



Virtual Learning

**Medical Interventions**

**Tissue Engineering**

May 21, 2020



# Medical Interventions

## Lesson: May 21, 2020

### **Objective/Learning Target:**

Describe how Tissue Engineering works, as well as their potential risks, benefits, challenges, and ethical or moral concerns. Defend arguments as to whether or not further research for Tissue Engineering should be banned. (4.4.1)



## Let's Get Started:

1. Review stem cells and their application to personalized medicine by watching [this video](#).
2. What is the benefit of using stem cells for personalized treatment?



## Let's Get Started: **Answers**

1. Review stem cells and their application to personalized medicine by watching [this video](#).
2. What is the benefit of using stem cells for personalized treatment?
  - a. Using individualized stem cells taken from the patient results in the same HLA genotype and a lower risk of rejection of tissue/organs



## Lesson Activity

Another exciting area of research is using stem cells to grow organs. Learn more about tissue engineering by watching this [video](#) and reading this [background](#) information. Take notes in your notebook and then answer the following questions:

1. What is the difference between therapeutic and reproductive cloning?
2. What are induced pluripotent stem cells and why are they important?
3. What 4 essential factors are needed for tissue engineering to work?



## Lesson Activity - Answer

Another exciting area of research is using stem cells to grow organs. Learn more about tissue engineering by watching this [video](#) and reading this [background](#) information. Take notes in your notebook and then answer the following questions:

1. What is the difference between therapeutic and reproductive cloning?
  - a. therapeutic cloning deals with embryos only, not human babies carried to term
2. What are induced pluripotent stem cells and why are they important?
  - a. Cells that are induced into a stem cell state that can differentiate into more than 200 types of cells
3. What 4 essential factors are needed for tissue engineering to work?
  - a. Right type of stem cell, scaffold to support cells, biomolecules to encourage cell health/production, physical/chemical forces to influence development of cells



## Practice

Answer the following questions after completing the activity.

1. How does this technology work?
2. What are the potential risks of using this technology?
3. What are the potential benefits of using this technology?
4. What are the challenges of this technology?
5. What are the ethical or moral concerns of using this technology?



## Practice - Answer

Answer the following questions after completing the activity.

1. How does this technology work?
  - a. Growing cells/tissue/organs in a lab using stem cells
2. What are the potential risks of using this technology?
  - a. May lead to other problems such as cancer, bone growth, certain metabolic problems, etc.
3. What are the potential benefits of using this technology?
  - a. Ease shortage of organs needed for transplantation, low risk of rejection
4. What are the challenges of this technology?
  - a. Difficult to obtain stem cells (embryonic)
5. What are the ethical or moral concerns of using this technology?
  - a. Possible use of stem cells from embryos (rare), cloning human tissue for transplants





## Additional Practice/Resources

1. List at least three arguments for banning research for the technology and three in favor of further research. What is your opinion on this topic?
2. Check your understanding by creating a Venn Diagram comparing xenotransplantation and tissue engineering. What are the similarities and differences between them?
3. Learn more about how stem cells are already being used as a possibly treatment for [kidney disease](#), restoring damaged skin with the use of [skin guns](#), or even using [Bio 3-D printing](#) to recreate tissue structures.