

Stem Cell Potency

By Rebecca Chan

“Time is a circus, always packing up and moving away.”

—Ben Hecht

In a way, we never gave up trying to find that elixir of immortality.

We try to better our lives or the way we live our lives because we have limited TIME.

Stem cells are looked at as possible treatment to many diseases. These cells are bewildering because they share two properties:

1. Self-Renewal: the ability to undergo cell division and remain undifferentiated
2. Potency: the ability to differentiate to specialized cell types

Totipotency

A single totipotent cell is limitless and can divide and produce all differentiated cells of an organism into identical totipotent cells. Example: zygote, a fertilized egg cell.

Humans emerge from that single totipotent cell.

What was it like to have the ability to do anything? Were we ever given that chance?

In kindergarten, we were asked what we wanted to be when we grew up.

We were given anything to choose from, and there wasn't any right or wrong answer. Scientist, astronaut, doctor, teacher, veterinarian, firefighter, and racecar driver were some of the answers given.

When it came to me, I called out, “Everything.” I wanted to be everything.

The teacher laughed and said, “Choose one.” I repeated,

“Everything.”

Why couldn't I be everything? Barbie was everything and could do everything. Why not everything?

The teacher gave me an odd look before she moved on.

But the next guy's answer wasn't that far off from mine.

"I want to be a superhero! A superhero, like Batman."

Pluripotency

Pluripotency is the next level down from totipotency.

Pluripotent cells can develop into any of our three germ layers: the endoderm, mesoderm and ectoderm. They can specialize into any cell of their body, but cannot turn into an entirely new organism like totipotent cells.

Here is when that guy next to me finally found out he couldn't become Batman, as much as it broke his heart. Here is when my teacher had a talk with my parents and they told me,

"Life doesn't always go your way."

Whatever that meant to a five year old. I screamed,

"I want it! I can't wait to grow up!"

The words I meant to say but couldn't were: "You're not taking me seriously."

So all we thought was, "I can't wait to grow up."

We couldn't wait to do the things we weren't allowed to do - eat all the cookies in the cookie jar, play in the jungle gym until the end of time...

We didn't see any problem with that.

However, pluripotency is the stage of life where we're suddenly driven into a hell period, called exams, without knowing their importance and how far they will take us in life. I had to stop playing in the sand box and... study.

Study because studying meant I was trying hard. Acing all my tests because it proved that I was striving to do well in life. Getting 100's because 99's meant you were careless and never good enough to represent the family.

If it wasn't 100, then I'd better pray my parents didn't know we had gotten our tests back that day.

All of a sudden we're going somewhere.

Multipotency

Multipotency is the next stage for the stem cell, derived from pluripotency. Multipotent cells can differentiate into multiple cell types, but are more limited than pluripotency.

The only thing left to do is go forward.

Forward into a "top middle school" and then choosing between the "best high school in NYC" that's an hour and a half train ride away or the "second best high school in NYC" that's a fifteen minute walk away.

Living on sleep deprivation for seven years.

Suddenly realizing that you can't go back.

Too old for the sandbox.

Told it was time for me to grow up.

Act my age.

We drilled ourselves with SAT practice exams, because acing it "would take us there."

When we were done, we laughed and called ourselves the "survivors." We watched movies, danced, went to karaoke down in KTOWN, singing:

"Five hundred twenty-five thousand

Six hundred minutes,
Five hundred twenty-five thousand
Moments so dear.
Five hundred twenty-five thousand
Six hundred minutes”

It all felt so bittersweet, but we weren't done. I just forgot to ask:

Where is “there?”

The only thing left to do was go forward.

Oligopotency

Oligopotency has the ability to differentiate into only a few cell types.

Neural oligopotent stem cells can only specialize into certain brain cells.

College happens, eighteen happens, driving happens. A bucketful of freedoms are suddenly gifted to us.

At eighteen, you are a legal adult and yet not necessarily considered mature or responsible.

At eighteen, you are at the legal age to vote.

Are we full adults, partial adults, or adolescents still?

When does a child become an adult?

When am I considered an adult? When was I no longer a child?

At what year? At what age? At what point in life? After what kind of experience?

What is ahead of me?

Graduation, medical school, career, marriage, family, old age?

Call it a quarter life crisis from having a realization that the next few years of life will have the most dramatic effect on your years to come. Or that's what I have been told.

Unipotency

The final level of potency is the unipotent stem cell. It can differentiate into only one cell type, mainly to replace damaged cell tissue. The one important difference between this stem cell and normal cells is its property to divide repeatedly.

What is it like to have only a single door of opportunity left ahead of you?

Does it even matter, considering we only select one pathway to follow?

Does it exist at one point in life?

Based on research, stem cells have the potential to combat a variety of diseases, including cancer. Yet, there has been cases of immortal cancer cells, known as HeLa.

Cells become cancerous or immortal when they activate telomerase, an enzyme that controls the length of telomeres. Telomeres are extra sequences at the end of DNA that protect the DNA and allow cell division. As cells divide, telomeres get shorter. When telomeres get too short, cell death occurs, a process known as apoptosis. However, telomerase adds on the length of telomeres after division, causing cells to continuously divide uncontrollably.

We dream of using our own immortal cells against cancer cells. We reach for improving our lives and helping those with serious medical conditions by using stem cells. We want to make use of their potential to ignore time barriers.

In the article, "Time on the Brain," George Musser says,

"[Electric fish] strikes a balance between mechanical and sensory efficiency... [such that] the two are comparable in size [and] reach does not exceed grasp."

We essentially live in the past.

"When we retrieve a memory, we also rewrite it, so that the next time we go to remember it, we don't retrieve the original memory..."

So, each time we tell a story, we embellish it, while remaining genuinely convinced of the veracity of our memories.”

It takes 0.4 seconds to think about the action.

It takes 0.2 seconds for the action to occur.

We think from the past, even when we try to think for the future.

A ninety-four year old woman graduates college, saying it's never too late.

The greater the gravitational field, the slower time runs on a clock in that field.

Gravity slows down time.

Gravity is a property of mass.

We have gravity, although we don't feel it because compared to the gravitational pull of the earth, it is nothing.

Time is another manifestation of mass.

“How do you measure

A year in the life?”

- Seasons of Love