Past papers

What is the differentiation potential of pluripotent stem cells?
A. Limited to a single cell type
B• Able to differentiate into all specialized embryonic tissues
C. Unable to differentiate
D. Can only repair damaged cells
B**

What is the purpose of stem cell division?
A. To create identical daughter cells
B. To generate progenitor cells
C. To stop cell renewal
D. To decrease cell potency
B**

What is a key process involved in stem cell-based therapies for spinal cord injuries?
A. Remyelination
B. Scar formation
C. Inflammation
D. Neurotransmission
A**

What is a potential con mentioned in the content regarding stem cell therapies for Parkinson's disease?
A. Restoration of striatal DA release
B. Functionally integrated neurons
C. Symptomatic relief in some patients
D. Presence of Lewy bodies in a fraction of neurons
D**

What is a proof of principle mentioned in the context of stem cell therapies for Parkinson's disease?
A. Clinical trials with intrastriatal transplantation of human embryonic mesencephalic tissue
B. Clinical trials with intravenous injection of stem cells
C. Clinical trials with oral administration of stem cell extracts
D. Clinical trials with topical application of stem cell creams
A**

Which symptoms are characteristic of Parkinson's disease ?
A. Memory loss and confusion
B. Muscle weakness and fatigue
C. Rigidity, hypokinesia, tremor, and postural instability
D. Visual disturbances and hearing loss
C**

you are working on a research project regarding stem cells, cells you are working on have the ability to produce dopamine which can be used to treat parkinson disease, which of the following must be taken under consideration (ethically)
A) test it first on animals to see its side effects and its carcinogenic ability
B) Clinical trials on patients suffering from Parkinson
ANSWER : A

Which of the following regarding stem cell biology is ture?
A) embryonic stem cells have a higher potency than adult stem cells
B) embryonic stem cells can give the rise of both embryonic and extraembryonic tissues
ANSWER : A

Which of the following is considered wrong when we use stem cells to treat neurodegenerative diseases?
A The cell type to be regenerated and transplanted.
B To determine the biological mechanism underlying the observed effects
C The stem cell–based approach should show substantial improvement of functional deficits in animal models
D Do clinical trials on the patient directly
Answer: D

Which of the following is incorrect?
A. Stem cells have limited ability to renewal
B. Adult cells are multipotent
C. Embryonic cells are pluripotent
D. None of the above
Answer: A

True about stem cells
ANSWER : embryonal stem cells have more potency that adult

If you find out that a iPSC is working to produce dopamenirgic neurons that can be used in Parkinson's disease, you don't do this:
ANSWER : start clinical trials to use the technique in patients with Parkinson's disease

You have recently heard that stem cells may have a potential in regenerating damaged lung tissue caused by SARS-CoV-2 in COVID-19. Before they can be used in clinic, the following has/have to be checked :
A) Carcinogenicity specifically if pluripotent stem cells are used
B) The mechanism by which stem cells repair the lost pulmonary function
C) All experimental stages starting with ex vivo experiments, animal stage, clinical trials of 3 stages
D) Food and drug administration approval in the country of practice .
E) All points have to be verified before stem cell can be used as a treatment for COVID19
ANSWER : E

Which stem cell is the most potent, genetically engineered and causes no immune reaction :
A) iPSCs
B) embryonic
C) adult neura
A**

Which is the best source for adult stem cells :
A) periventricular area
B) dentate of hippocampus
C) spinal cord
ANSWER : A

The statement that describes stem cells is :
A) Changes in the niche have no effect on the behaviour of stem cells
B) They can be used for cell- based therapy and modelling human diseases
C) Their niche drive their differentiation and does not keep their stemness
D) They have a limited ability to asymmetrically divide
E) We can use them as a cell- based therapy directly after we test them in tissue culture models and they show an improvement of the disease
ANSWER : B

Test bank

1. What are stem cells?

a) Specialized cells with a specific function.

b) Cells that can only divide symmetrically.

c) Unspecialized cells that can differentiate into various cell types and self-renew.

d) Cells that are unable to divide.

Answer: c)

2. What is asymmetric cell division in stem cells?

a) Division that produces two identical daughter cells.

b) Division that only occurs in differentiated cells.

c) Division that produces two daughter cells with different cellular fates: one stem cell and one differentiating cell.

d) Division that only occurs in embryonic stem cells.

Answer: c)

3. What is a stem cell niche?

a) A type of stem cell.

b) A specialized cellular environment that supports stem cell self-renewal and differentiation.

c) A fully differentiated cell.

d) A cell that can divide symmetrically.

Answer: b)

4. Which of the following is NOT a component of the stem cell niche?

a) Cells

b) ECM components

c) Soluble factors

d) Differentiated cells

Answer: d)

5. What is the term for a stem cell's ability to differentiate into various cell types?

a) Self-renewal

b) Potency

c) Asymmetric division

d) Specialization

Answer: b)

6. Which type of stem cell has the highest differentiation potential?

a) Unipotent

b) Multipotent

c) Pluripotent

d) Totipotent

Answer: d)

7. What is the main difference between pluripotent and totipotent stem cells?

a) Pluripotent cells can differentiate into all cell types, including extraembryonic tissues.

b) Totipotent cells can differentiate into all cells of the embryo but not extraembryonic tissues.

c) Totipotent cells can differentiate into all cells of the embryo and extraembryonic tissues.

d) Pluripotent cells can only differentiate into a single cell type.

Answer: c)

8. Where are embryonic stem cells (ESCs) derived from?

a) Adult tissues

b) The inner cell mass of blastocysts

c) Skin fibroblasts

d) Urine

Answer: b)

9. What are iPSCs?

a) Adult stem cells

b) Embryonic stem cells

c) Induced Pluripotent Stem Cells

d) Unipotent stem cells

Answer: c)

10. What is a major advantage of using iPSCs over ESCs?

a) iPSCs are easier to extract.

b) iPSCs can only differentiate into a single cell type.

c) iPSCs do not raise ethical concerns.

d) iPSCs are derived from embryos.

Answer: c)

11. Which transcription factors are NOT responsible for pluripotency of ESCs:

a) Oct 4

b) Nanog

c) SOX2

d) B catenin

Answer: d)

1. What are the two properties stem cells must maintain to be classified as stem cells?

a) Ability to divide symmetrically and differentiate into one cell type.

b) Ability to divide asymmetrically and differentiate into a wide range of specialized cell types.

c) Ability to divide symmetrically and remain undifferentiated.

d) Ability to differentiate into any cell type and self-destruct.

Answer: b)

2. What is the role of progenitor cells in stem cell differentiation?

a) They are fully differentiated cells.

b) They are the initial cells that divide into stem cells.

c) They are intermediate, partially differentiated cells between stem cells and fully differentiated cells.

d) They are cells that can only divide symmetrically.

Answer: c)

3. What is the main function of the stem cell niche?

a) To differentiate stem cells into specialized cells immediately.

b) To provide support for stem cell self-renewal and optimize conditions for differentiation.

c) To destroy stem cells that are not actively dividing.

d) To provide a barrier against external factors affecting stem cells.

Answer: b)

4. Which of the following can be components of the stem cell niche?

a) Cells only.

b) Cells and ECM components.

c) Soluble factors secreted by adjacent cells.

d) All of the above.

Answer: d)

5. What happens if there is a defect in the stem cell niche?

a) The stem cells will start to self-renew more rapidly.

b) The stem cells will start to differentiate.

c) The stem cells will become totipotent.

d) The stem cells will become progenitor cells.

Answer: b)

6. Which of the following is an example of a totipotent stem cell?

a) Hematopoietic stem cell

b) Embryonic stem cell from the inner cell mass

c) A cell in the very early stages of embryonic development

d) Intestinal stem cell

Answer: c)

7. What is the major ethical concern associated with the use of embryonic stem cells (ESCs)?

a) They are difficult to obtain.

b) They have limited differentiation potential.

c) Their extraction involves the destruction of an embryo.

d) They cause immune rejection.

Answer: c)

8. What is one of the main advantages of using iPSCs (induced Pluripotent Stem Cells) over ESCs (Embryonic Stem Cells) in therapies?

a) iPSCs can differentiate into a wider range of cell types.

b) iPSCs are easier to extract.

c) iPSCs are autologous and do not cause immune rejection.

d) iPSCs are derived from embryos.

Answer: c)

9. What does “autologous” mean in the context of iPSC therapy?

a) The cells are derived from a different species.

b) The cells are derived from the patient’s own cells.

c) The cells are derived from an embryo.

d) The cells are derived from a universal donor.

Answer: b)

10. What was Yamanaka’s contribution to stem cell research?

a) Discovery of embryonic stem cells.

b) Development of the technique to generate induced pluripotent stem cells (iPSCs).

c) Identification of the stem cell niche.

d) Development of the first stem cell therapy.

Answer: b)

11. what is one of the issues with transplanting ESCs from one embryo into another patient, even if it is a sibling?

a) Ethical issues

b) Immunological problems and immune rejection

c) Limited differentiation potential

d) Difficulty in obtaining the cells

Answer: b)

Lecture 2

1. Which of the following cell types is primarily targeted for regeneration in Parkinson's Disease (PD) stem cell therapy?

a) Motor neurons

b) Dopaminergic neurons

c) Glial cells

d) Hippocampal neurons

Answer: b) Dopaminergic neurons

2. Which of the following is NOT a major consideration when using stem cells to treat neurodegenerative diseases?

a) The variability in disease severity

b) The cost of stem cell treatment

c) The type of cell that needs to be regenerated

d) The potential for tumor formation

Answer: b) The cost of stem cell treatment

3. In Alzheimer's Disease (AD), stem cell therapy faces the challenge of needing to:

a) Replace only one specific type of neuron

b) Replace multiple neuron types and reinnervate synapses

c) Primarily focus on motor neuron regeneration

d) Simply deliver dopamine to the brain

Answer: b) Replace multiple neuron types and reinnervate synapses

4. A key requirement before using stem cell-based approaches in clinical applications is:

a) Approval from the FDA

b) Demonstrating substantial improvement of functional deficits in animal models

c) Guaranteeing complete recovery for all patients

d) Ensuring the treatment is cheaper than existing options

Answer: b) Demonstrating substantial improvement of functional deficits in animal models

5. What is a major hurdle preventing stem cell therapy for Parkinson's Disease from moving from the laboratory to the clinic?

a) The lack of animal models for PD research

b) The ethical concerns surrounding stem cell use

c) The difficulty in demonstrating marked (50-70%) improvement in patient symptoms

d) The ease of differentiating stem cells into neurons

Answer: c) The difficulty in demonstrating marked (50-70%) improvement in patient symptoms

6. What is one of the main mechanisms by which stem cells aid neurodegenerative disease treatment?

a) Directly replacing damaged organs

b) Releasing bioactive molecules to create a neuroprotective environment

c) Eliminating amyloid plaques entirely

d) Stimulating immune system overactivity

Answer: b) Releasing bioactive molecules to create a neuroprotective environment

7. Which stem cell type is most commonly used in clinical trials for neurological disorders?

a) Embryonic stem cells (ESCs)

b) Neural stem cells (NSCs)

c) Mesenchymal stem cells (MSCs)

d) Induced pluripotent stem cells (iPSCs)

Answer: c) Mesenchymal stem cells (MSCs)

8. In Alzheimer's Disease, what is a key role of transplanted neural stem cells (NSCs)?

a) Decreasing amyloid plaques directly

b) Producing brain-derived neurotrophic factor (BDNF) to form new synapses

c) Replacing damaged motor neurons

d) Suppressing all immune responses

Answer: b) Producing brain-derived neurotrophic factor (BDNF) to form new synapses

9. What is a significant limitation of stem cell therapy in aging-related neurological disorders?

a) Lack of FDA approval for any trials

b) Reduced efficacy due to aging-related changes in the brain and body

c) High risk of teratoma formation in older patients

d) Inability to integrate into existing neural networks

Answer: b) Reduced efficacy due to aging-related changes in the brain and body

10. Which of the following is NOT a current challenge for translating stem cell therapy into clinical practice?

a) Understanding cellular mechanisms of neurodegeneration

b) Lack of preclinical animal models for testing therapies

c) Risk of tumor formation from transplanted cells

d) Need for substantial functional improvement before clinical trials

Answer: b) Lack of preclinical animal models for testing therapies

11. What is a significant advantage of induced pluripotent stem cells (iPSCs) in treating neurodegenerative diseases?

a) They are derived from human embryonic stem cells (hESCs).

b) They avoid immune reactions due to being patient-specific.

c) They have been widely used in clinical trials for Parkinson's Disease (PD).

d) They do not require genetic engineering.

Answer: b) They avoid immune reactions due to being patient-specific.

12. Which of the following neurotrophic factors is commonly delivered by stem cells to support host neurons?

a) Dopamine

b) Brain-derived neurotrophic factor (BDNF)

c) Acetylcholine

d) Serotonin

Answer: b) Brain-derived neurotrophic factor (BDNF).

13. What is a key challenge in using stem cell therapy for Alzheimer's Disease (AD)?

a) Lack of animal models for testing therapies.

b) Difficulty in replacing and reinnervating synaptic connections.

c) Inability to cross the blood-brain barrier.

d) High rejection rates of transplanted cells.

Answer: b) Difficulty in replacing and reinnervating synaptic connections.

14. Why is stem cell therapy considered more practical for chronic neurodegenerative disorders compared to acute injuries like stroke?

a) Acute injuries require treatment within hours, which is difficult to achieve.

b) Chronic disorders have fewer affected brain regions.

c) Stem cell therapy works only on long-term diseases.

d) Acute injuries have no approved treatments yet.

Answer: a) Acute injuries require treatment within hours, which is difficult to achieve.

15. What is a major limitation of current pharmacological treatments for neurodegenerative diseases?

a) They are too expensive for most patients.

b) They fail to cross the blood-brain barrier effectively.

c) They completely halt disease progression but have severe side effects.

d) They only target genetic causes of these diseases.

Answer: b) They fail to cross the blood-brain barrier effectively.

16. Which neurodegenerative disease has shown the most promise for stem cell therapy due to its localized pathology?

a) Huntington's Disease (HD).

b) Alzheimer's Disease (AD).

c) Parkinson's Disease (PD).

d) Amyotrophic Lateral Sclerosis (ALS).

Answer: c) Parkinson's Disease (PD).

17. What is one reason why graft-induced dyskinesias occur in Parkinson's Disease after stem cell transplantation?

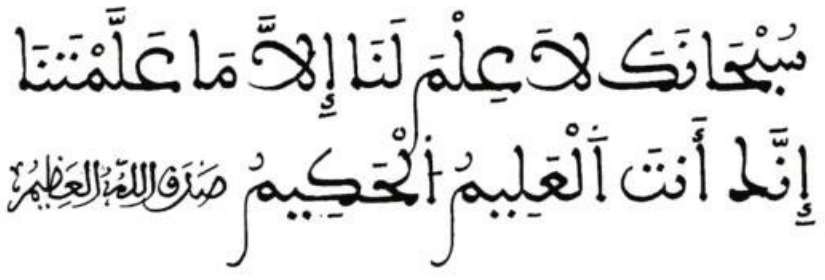
a) Overproduction of dopamine by transplanted cells.

b) Serotonergic hyperinnervation in the grafted striatum.

c) Immune rejection of transplanted cells.

d) Insufficient dopamine production by transplanted cells.

Answer: b) Serotonergic hyperinnervation in the grafted striatum.



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