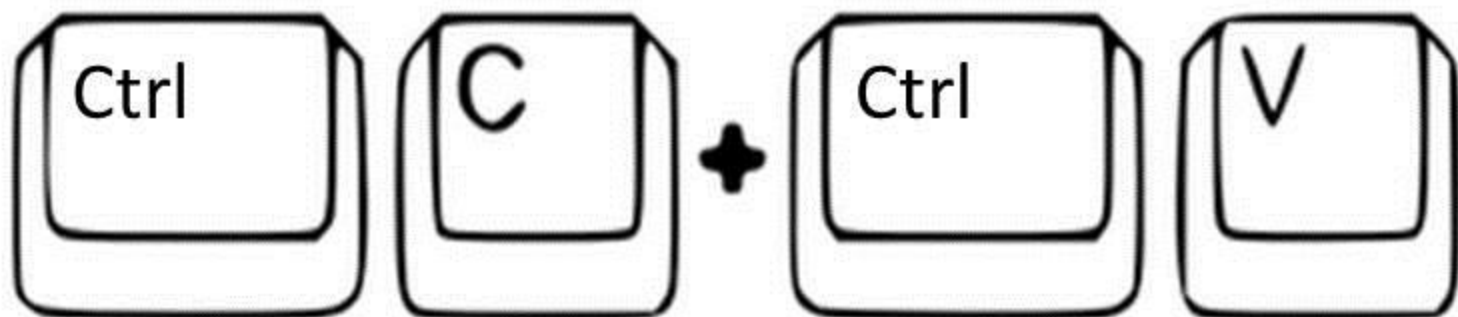


3 сентября 16:00 Конференц-зал ИЦиГ

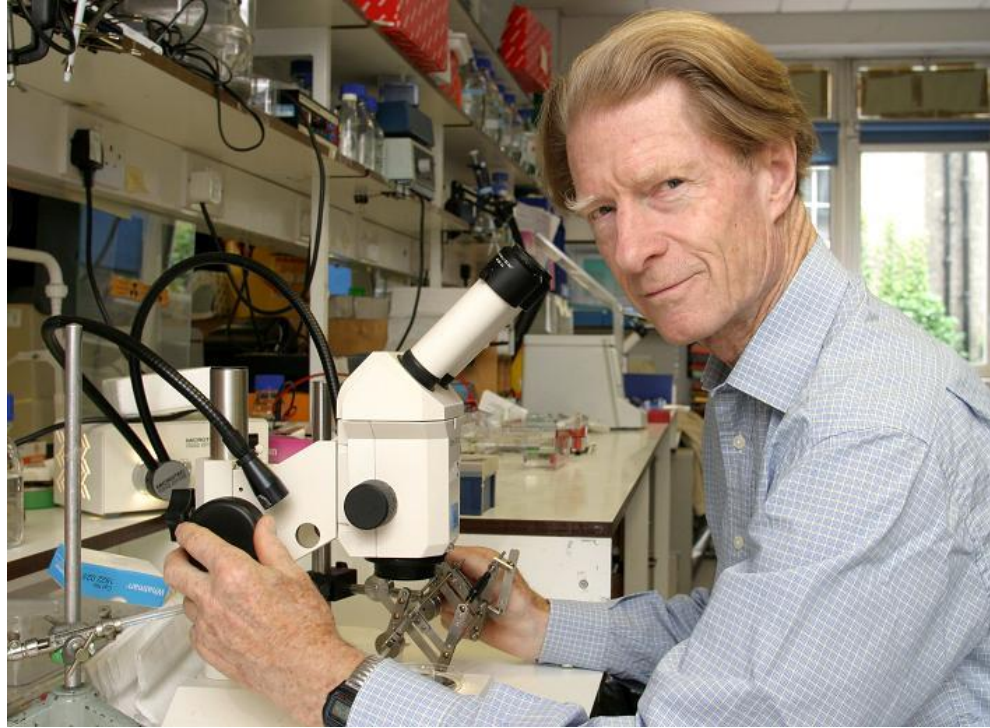
Публичная лекция  
Наримана Баттулина



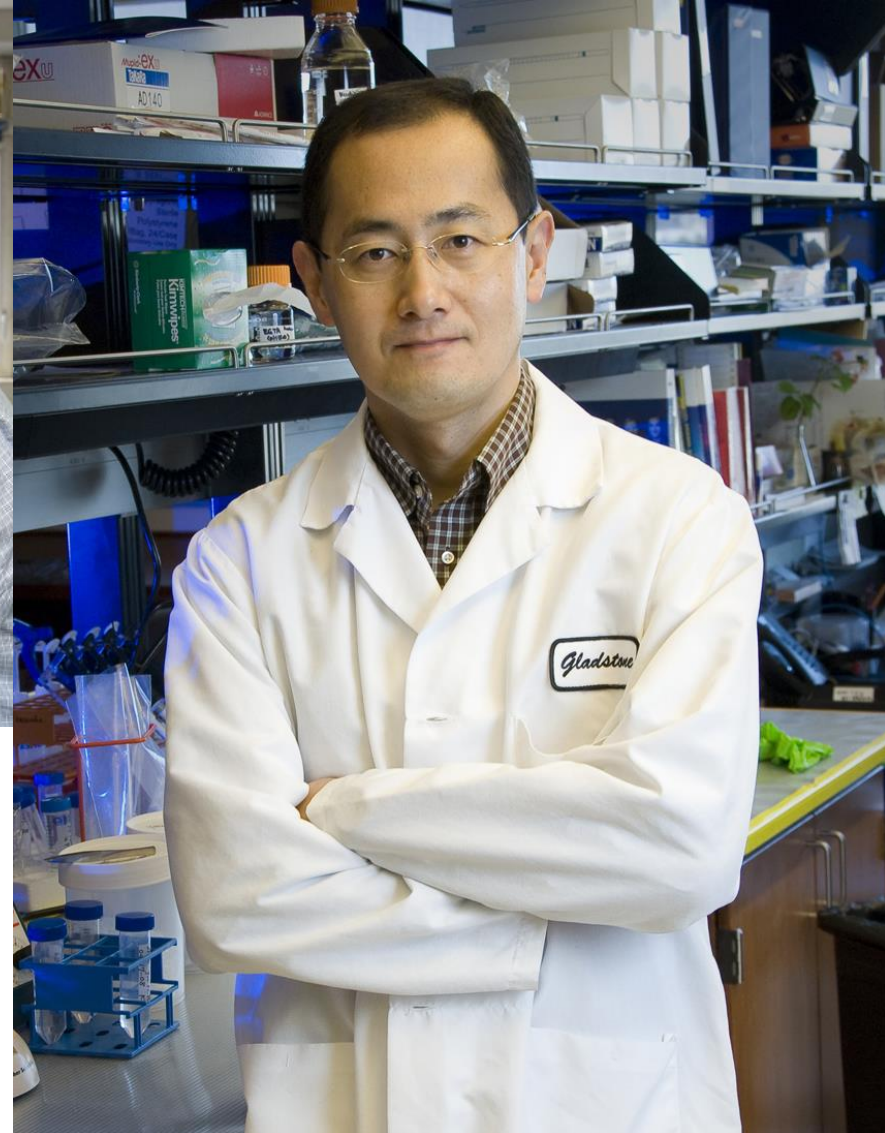
или

все что вы хотели знать о  
клонировании

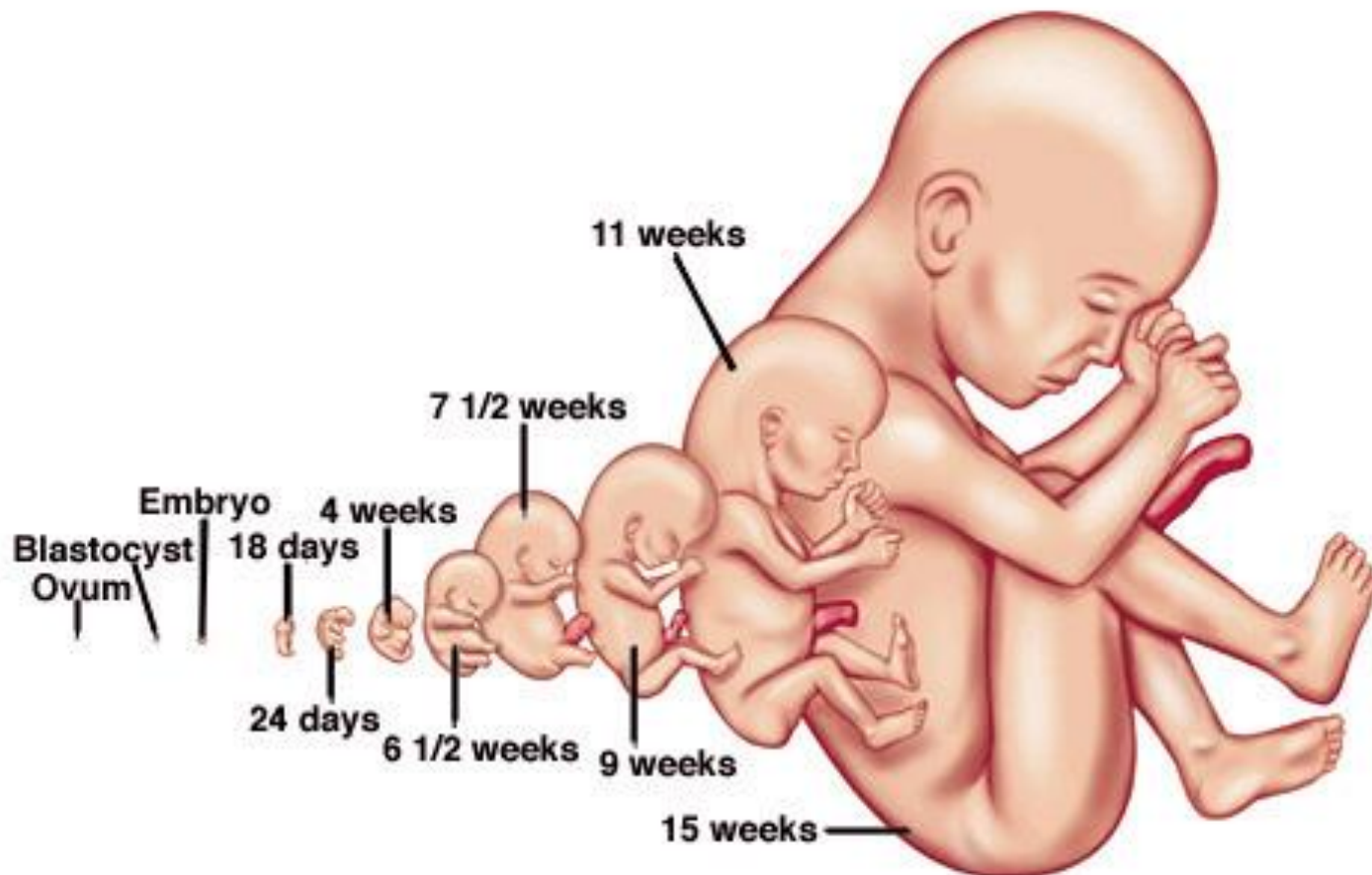
*for the discovery that mature cells can be reprogrammed to become pluripotent*



*за открытие возможности  
превращения клеток взрослого  
организма в эмбриональные*

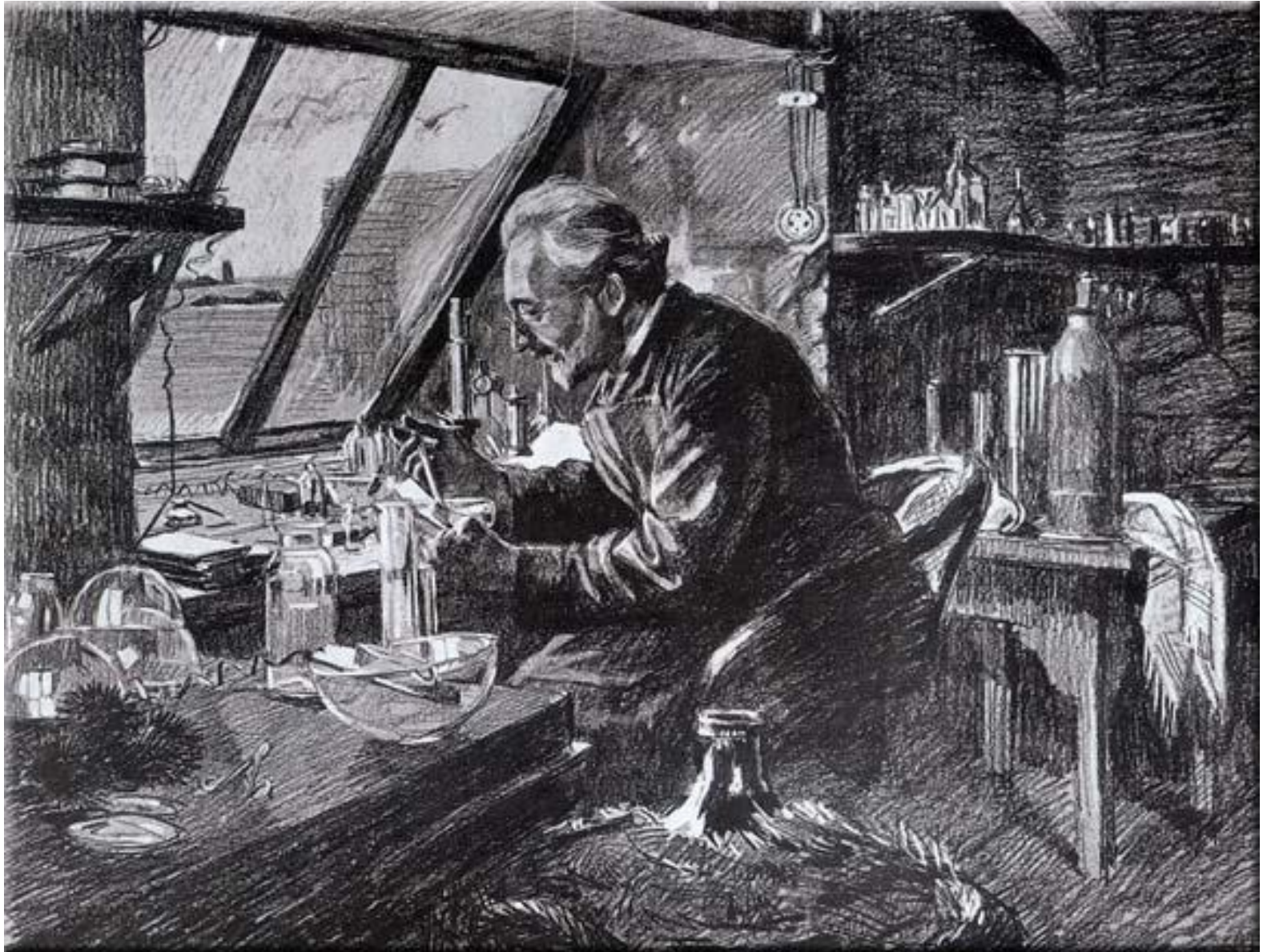


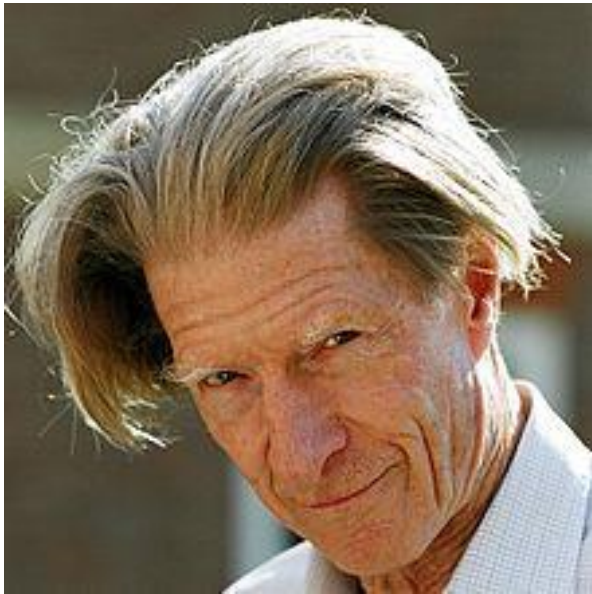
Отличается ли набор генов в различных клетках организма?





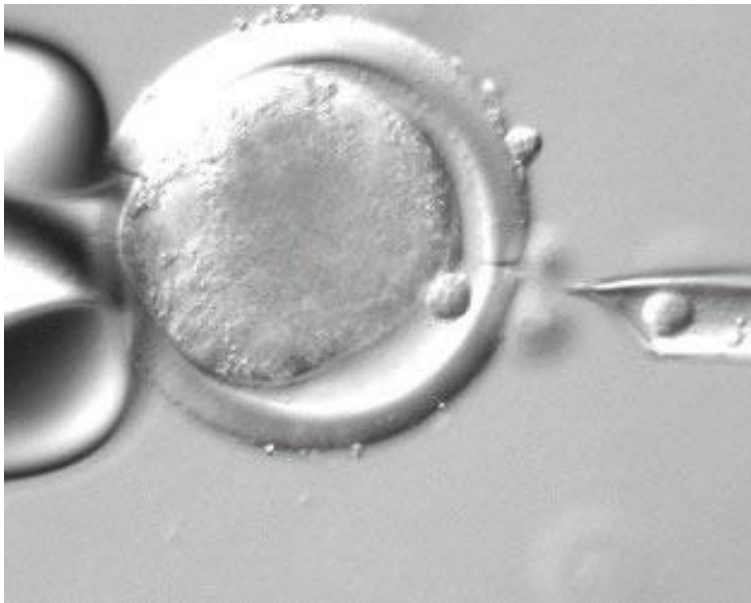
Идею переноса ядра эмбриональной клетки в энуклеированную яйцеклетку высказал Ив Делаж (Yves Delage) в 1895 году



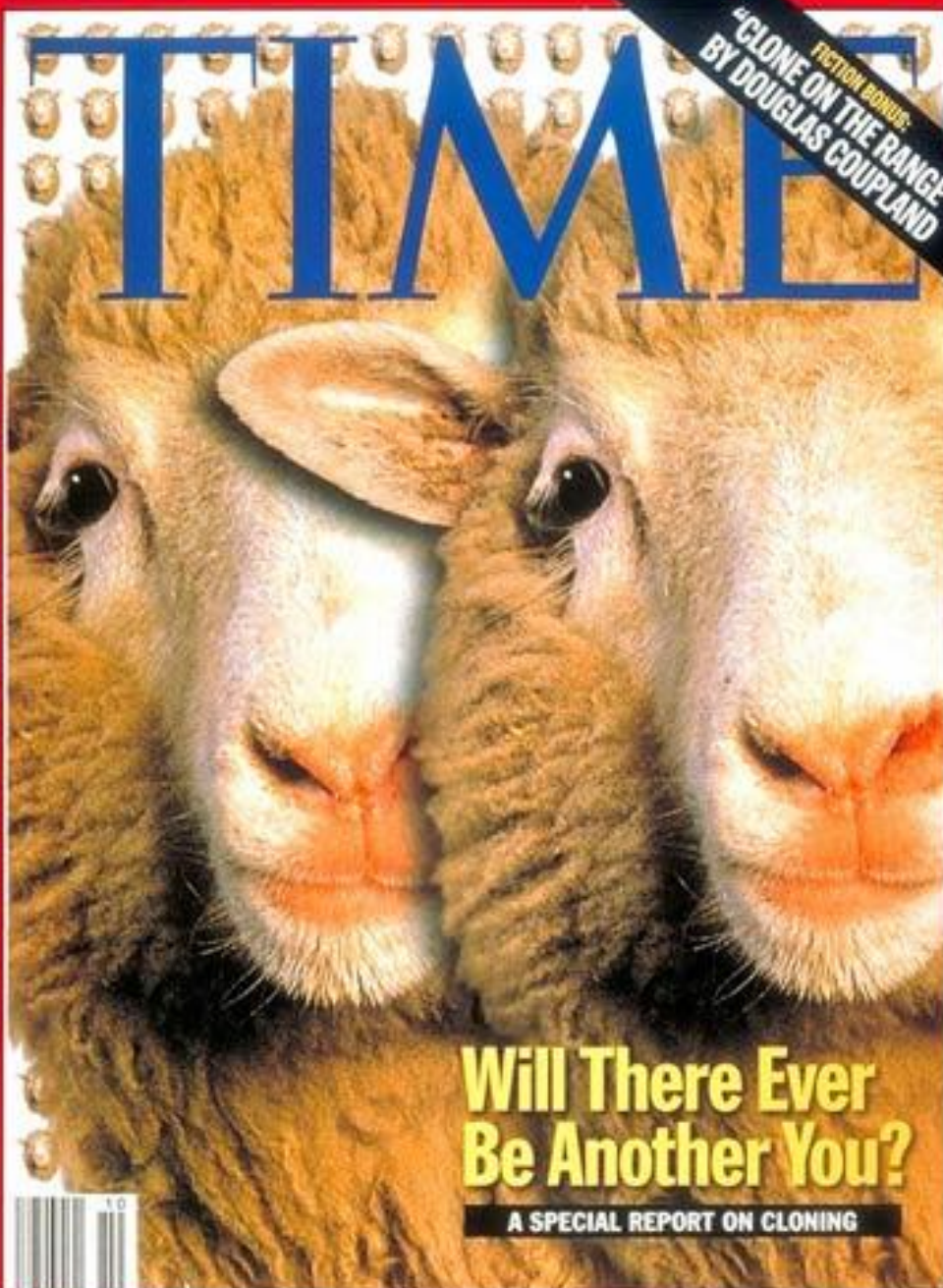


«Идея Джона стать ученым просто смехотворна; если он не может усвоить простых биологических фактов он не сможет стать специалистом; это будет бесполезная трата времени и для него и для его руководителей»

из школьной характеристики, 15 лет







# TIME

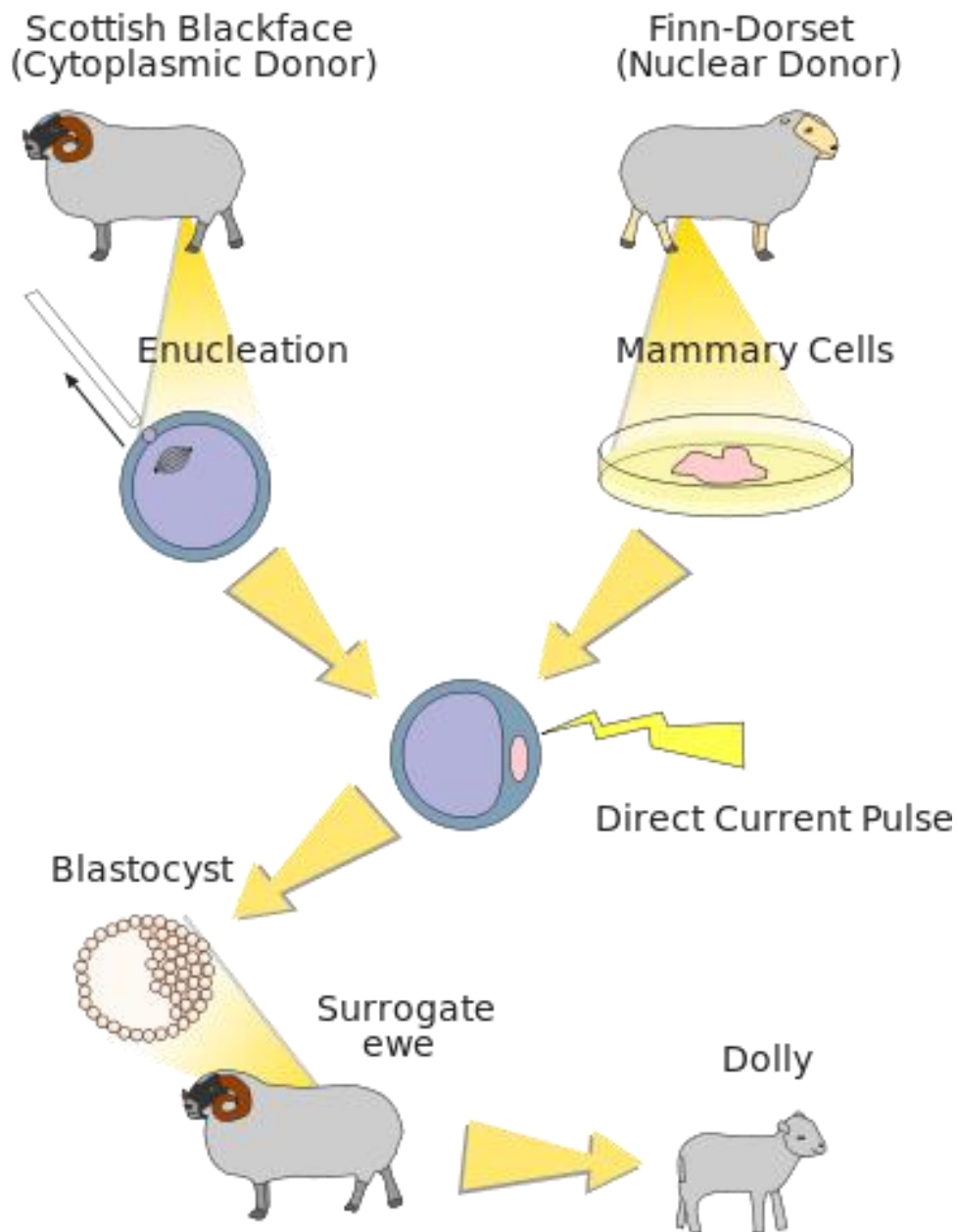
FICTION BONUS:  
"CLONE ON THE RANGE"  
BY DOUGLAS COUPLAND

**Will There Ever  
Be Another You?**

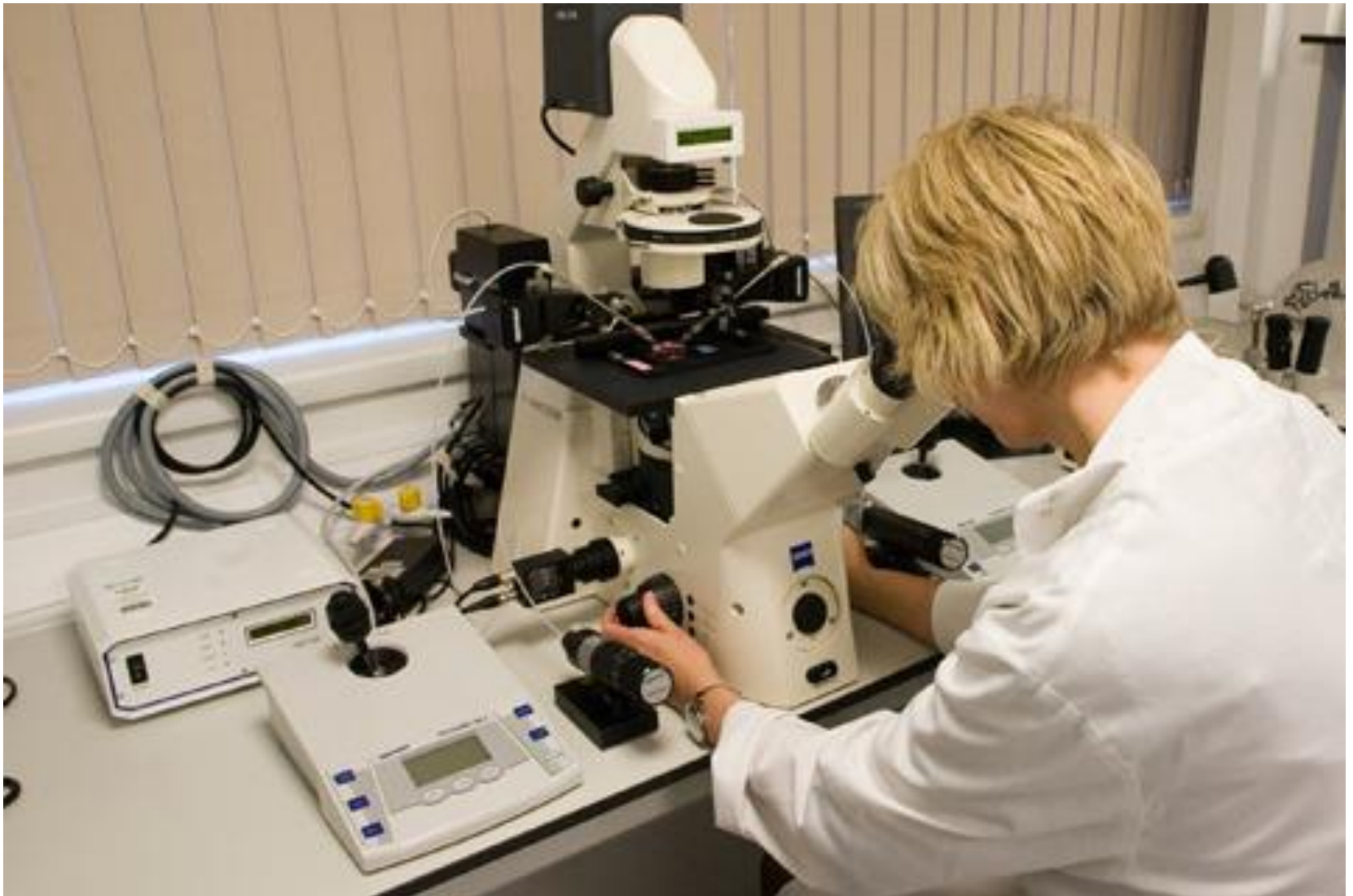
A SPECIAL REPORT ON CLONING



# Схема эксперимента по получению клонированной овцы



# Микроманипулятор





12-12-00 2H Oocyte Enucleation

14:19:47



12-12-00

2H

Cell Transfer

14:20:17



# Овечка Долли при рождении





# Долли жила в комфорте



# Овечка Долли, наши дни



## Dolly the Sheep

When Dolly was born at the Roslin Institute on 5 July 1996, she was the first mammal to be cloned from an adult cell. In her short life Dolly came to symbolise the future of cloning throughout the world. In 1997 the Roslin Institute agreed to donate Dolly to the National Museums of Scotland when she died, so that she could be preserved for future generations to see. Dolly died on 14 February 2003.

In a joint experiment with PPL Therapeutics, Professor Ian Wilmut and his colleagues at the Roslin Institute used a cell from the udder tissue of a 6-year-old Finn Dorset ewe to clone Dolly.

Cloning involves the removal of the nuclear DNA from an egg cell, so that it can be replaced by the nucleus from a donor cell. The reconstructed egg cell is

activated to develop into an embryo using a small electric pulse and then it is implanted into a surrogate mother. Dolly's surrogate mother was a Scottish Blackface sheep.

Cloning from adult mammals allows the copying of all the very best farm animals and may also help the conservation of critically endangered species.

However, the use of cloning for all cloning is present. It might not be possible that every animal clone is a perfect copy of the original. Some clones may have health problems. It is important to be aware of the risks of cloning and to use the technology responsibly.

**Further information**  
For more information on Dolly the Sheep visit the Roslin Institute website:  
[www.roslin.ac.uk](http://www.roslin.ac.uk)

Сколько прожила овечка Долли?



12 лет



# Клонирование очень не эффективно

Долли была единственным родившимся клоном из 277 реконструированных эмбрионов

Даже в наши дни эффективность клонирования 1-5 %

# Нарушения развития клонированных животных

увеличенная плацента

a

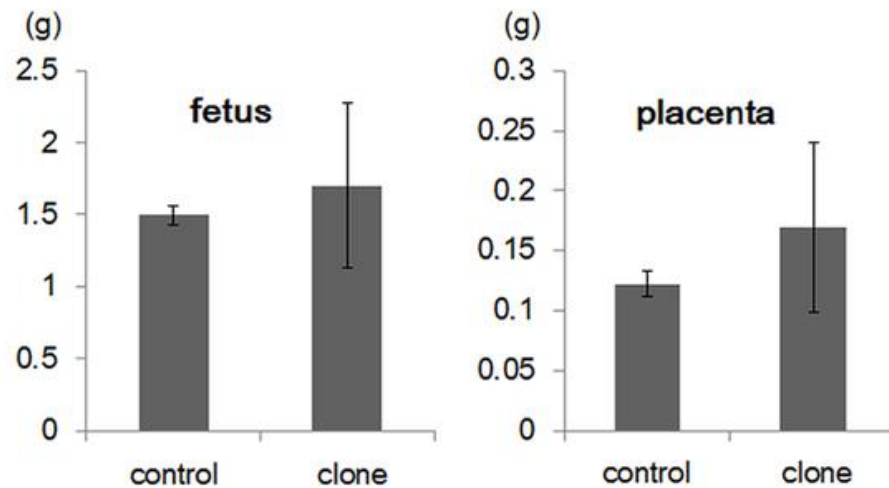
Clones



Controls



b



Kang et al., 2014

# Нарушения развития клонированных животных

кишечная грыжа и аномалии черепа





—Full Paper—

## Sex-Reversed Somatic Cell Cloning in the Mouse

Kimiko INOUE<sup>1,2)</sup>, Narumi OGONUKI<sup>1)</sup>, Kazuyuki MEKADA<sup>1)</sup>, Atsushi YOSHIKI<sup>1)</sup>,  
Takashi SADO<sup>3)</sup> and Atsuo OGURA<sup>1,2,4)</sup>

FEMALE MOUSE CLONED FROM A SERTOLI CELL

567

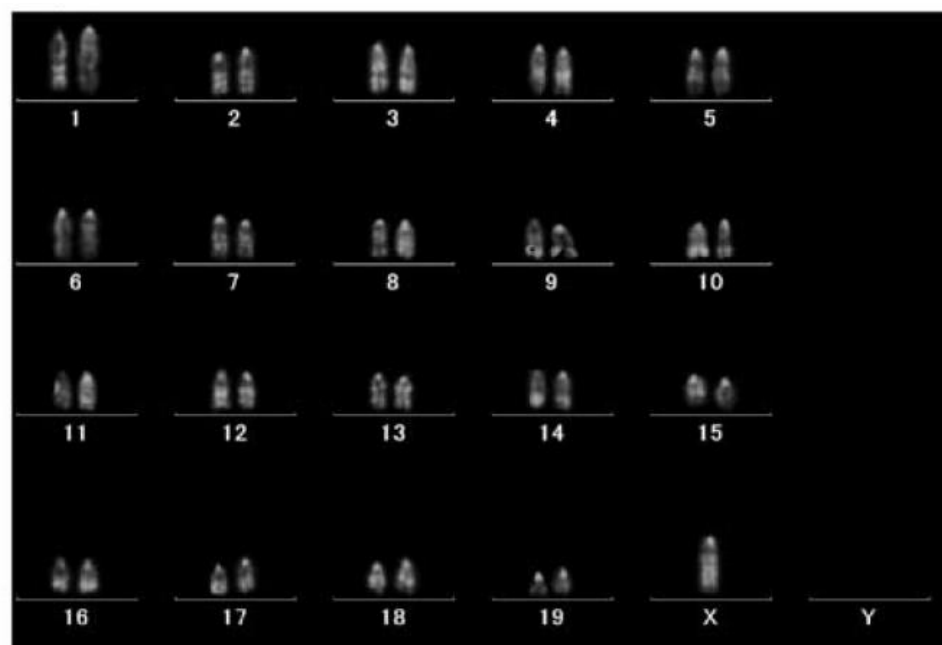
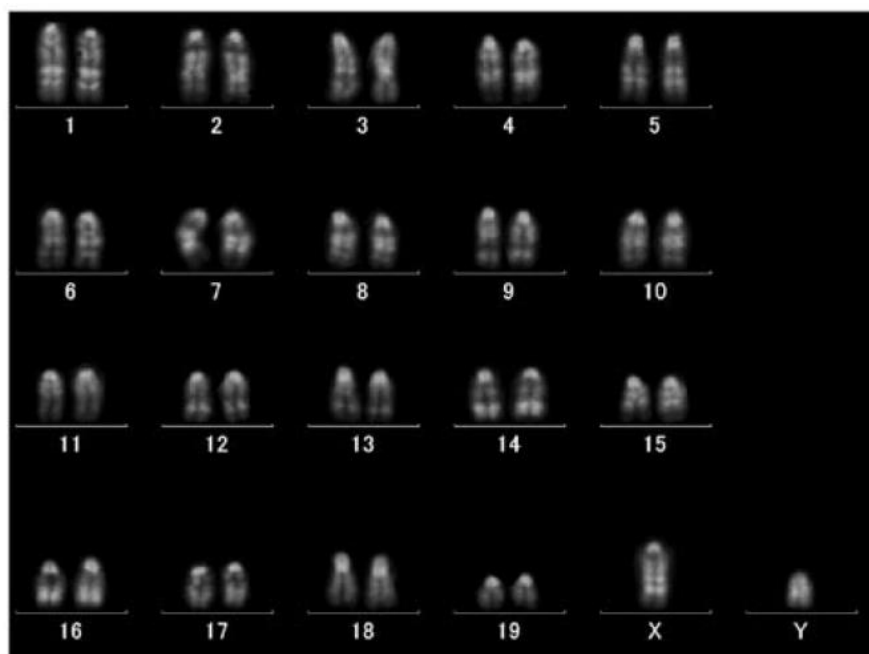


**Fig. 1.** a, b) Gross appearance (a) and external genitalia (b) of a female mouse and a male mouse cloned from Sertoli cells. c) Offspring (arrow) born from the female cloned mouse. The fertility of the female clone was confirmed by pregnancy and birth of normal offspring.

—Full Paper—

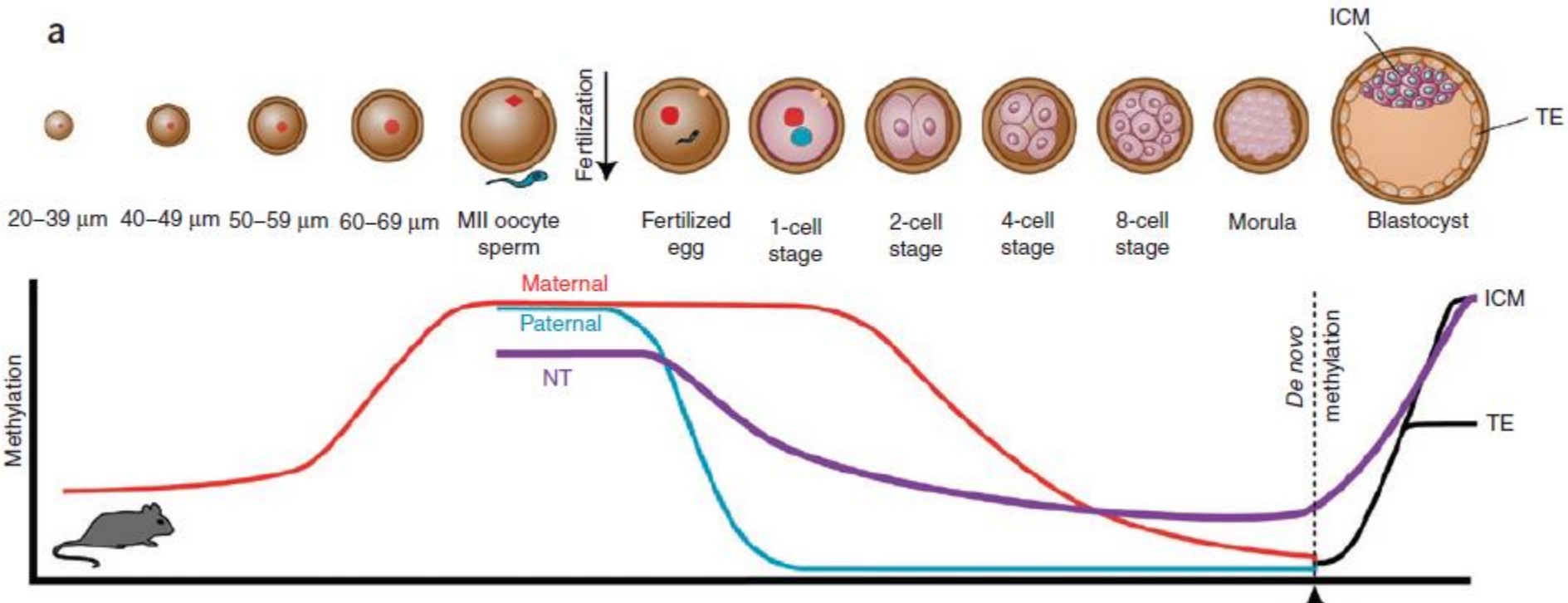
## Sex-Reversed Somatic Cell Cloning in the Mouse

Kimiko INOUE<sup>1,2)</sup>, Narumi OGONUKI<sup>1)</sup>, Kazuyuki MEKADA<sup>1)</sup>, Atsushi YOSHIKI<sup>1)</sup>,  
Takashi SADO<sup>3)</sup> and Atsuo OGURA<sup>1,2,4)</sup>



# Динамика метилирования ДНК в раннем эмбриональном развитии мыши

a



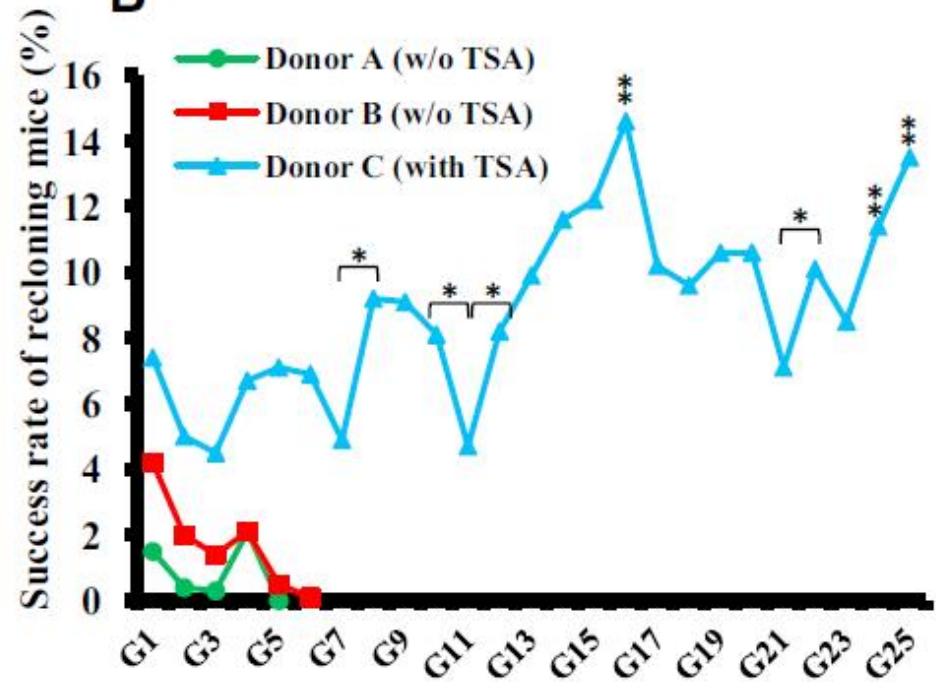
# Как долго можно клонировать клонов?



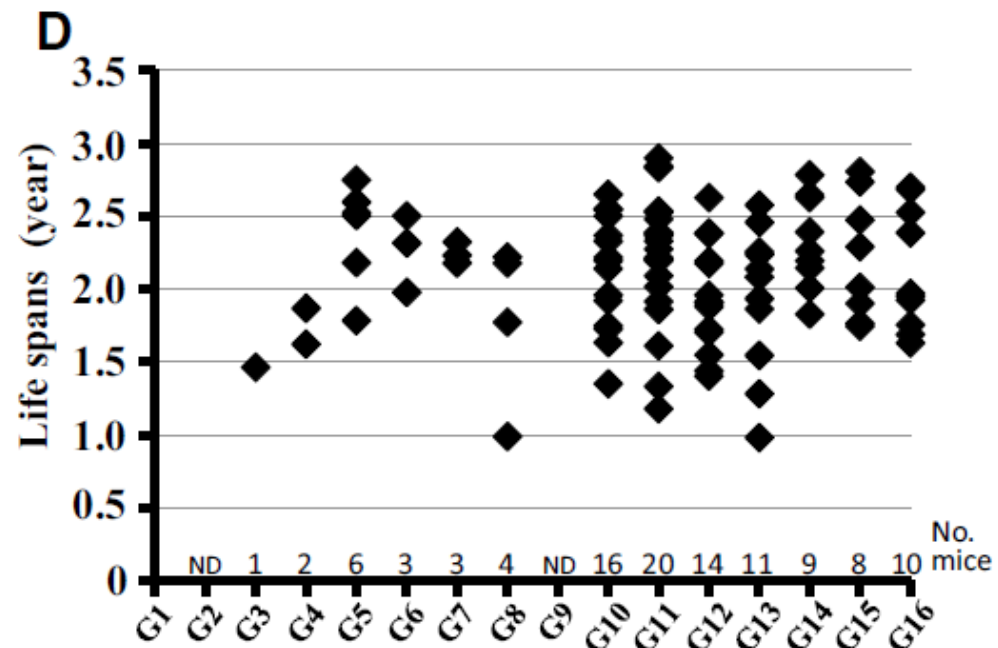
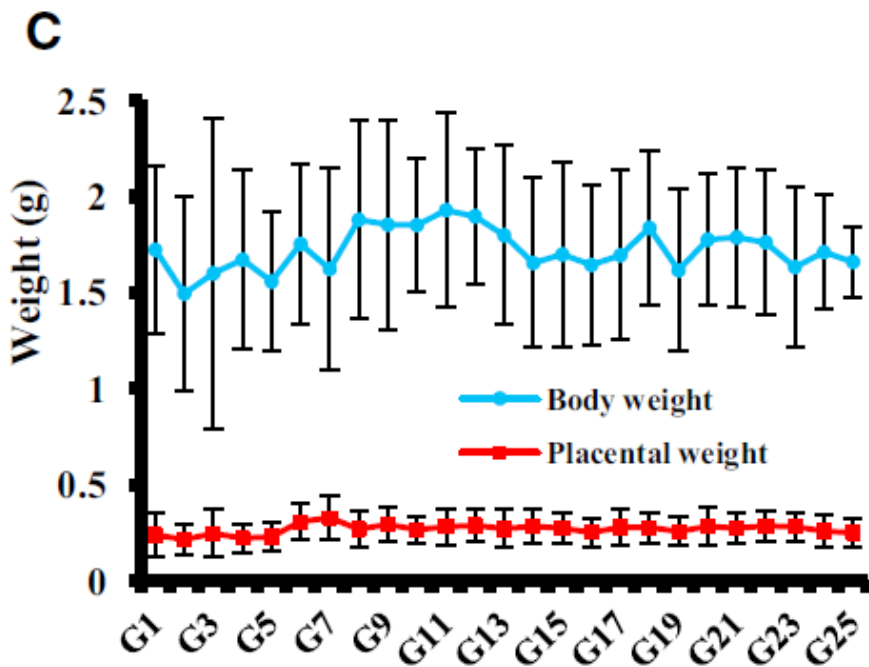
**A**



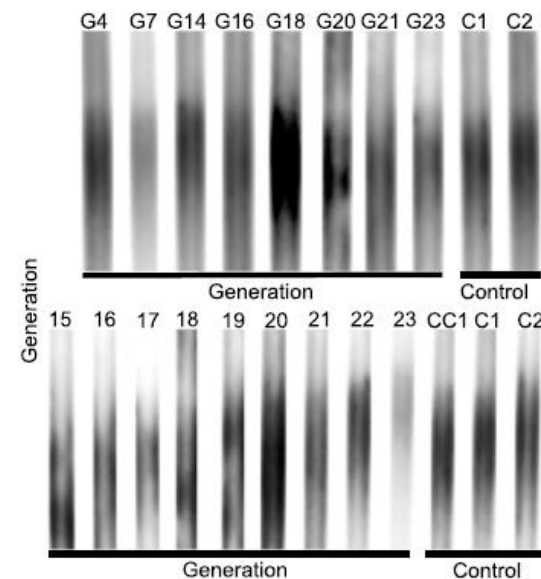
**B**





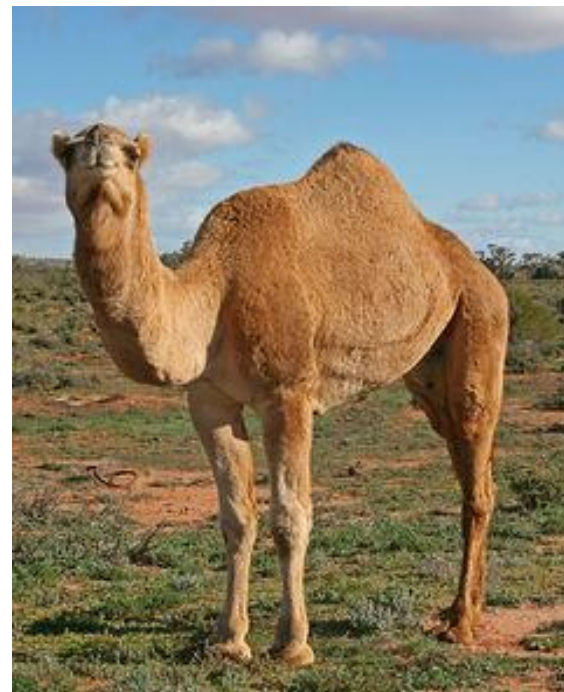


**A**



Ни продолжительность жизни  
ни длинна теломер уклонов не  
отличались от нормы, но  
плацента была увеличена

На сегодняшний день клонировано 14 (или чуть более) видов млекопитающих



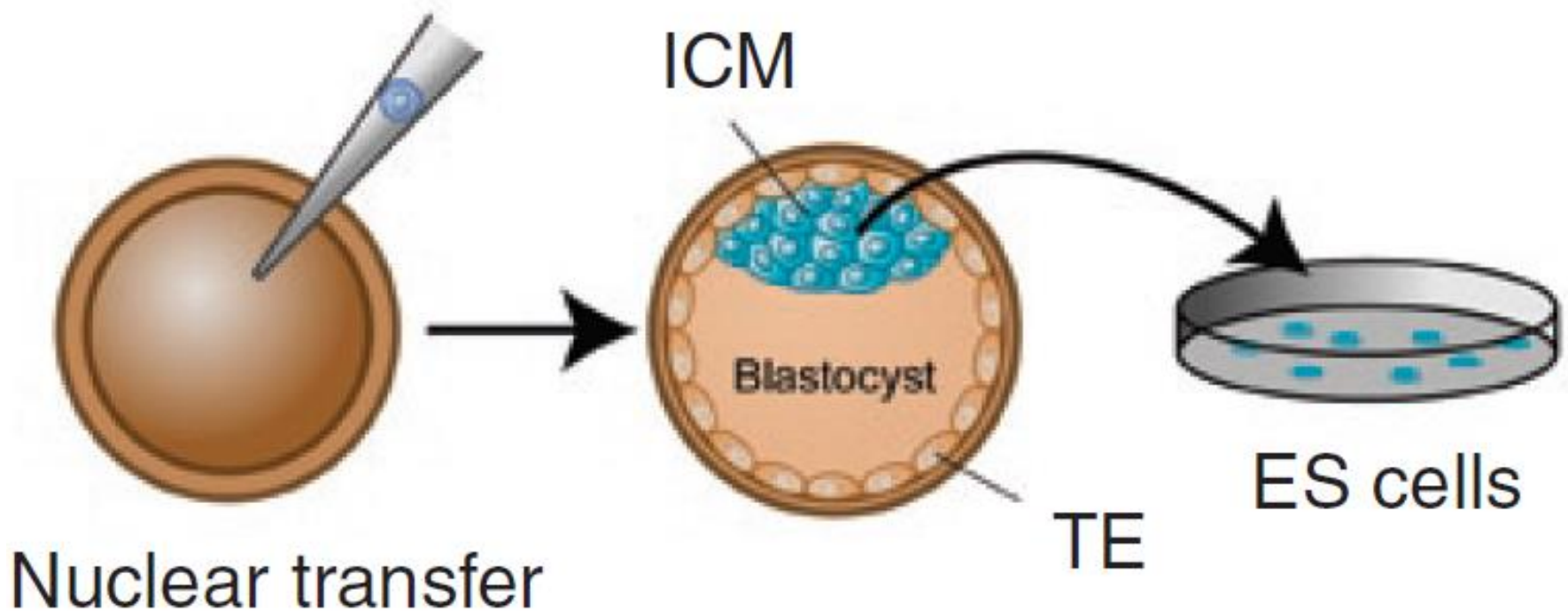
**Taeyoung Shin et al.**  
**A cat cloned by nuclear transplantation.**  
***Nature* 2002, v.415, 723**





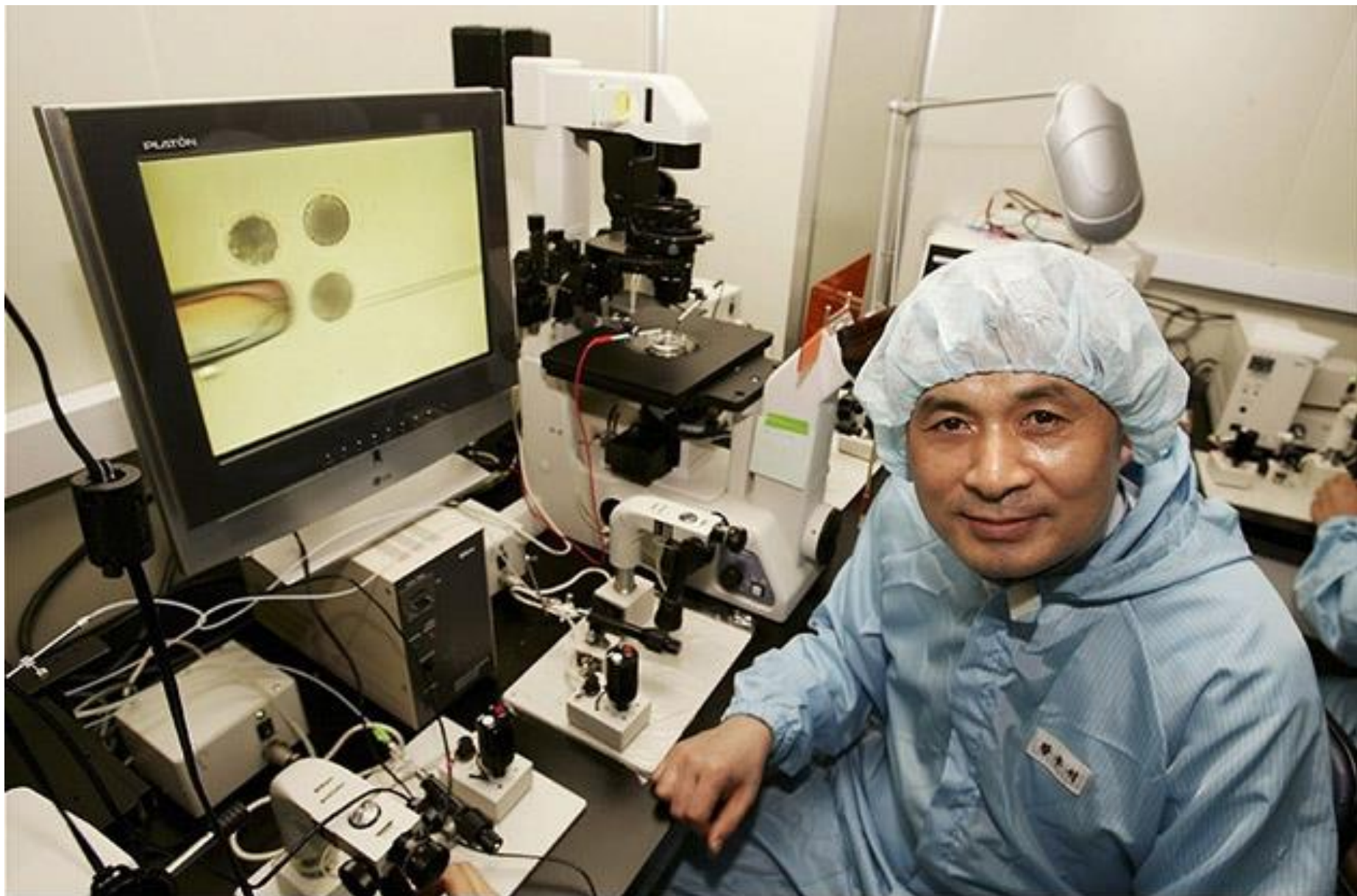
# Клонирование человека

Терапевтическое клонирование – клонирование с целью получения линии ЭС клеток (ntES cells)





Woo Suk Hwang в 2004 и 2005 годах сообщил о успешном терапевтическом клонировании человека



Расследование показало, что результаты были  
сфаальсифицированы!







# Шухрат Миталипов впервые осуществил терапевтическое клонирование человека



Cell

## Human Embryonic Stem Cells Derived by Somatic Cell Nuclear Transfer

Masahito Tachibana,<sup>1</sup> Paula Amato,<sup>2</sup> Michelle Sparrman,<sup>1</sup> Nuria Martí Gutierrez,<sup>1</sup> Rebecca Tippner-Hedges,<sup>1</sup> Hong Ma,<sup>1</sup> Eunju Kang,<sup>1</sup> Alimujiang Fulati,<sup>1</sup> Hyo-Sang Lee,<sup>1,4</sup> Hathaithip Sritanadomchai,<sup>2</sup> Keith Masterson,<sup>2</sup> Janine Larson,<sup>2</sup> Deborah Eaton,<sup>2</sup> Karen Sadler-Fredd,<sup>2</sup> David Battaglia,<sup>2</sup> David Lee,<sup>2</sup> Diana Wu,<sup>2</sup> Jeffrey Jensen,<sup>1,4</sup> Phillip Patton,<sup>2</sup> Sumita Gokhale,<sup>4</sup> Richard L. Stouffer,<sup>1,5</sup> Don Wolf,<sup>1</sup> and Shukhrat Mitalipov<sup>1,2\*</sup>

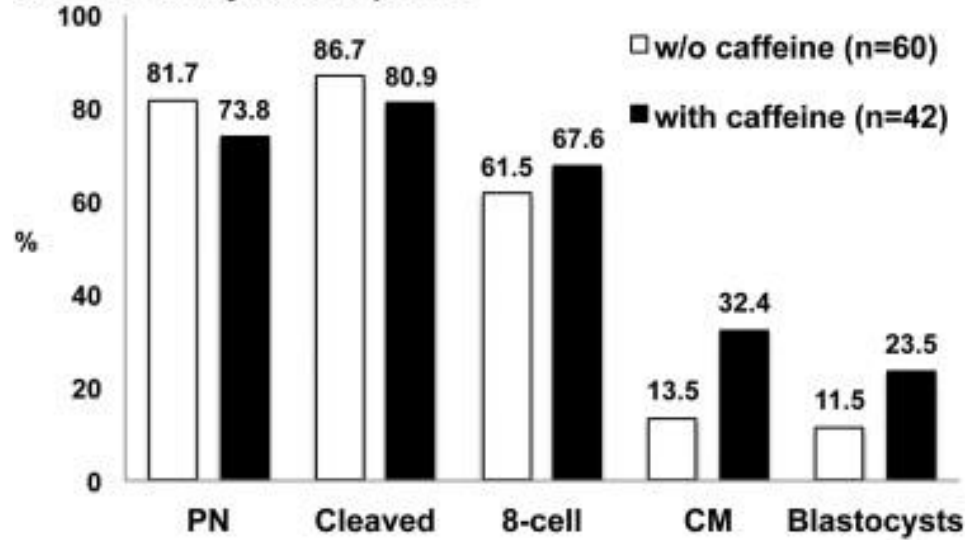
<sup>1</sup>Division of Reproductive & Developmental Sciences, Oregon National Primate Research Center, Oregon Health & Science University, 505 NW 18th Avenue, Beaverton, OR 97006, USA  
<sup>2</sup>Division of Reproductive Endocrinology, Department of Obstetrics and Gynecology, Oregon Health & Science University, 3181 SW Sam Jackson Park Road, Portland, OR 97239, USA  
<sup>3</sup>Department of Oral Biology, Faculty of Dentistry, Mahidol University, Bangkok 10400, Thailand  
<sup>4</sup>Women's Health Research Unit, Oregon Health & Science University, 3303 SW Bond Avenue, Portland, OR 97239, USA  
<sup>5</sup>Boston University School of Medicine, 72 East Concord Street, Boston, MA 02118, USA  
<sup>6</sup>Present address: Laboratory Animal Center, Osong Medical Innovation Foundation, Chungbuk 365-651, Republic of Korea  
\*Correspondence: mitalipov@ohsu.edu  
<http://dx.doi.org/10.1016/j.cell.2013.05.006>



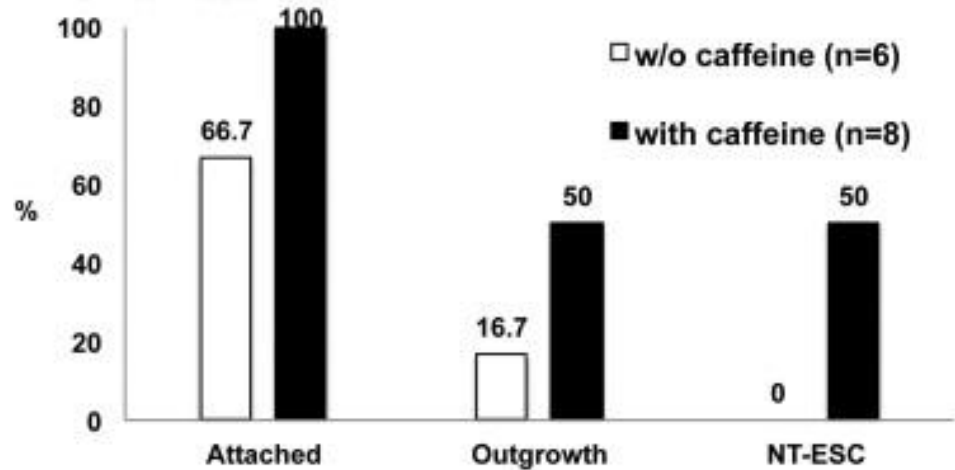
# Кофе и клонирование



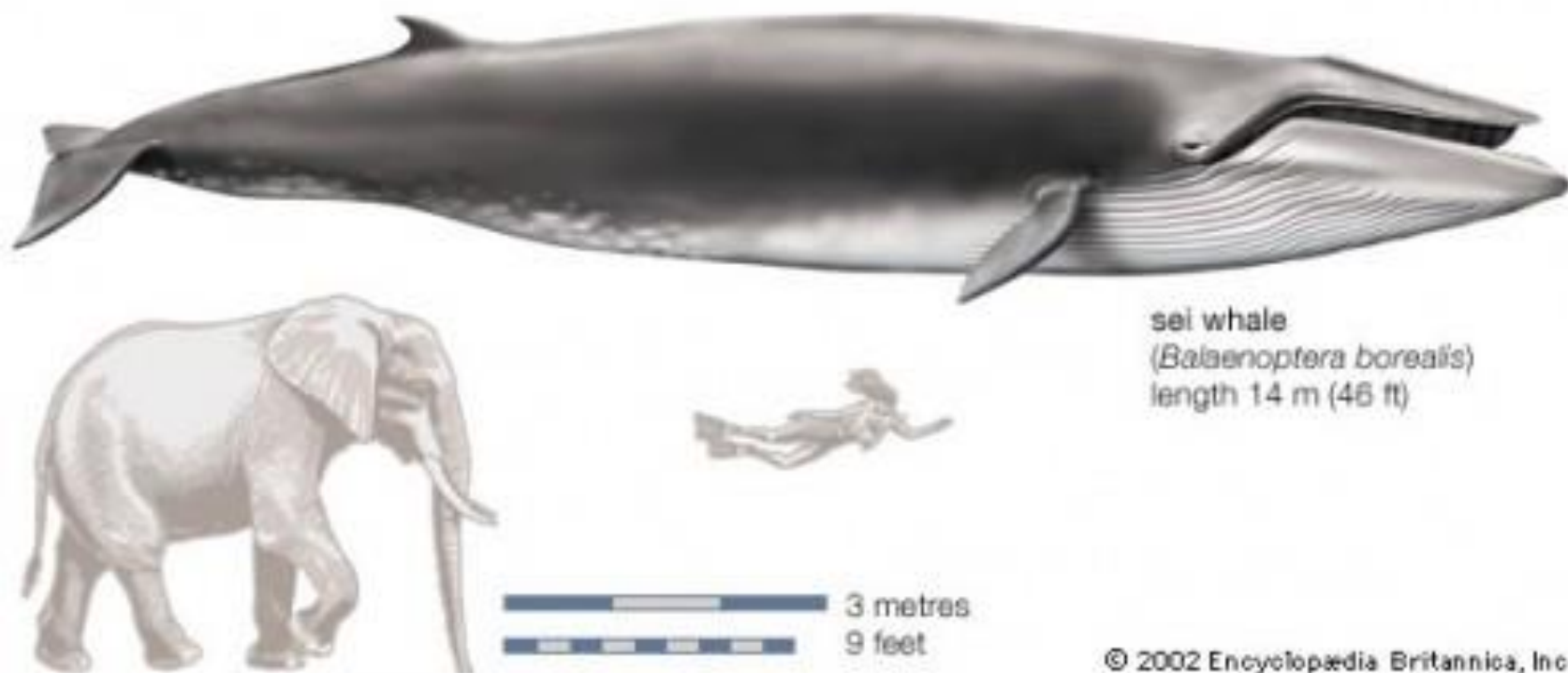
**A SCNT embryo development**



**B ESC derivation**



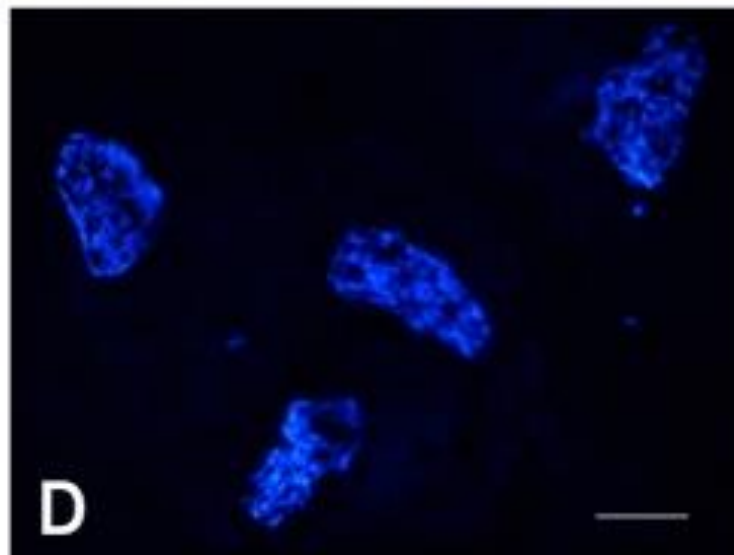
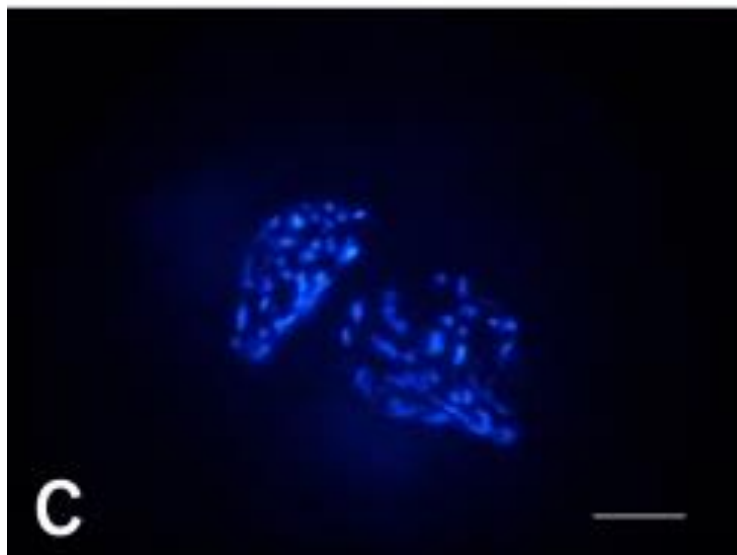
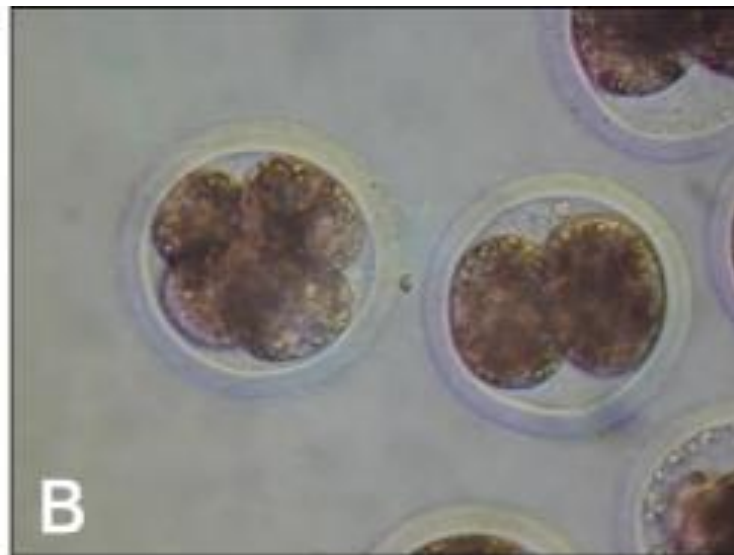
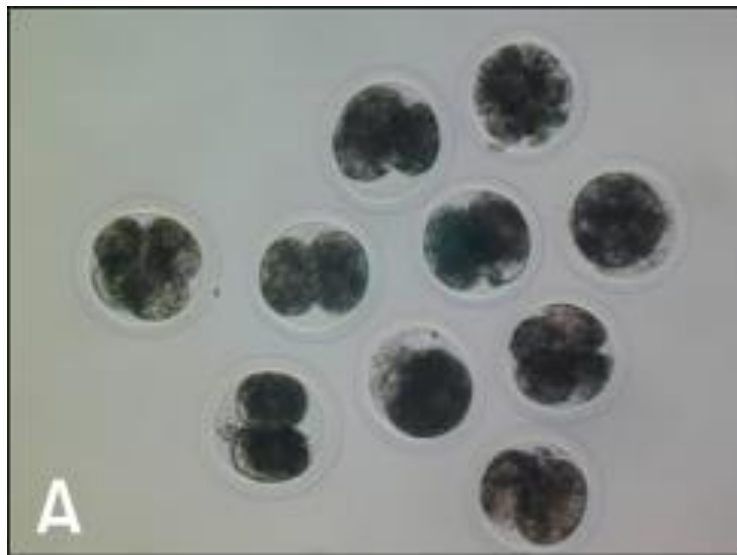
# Клонирование сейвала



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# Клонирование сейвала

Ядра фибробластов кита инжектировали в энуклеированные ооциты  
СВИНЬИ







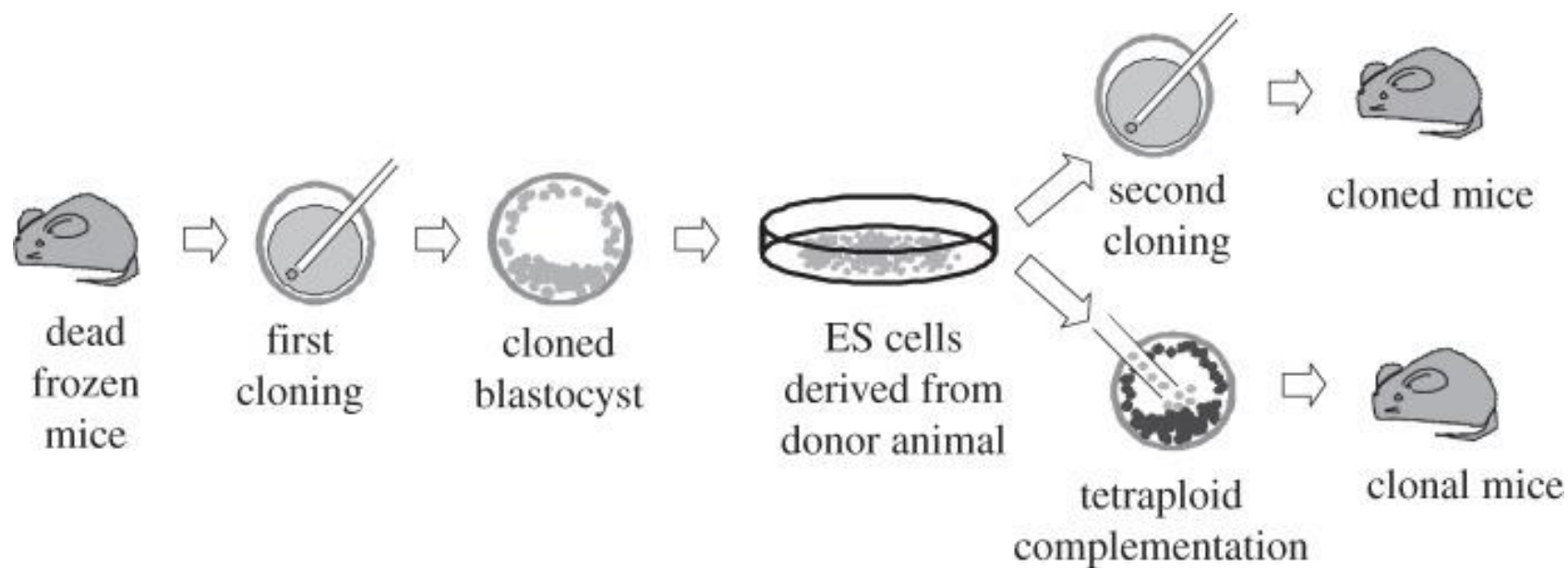


Успешное клонирование мыши 16 лет (!) пролежавшей в морозильнике



Успешное клонирование мыши 16 лет (!) пролежавшей в морозильнике







# «Воскрешение» Ясуфуку

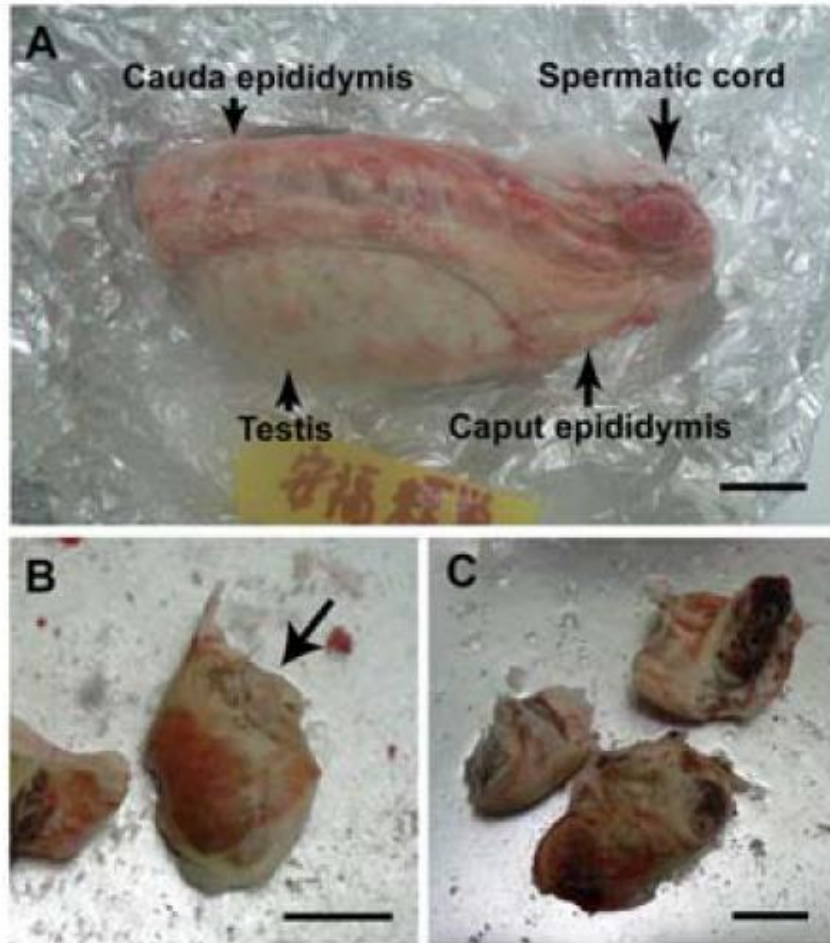


Ясуфуку – папа 40000 телят.  
30% животных этой породы его  
прямые потомки

Мраморная говядина



# «Воскрешение» Ясуфуку



**Figure 1. One of Yasufuku's testicles frozen for 13 years.** The testicle was stored in a  $-80^{\circ}\text{C}$  freezer for 10 years and then transferred to liquid nitrogen for 3 years. **(A)** Yasufuku's frozen testicle. **(B)** Part of the caput epididymis (arrow). **(C)** Spermatic cords that had been cut into three pieces. Scale bars represent 2 cm.

doi:10.1371/journal.pone.0004142.g001

## Ясуфуки 2.0



Один из клонов погиб вскоре после рождения от проблем с легкими



Главное  
Россия  
Мир  
Бывший СССР  
Экономика  
**Наука и техника**  
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Спорт  
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Первая мировая

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Дом

Статьи  
Галереи  
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Поиск



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1 СЕНТЯБРЯ 2014, ПОНЕДЕЛЬНИК, 16:06

Все   Гаджеты   Софт   **Наука**   Техника   Космос

12:57, 1 сентября 2014

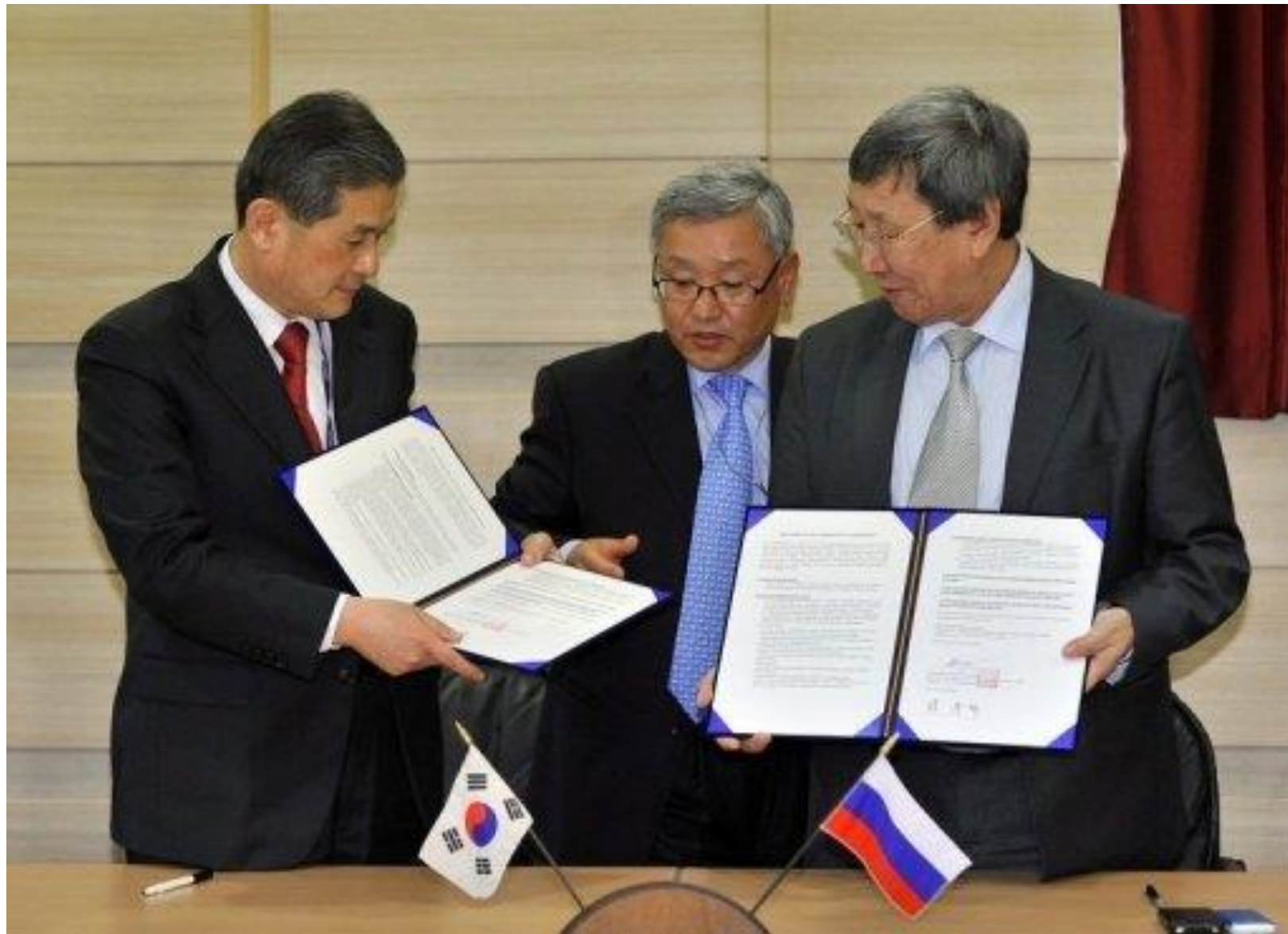
## Путин заинтересовался возможностью клонирования мамонтов



Фото: s-vfu.ru

drugoi.livejournal.com

«South Korean scientist Hwang Woo-Suk and Vasily Vasiliev, vice director of North-Eastern Federal University of Russia's Sakha Republic, exchange agreements during a signing ceremony on joint research at Hwang's office in Seoul. The research collaboration agreement will help Russian and S.Korean scientists to recreate a woolly mammoth which last walked the earth some 10,000 years ago.»



# My Friend Again

Dog Cloning Services

## facebook

Home  
Dog Cloning Cost  
My Dog Has Died  
My Dog is still alive  
Step By Step  
Photo Gallery  
About my Dogs  
Clone Updates  
You are in Grief  
My Story  
Am I Happy  
Links  
News  
FAQ  
Contact

## Dog Clone

### The Dog Cloning Company



This site is dedicated to Wolfie and Bubble. Their love changed my life forever

**[If your Pet Has just died please Click here now before it's too late!](#)**

Hello, my name is Peter and I have cloned both of my dogs, Wolfie and Bubble. I created this website in honor of them and for those of you who, like myself, need accurate information about dog cloning. The cost to clone a dog is not cheap and I know you may have many concerns about the entire cloning process, which company can really clone your dog, and which company is just a middle man. I do not make any money for this site but I do charge companies to advertise their cell banking services. I then donate 100% of it to an animal charity of my choice. Why do I do this? Because I love animals with all my heart.



# My Friend Again

## Dog Cloning Services

### facebook

Home  
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Links  
News  
FAQ  
Contact

### Dog Clone



## Your Dog has just Died and you want to save his cells for Cloning

**Important! Please read below and act now!**

If your dog has just passed then you must act quickly as in right now! There is a 5 day window to successfully extract good quality cells from your beloved friend before the cells begin to deteriorate.

This means that once your dog has passed the body will begin to quickly deteriorate and your chances of extracting quality cells diminishes with every passing day.

## Warning!!!

**Do not place your dog in the Freezer. If you do there will be zero chance of cloning your dog. You must wrap your dogs entire body with wet bathing towels and place it in the Refridgerator to keep it cool. Do this first and then call us right away. Time is of the essence!**

You must act now to preserve the cells of your dog. Cloning cannot be done with just DNA, Blood, Skin, Hair, Teeth, Etc. Cloning can only be done with live tissue taken from your dog immediately after death. After your dog dies, the deteriation of your dogs live tissue will begin. After 5 days it is too late. There will be no way to clone your dog. You'll need to call us right away and we'll will send you a biopsy kit. Give us a call at **608-345-1321** and we'll will ship- a biopsy kit directly to your veterinarian complete with instructions for the doctor to follow. The Biopsy kit is a Styrofoam box with ice packs and vials to store your pets tissues or biopsy samples when shipping back to us. The vet will extract quality tissue and cells from your dogs body. The Vet will than place your pets biopsy samples in the container and ship it back via next day air to our storage facility. Once there we will will culture the cells from the sample tissue to ensure that the cells are viable. The cells are then frozen and stored in a liquid