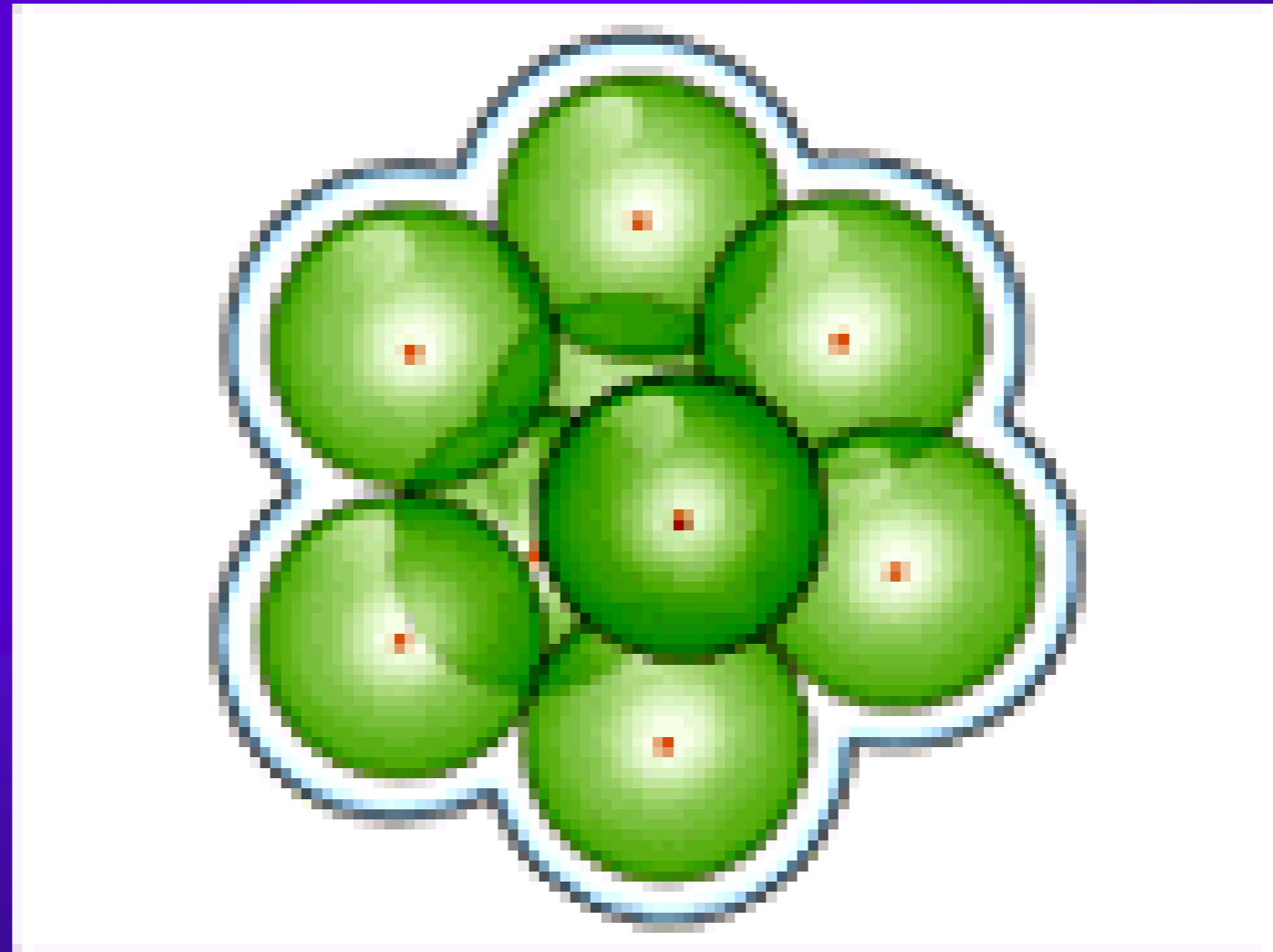
Insertion is successful.

Stage 5



Electrical charge is supplied.

Stage 6



Cells begin to divide (29 cells).

Stages 8 & 7

7.
Embryo is placed
into a third sheep,
the surrogate mother.



8.
Dolly is born.

CLONAIID



Clonaid

(Bahamas, 1997)

Service = 200,000\$



- RMX2010

Embryonic Cell Fusion System

by Korean company: BioFusion Tech Inc.

<http://www.clonaid.com>

Sir Lancelot = 155000\$

- **Back from the dead: Couple who paid \$155,000 to CLONE their dog after his sudden death**



January 29, 2009

Florida couple clones beloved dog for \$155,000

A couple paid a California firm \$155,000 to clone their beloved dog, who died from cancer a year ago. The clone, a 10-week-old puppy, was hand-delivered to them earlier this week by Lou Hawthorne, chairman of BioArts International, a biotechnology company.



Edgar and Nina Otto said they began thinking about cloning Sir Lancelot about five years ago



With £67,000

27 December 2015

- **Laura Jacques and Richard Remede from Yorkshire lost dog Dylan in June**
- **They wanted to clone Dylan so they could have a pet exactly like him**
- **South Korean firm has carried out a cloning procedure using Dylan's DNA**
- **The cloned dog, called Chance, was born yesterday, at the cloning clinic**

يسبق خيال الأدباء دائما العلماء...وهو ما حدث بالنسبة للاستنساخ فقد تناولته قصص الخيال العلمي و الذي اصبح حقيقة الآن ففي رواية (**عالم بلا رجال**) للكاتب تشارلز ايريك و رواية بول أندرسون (**كوكب العذارى**) والذي يتخيل انه سوف ياتي الزمان الذي يتمكن فيه العلماء من أن يستنسخوا الأطفال من المرأة دون حاجة الى الرجل و تشرح القصة كيف يمكن للنساء أن تعيش على كوكب الأرض بدون رجال.

في فيلم ورواية (**أولاد من البرازيل**) تأليف ايرالفين يحاول النازيون فيها استنساخ 940 ولدا من الخلايا التي أخذوها من جلد و شعر هتلر. و أيضا فيلم (**حديقة الديناصورات**) الذي تناول الاستنساخ عن طريق تكبير الحمض النووي الموجود في بيض الديناصورات التي انقرضت منذ 60 مليون سنة.

كلها قصص نجد فيها أن خيال الأدباء قد تحول الى حقيقة ..

في مصر: كتب توفيق الحكيم قصة قصيرة نشرها ضمن مجموعة (**أرني الله**) وقد أشار إليها الكاتب محمد مسعود بان توفيق الحكيم تحدث عن الاستنساخ منذ عشرات السنين دون أن يراه و قد كتب في قصته أن:

(سكان الأرض سنه مليون سوف يربون النطفة كما يربون البكتيريا)

اعتبر القرآن الكريم التغيير في خلق الله فكرة شريرة وشيطانية تنسب الى إبليس
يقول تعالى " **ولامرئهم فليغيرن خلق الله** " (النساء - 119) فالإسلام يفرق بين
العبث بالمخلوقات والنواميس .. وبين تحسين أوضاع الكائنات .

لم يحاول الرسول صلى الله عليه و سلم أن يحجر على ما يظهر من علم ، او
يقصره على فئة أو عصر معين حين قال " **أنتم أعلم بأمور دينكم** " **وقال**
"هو من قدر الله"
وعندما سئل الرسول عن دواء يتداوى به المريض ، وهل يرد من قدر الله شيئاً؟

ولكن هل يجوز أن ننقل عن الغرب علومهم الحديثة: تأتي الإجابة في قصة سعد
بن ابي وقاص حين مرض ووضع الرسول صلى الله عليه وسلم يده على صدره
وقال **إنك رجل مفؤود (مريض بالقلب) إئت الحارث بن كلده الثقفي**
فإنه رجل يعرف الطب

(أول طبيب في الاسلام تعلم في فارس)

فكرة التكامل والتوازن في البيئة

في غابات استراليا حيث يكثر الثعالب ذات الفراء الممتاز فقد لاحظ المسئولون عن صناعة الفراء ان بالجبال نوعية من الذئاب تلاحق الثعالب وتفترسها ولكي يزداد حصيلتهم من الفراء قاموا بحملة للتخلص من الذئاب لتنعم الثعالب بالراحة والتكاثر.

ولكن بعد فيرة وجدوا ان الفراء قد اختلفت صفاته فلم يعد بنفس القوة ولا النعومة واللمعان والبياض الذي اشير به.

وبعد دراسة للظاهرة الجديرة وجد ان ارتقاء الثعالب أدى الى تدهور خواص الفراء الراجع الى القضاء على الذئاب المفترسة فوجدوا ان ملاحقة الذئاب للثعالب كان يؤدي الى نشاطها وتوترها وإفرازها لمواد وهدنية تعمل على لمعان الفرو والمحافظة عليه من الجفاف ويظل مشدودا وانم اللصصصاب شديد اللمعان الامر الذي وعاهم بعد ذلك من إطلاق عدد من الذئاب مرة اخرى في تلك الجبال لتواصل صيدها في ملاحقة الثعالب ومن ثم تحسين فرائحها.



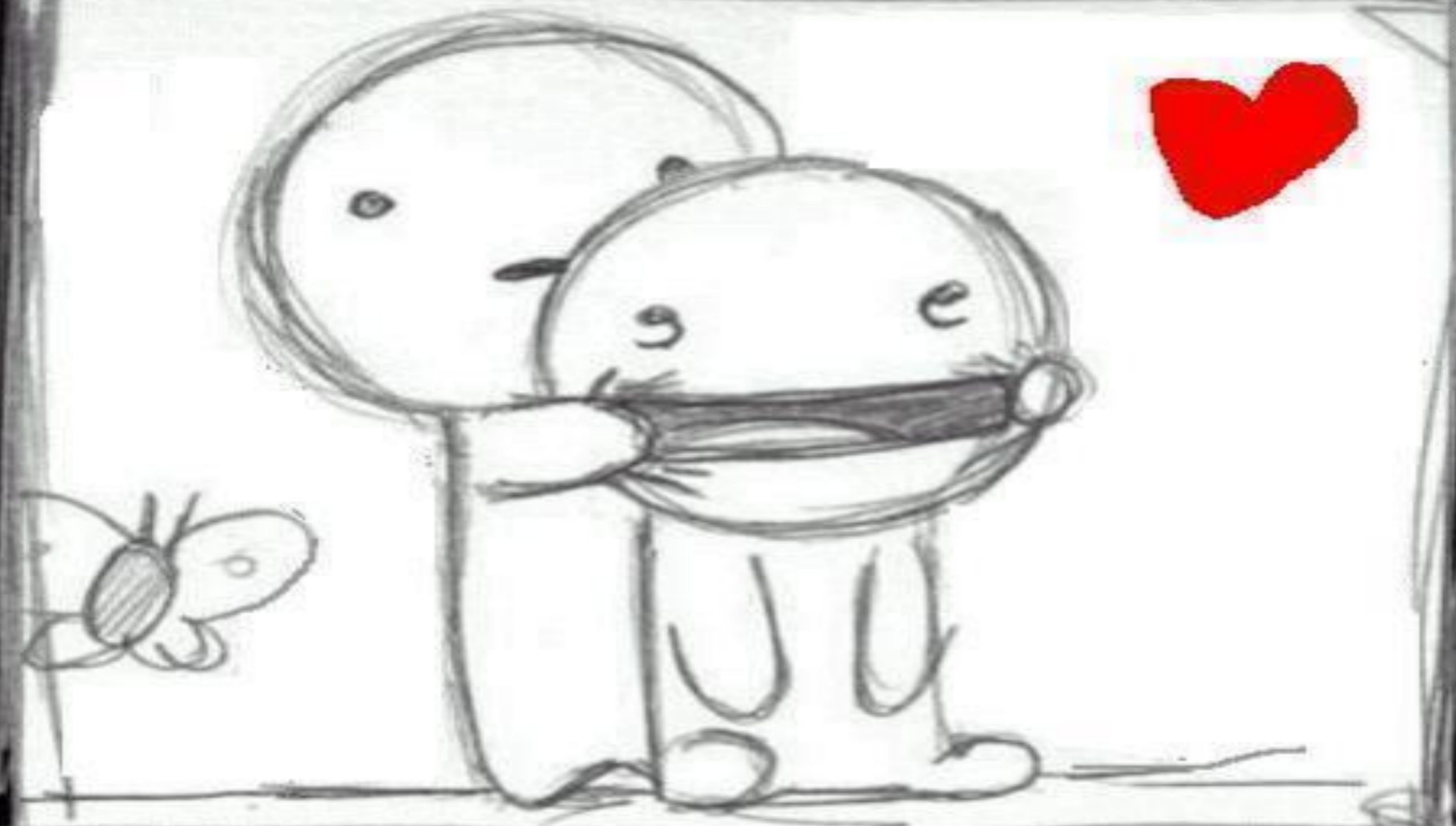
A QUESTION

Can you expect, If the cloned animal carries the same characters of parents or not ..?

Yes

Genes which are transmitted through the mitochondrial DNA are inherited exclusively from the mother, so the clone can carry some traits from his egg donor

Mitochondrial DNA



YOU CAN ALWAYS
MAKE ME SMILE.

شكرا

جزاكم الله خيرا على حسن استماعكم