A

MINI PROJECT ON

HUMAN ORGANOIDS

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HUMAN ORGANOIDS

ABSTRACT

Organoids opens a new window to observe some of the most elusive aspects of our biology. Biologists are drawn to this system as a new “model organism” to study complex disease phenotypes and genetic variability among individuals using patient-derived tissues. Resembling the in vivo like organ complexity, study of these patient derived human organoids are used as tools for medical research, accurate models of human diseases, generating patient matched tissue sources for regenerative medicine, drug development and testing. To date, researchers have been able to produce organoids that resemble the brain, kidney, lung, intestine, stomach, and liver, and many more are on the way. They have the potential to overcome a number of previous limitations in biomedical research aimed at gaining mechanistic insights into human development. It is an emerging, rapidly expanding and highly promising field.

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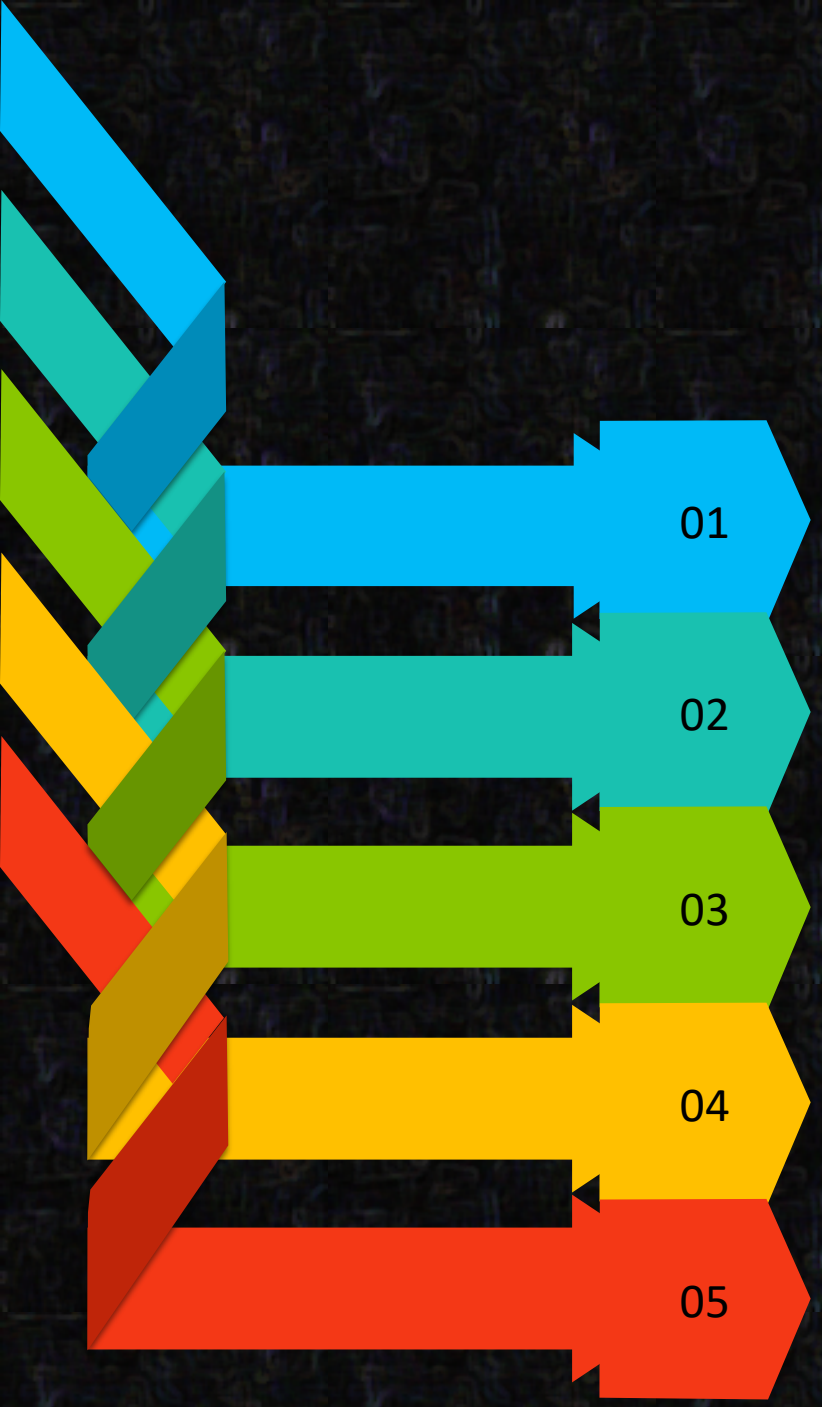


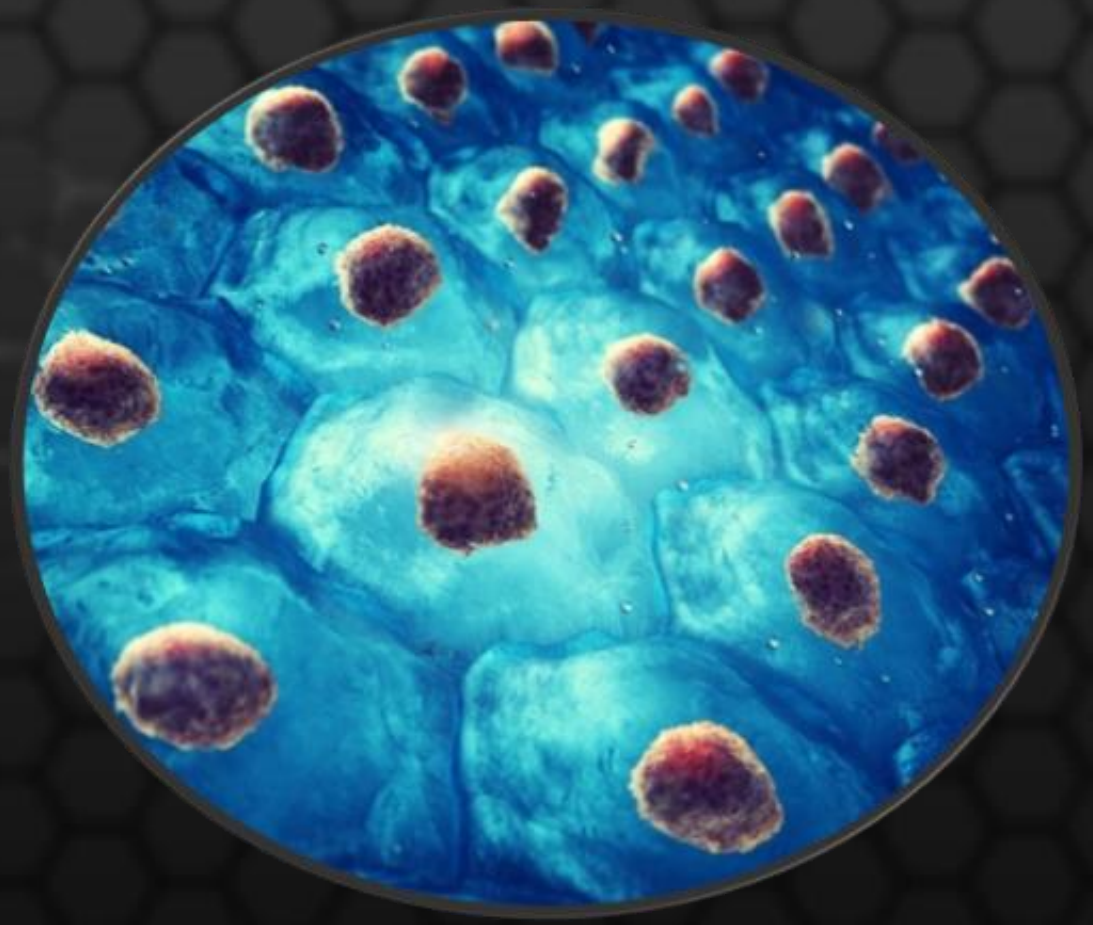
OBJECTIVE

The purpose of this study is to outline the progress, potential, limitations and challenges of the organoid technology for future biomedical research.

02

INTRODUCTION

Organoids are miniature sized, self-organized structures, that are derived from stem cells or tissues in culture and can develop into structures that resemble the in vivo anatomy and physiology of intact organs. Organoids can be generated from human cell sources, including adult tissue-specific stem cells, embryonic stem cells (hESCs), and induced pluripotent stem cells (hIPSCs).To date, researchers have been able to produce organoids that resemble the brain, kidney, lung, intestine, stomach, and liver, and many more are on the way. These offer an opportunity to better understand complex biology in a physiologically relevant context where 2 D models have not proven as successful.



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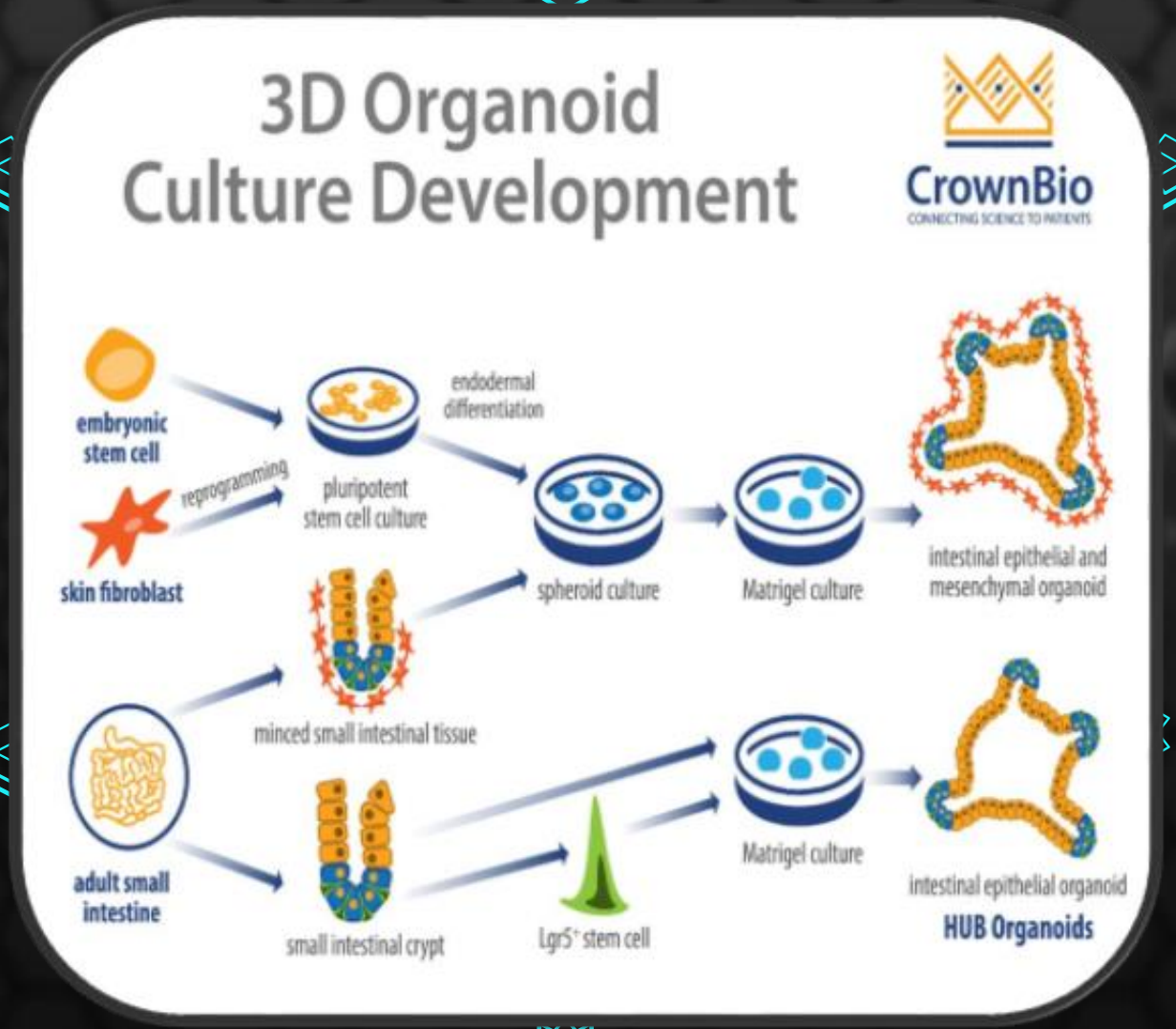
MAKING OF AN ORGANOID



STEP 1

Obtain sample.

STEP 2

Mechanically and chemically dissociate tissue into single cell.

STEP 3

Use cell sorter to obtain target cells.

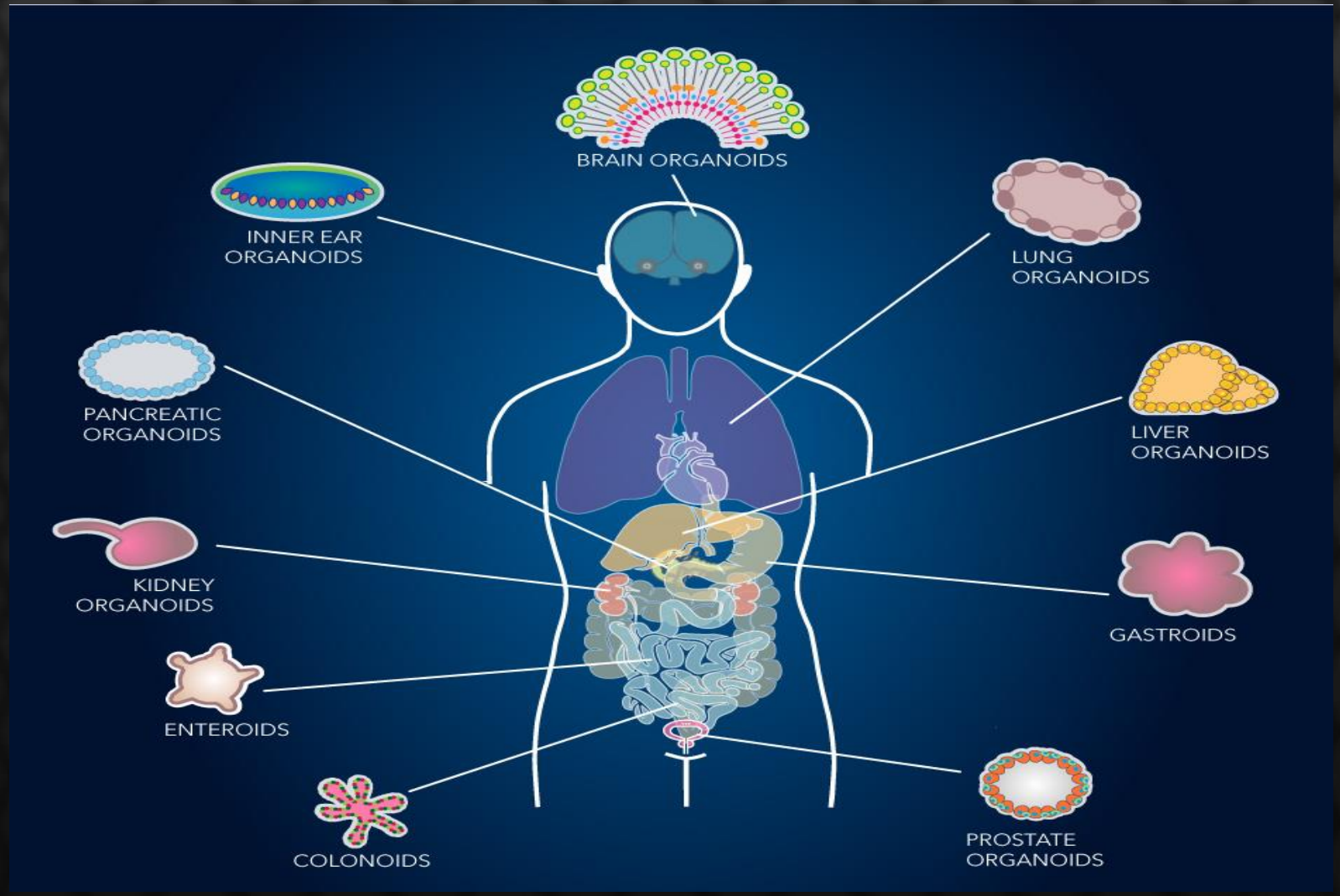
STEP 4

Add targeted cells to matrigel.

STEP 5

Allow cells to grow for 1 to 90 days.

TYPES OF ORGANOIDS



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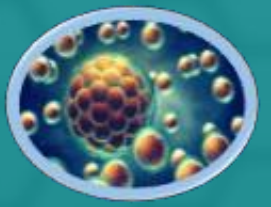
Potential uses of organoids

TESTING USES

Perform tests of medical, biological and chemical agents.

PHARMACEUTICAL USES

Benefits to drug manufacturing.



REGENERATIVE MEDICINE

1.Benefits to lab grown organs.
2. Hepatic cancer treatment.

06

OPPURTUNITIES

Organoids, the 3 D cell culture models show great potential in many applications.

1. Organoids that model disease can be used as an alternative system for drug testing and also offer numerous applications for tissue engineering and regenerative medicine.
2. Provide alternative organ replacement strategies. Unlike current organ transplant treatments, such autologous tissues would not suffer from issues of immunocompetency and rejection.
3. Offer the possibility to study human tissues at the same level of scientific scrutiny, reproducibility, and depth of analysis

07

CHALLENGES

01

Applying this technology to practical problems, will depend on overcoming 3 main technical challenges: ability to make organoids reliably and in large numbers; to make them more mature; and to make organoids larger and more realistic.

02

It may also depend on intelligent development of an effective ethico-legal framework.

03

Gold standards and best practices must be defined for the study of organoids.

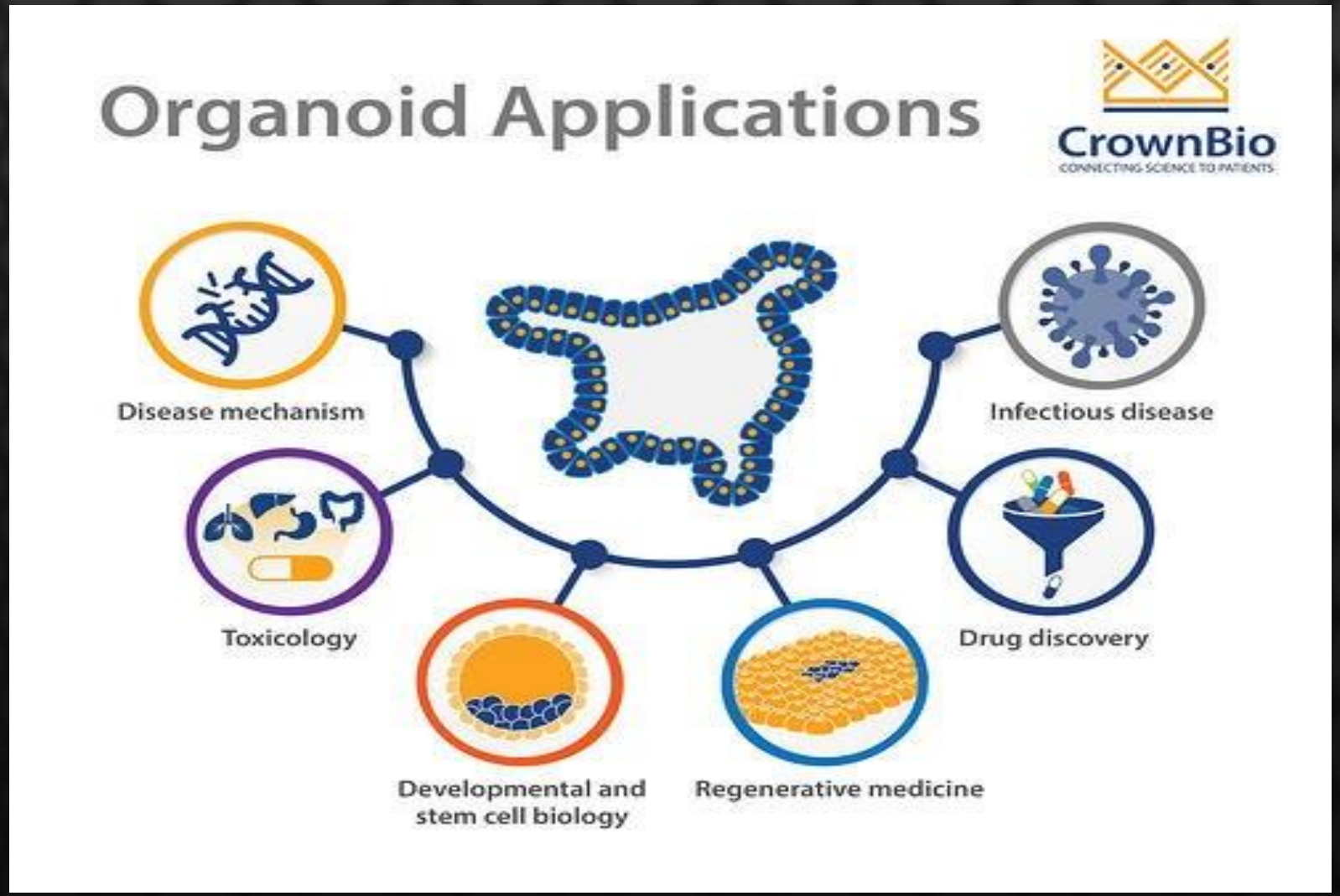
04

For patient- derived tissue samples, patient consent needs to specify the requirement.

05

Transparency in communication with public

APPLICATIONS



GLIMPSE OF WHAT IS LIKELY TO COME IN FUTURE

1. Human disease modeling

Organoids provide a unique platform for identifying the mechanisms of adult human disease by studying the organ morphology and functions. This would open up new avenues in drug development and regenerative medicine.

2. Tissue engineering and regenerative medicine

iPSC- derived organoids have tremendous potential for applications in tissue engineering and regenerative medicine.

3. Personalized medicine

They aid in identifying drugs or combinations of drugs for treating diseases.

MANY THANKS !

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