

# **Lec1 \ Animal Tissue Culture**

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"تخليلوا أننا أخذنا خلية حيوانية واحدة فقط... برأيكم، ما الذي يمكن أن نفعله بها في المختبر؟"

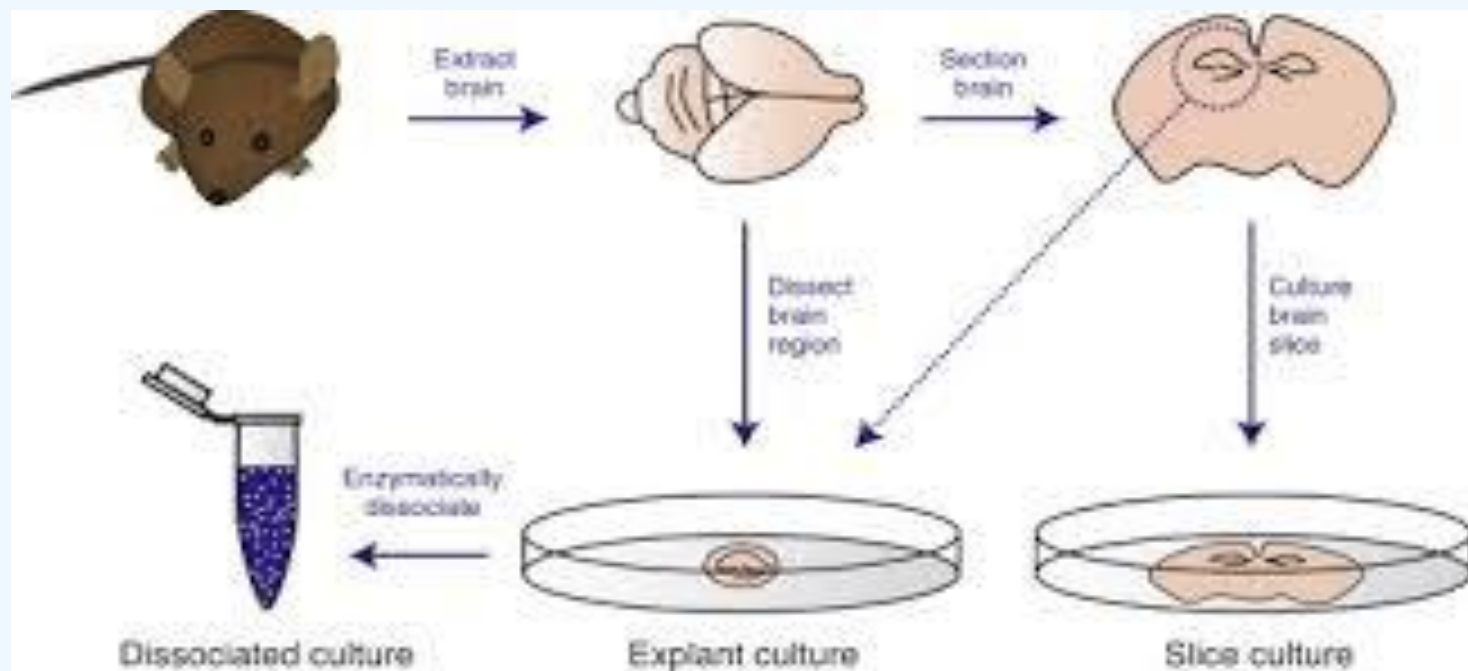
- تنمو وتتكاثر
- يمكن أن ندرس مرضًا معينًا.
- يمكن اختبار دواء جديد عليها.
- ربما نستخدمها لإنتاج لقاح.
- يمكن أن تفيد في زراعة الأعضاء مستقبلاً.





# Historical Background

- Ross Harrison - First frog nerve fiber culture.
- Alexis Carrel - Long-term culture of chicken heart tissue.
- Development of specific media ,Modern advances: Antibiotics, aseptic techniques.



# Introduction

**Animal tissue culture:** is the growth of tissues separate from the animal in vitro (in the laboratory culture media)



# Cell line

## Cell line

Every cell present in **the human body is not capable of growing in the laboratory**, only a few types of cells can grow in vitro, but they are neither suitable for industrial use nor for scientific purpose, **why?**

**Because** many cells die during the course of time releasing toxic substances which inhibit the activity of other living cells.

هل يوجد فرق بين Cell line و زراعة الانسجة الحيوانية



# Procedure for production of a cell line:

- 1- A piece of tissue is removed from an organism.
- 2- Adhesion between cells is **broken by enzymes like trypsin or collagenase.**
- 3- The cells are transferred to bottle which contains cultured medium.
- 4- The cells are incubated at 37°C in 5-10% CO<sub>2</sub> and 90-95% O<sub>2</sub>
- 5- The cells grow, divide and cover the surface of the container, this culture is referred to as **primary cell** culture, **all cells will stop dividing due to contact inhibition.**



# Procedure for production of a cell line:

6- The cells are transferred to a **fresh medium** and will again start growing.

**This type of repetitive culturing of the cells is limited, why?**

**1**-Because the growth of animal cells stop after about 50 divisions

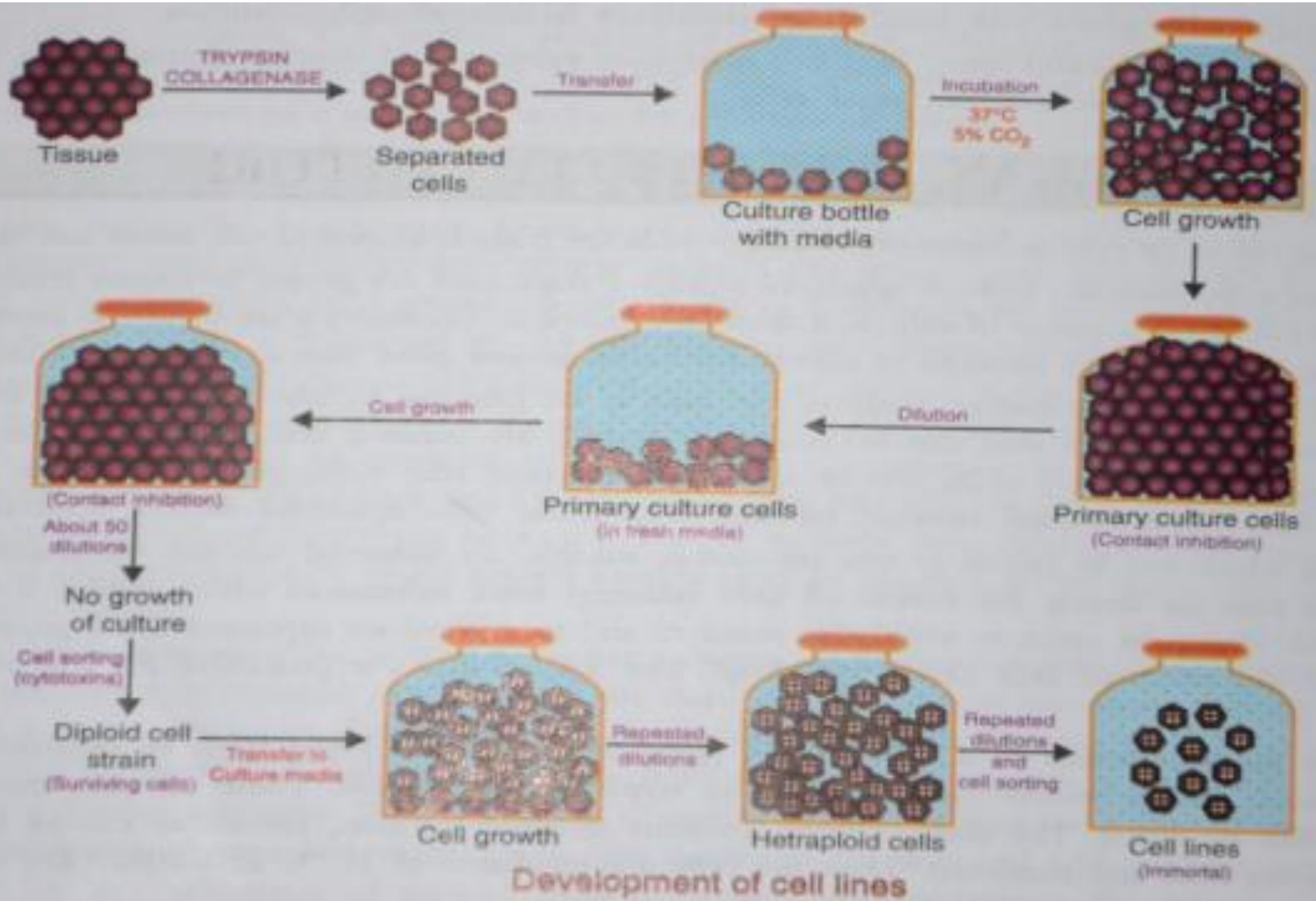
**2**-either due to lack of proper culture media or built-in-senescence mechanism.

7- Some cells continue to grow after numerous transformations, these are termed as **diploid cell strains**, these cells also lose the ability to grow after sometimes.

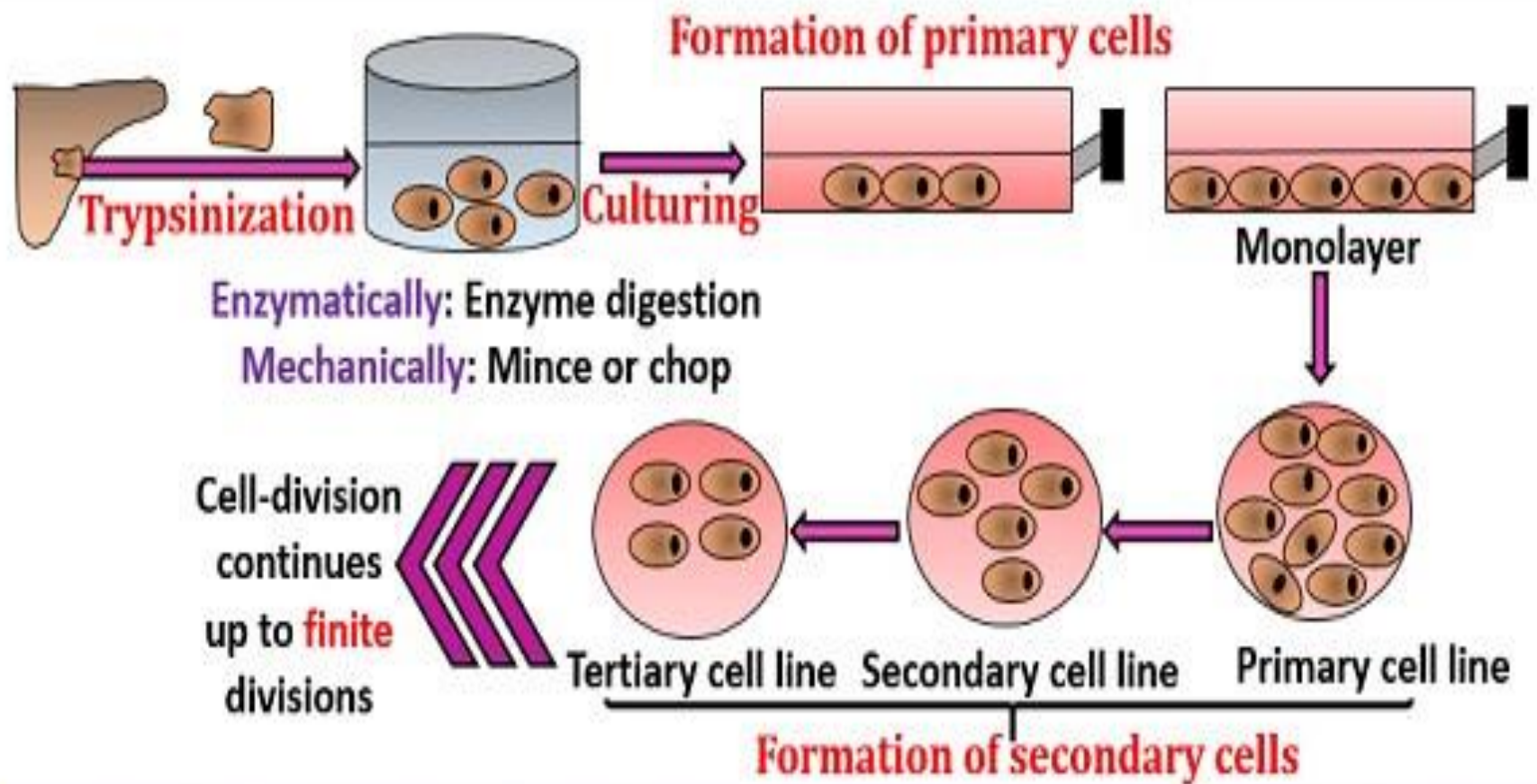
# Procedure for production of a cell line:

8- Few cells among diploid cell strains will survive; these are termed as **heteroploid** cells

because they undergo many chromosomal rearrangements and deletions. These cells will grow indefinitely as long as the medium is replaced, becoming effectively immortal. These survivors are **known as cell line.**







# Animal cell culture: For Normal Cells



## نشاط جماعي

إذا تمكنا من استنبات خلايا حيوانية خارج الجسم لفترات طويلة بنجاح،  
فهل يمكن اعتبار ذلك **بديلاً حقيقياً لاستخدام** الحيوانات في التجارب  
العلمية؟

ناقشوا في مجموعاتكم المزايا والعيوب والتحديات العلمية المرتبطة بهذا  
الأمر.



# Culture medium:

**Culture medium:** It is the environment provided for the growth of the cells in the laboratory, similar to those conditions that the cells have been exposed to in vivo. Culture media consists of:

- **Physical media:** a support or matrix ex: Ph O<sub>2</sub> , H<sub>2</sub>O , heat
- **Chemical media:** appropriate nutrients, hormones and stromal factors.ex : Cytokines IL-6.Growth factors SCF





## نشاط جماعي

اذكر أنواع Growth factors

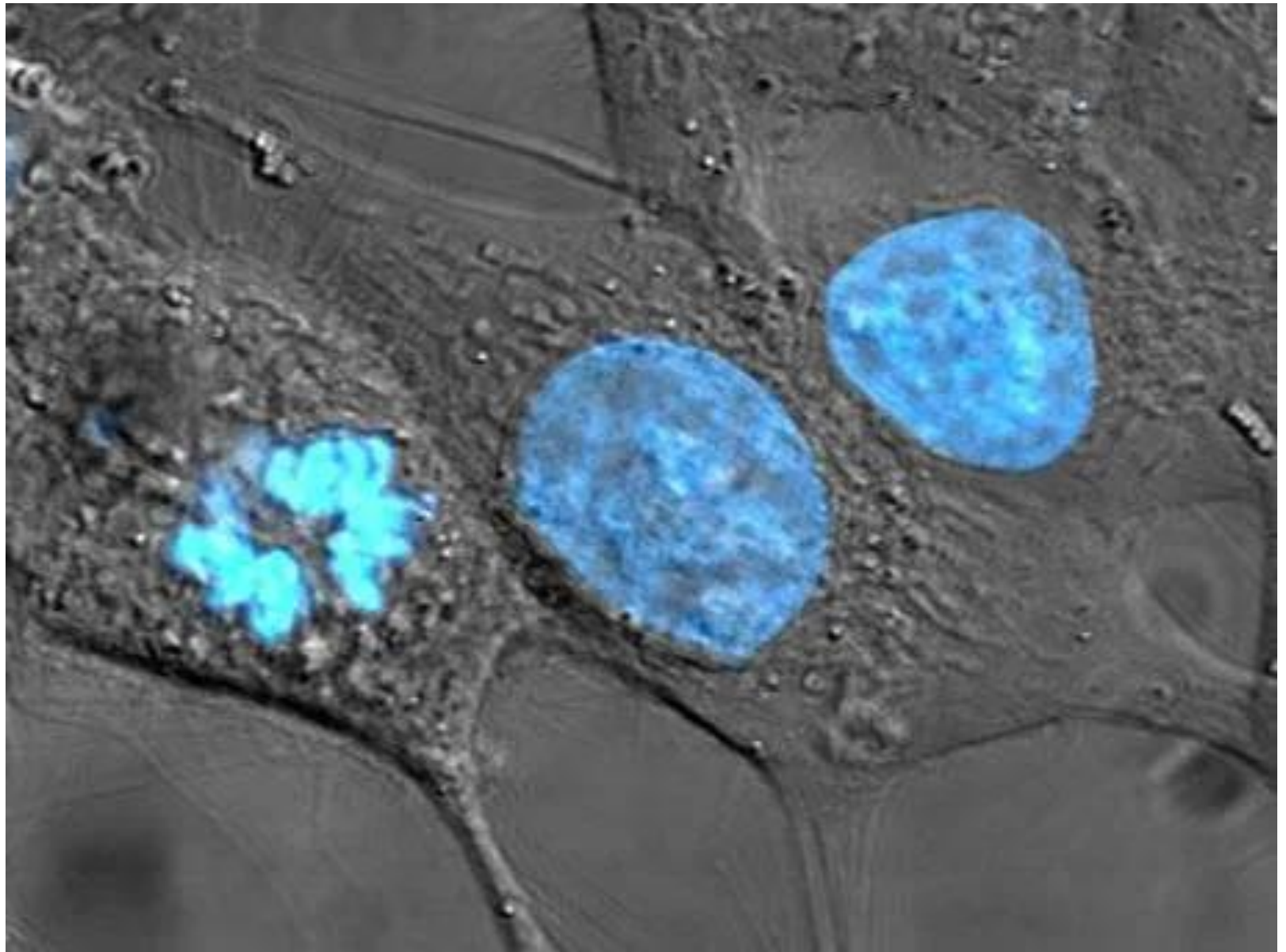




# Culture medium

Serum is the most economical, easily available and most widely used culture medium for animal cell culture; **fetal calf serum** is the preferred one.

**The major functions of serum as a culture medium are:** to provide nutrients, hormones, growth factors, attachment and spreading factors, binding proteins, vitamins, minerals, lipids, protease inhibitors and pH buffer



## Disadvantages of serum:

- Virus, fungi and bacteria may contaminate the serum easily
- Some enzymes presents in serum can convert the cell secretions into toxic compounds



## Now there are three types of artificial culture media:

- Serum –free culture medium
- Protein- free culture medium
- Chemically defined media

Eagles minimal essential medium (EMEM), Dulbeccos modified enriched medium (DMEM) and Rosswell park memorial institute (RPMI) are examples on artificial culture media

