



# Nail Regeneration

## A citizen science project

- CUBE National Meet-2022  
(30th June 2022)

Presented by: Smiti, Misbah and Rahul  
(On behalf of all the collaborators, data contributors and mentors.)



- Organismal level regeneration
- Evolution for better survival
- Conditional regeneration

## Connecting earthworm regeneration to nail regeneration

- Tissue level regeneration
- Evolution for protection/defense
- continuous regeneration



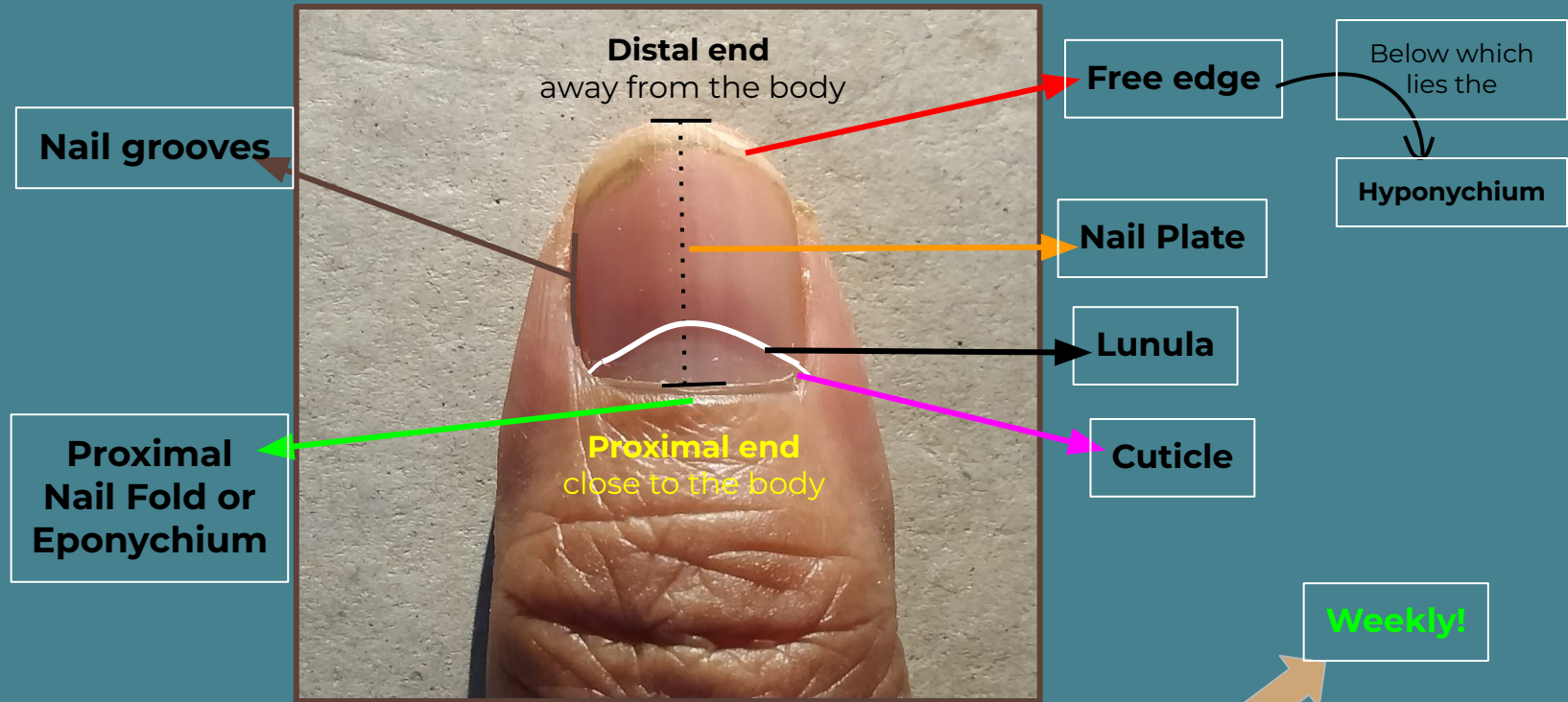
# Nail regeneration introduction

- What is regeneration?
  - Ability to grow back lost tissues/organs.
- Why study nail regeneration?
  - To understand the mechanism and factors regulating this limited regeneration capability in humans.
- Nail as a model system for regeneration.
  - Easy to observe, record, study and analyse.

# Why/how study Nail Regeneration?

- Helps to understand our physiology better and can be used as an indicator of health
- Just a **click of a photo** with consistency and follow-up with continuity
- Related to **frontier areas** of research
- Large subsets of sample size can be obtained
- Being our own model organism
- **Myths and beliefs** can be busted

# Structure of the human nail

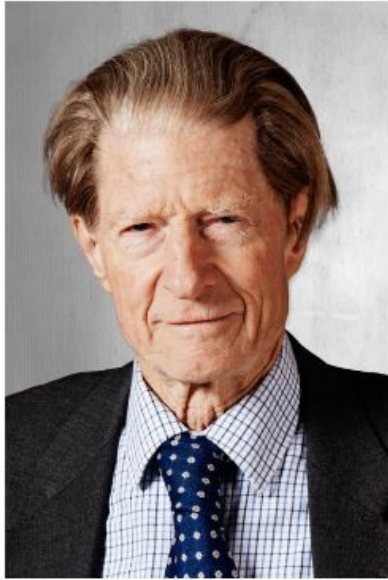


Nail growth is measured **from** the **proximal nail fold** **till** the **proximal end of the ink/henna mark**

Pic courtesy: Shirley Chawla

**Now you know!**

# The Nobel Prize in Physiology or Medicine 2012



© The Nobel Foundation. Photo: U. Montan

Sir John B. Gurdon



© The Nobel Foundation. Photo: U. Montan

Shinya Yamanaka

for their discovery that  
**mature cells** can be  
**reprogrammed** to become  
**pluripotent**



**Stem cell therapy**

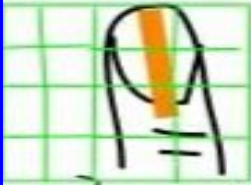


**Limb, Digit and organ  
regeneration**

Source: <https://www.nobelprize.org/prizes/medicine/2012/summary/>

# How to study the nail regeneration?

**1. Apply the henna/Mehandi mark on left hand index finger**



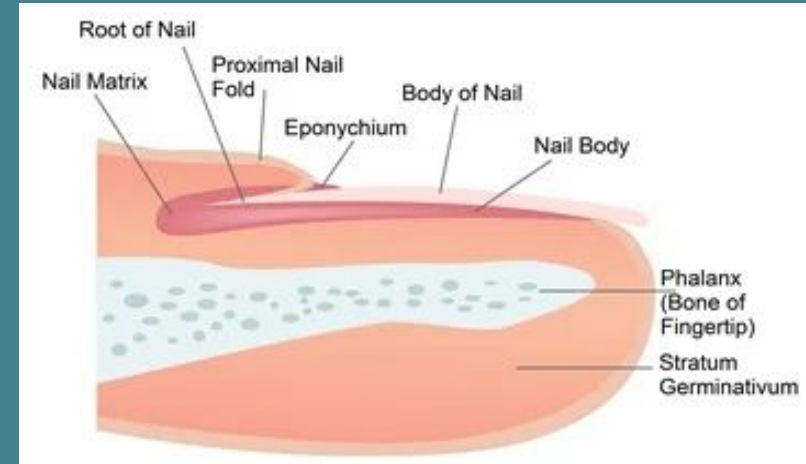

**Requirements**  
1. Mehendi cone

Best way to get the dark mark of the henna is to apply henna on the nail at night till the next morning

**Method to enhance the mark**  
-Mix the tea water in the mehendi and then apply on the nail.

**DOM: 24th June 2021**  
DOP: 24th June 2021  
Age  
Gender  
Name Code  
Name of data collector

**DOM: 24th June 2021**  
DOP: 01st July 2021  
Name code  
Age/Gender  
Data collector



**Pic courtesy:**

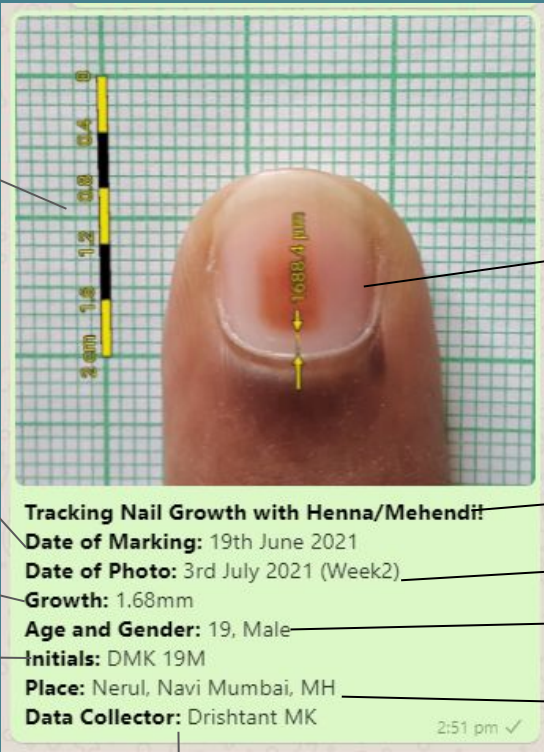
<https://www.jscimedcentral.com/Dermatology/dermatology-2-1008.php>

# PROTOCOL: Ink → Click → Share → Spread → Repeat!



**Requirements: Indelible ink or Henna/Mehendi, a ruler scale or a graph paper or a coin, a phone camera**

# How to study the nail regeneration?



**Reference scale**

**Start date**

**Our subjects' nail**

**Objective: The why?**

**DOP**

**Crucial for analysis**

**The Where?**

**The Who?**

**How far has the Nail mark travelled? ID of the data**

**Tracking Nail Growth with Henna/Mehendi!**

**Date of Marking:** 19th June 2021

**Date of Photo:** 3rd July 2021 (Week2)

**Growth:** 1.68mm

**Age and Gender:** 19, Male

**Initials:** DMK 19M

**Place:** Nerul, Navi Mumbai, MH

**Data Collector:** Drishtant MK

2:51 pm ✓

# Batul

Kolkata, WB

Number of observations: 27

Female: 16 | Male: 11

All via **voter's ink**



# Lakshmy

Thrissur, KL

Number of observations: 7

Female: 5 | Male: 2

All via **voter's ink**



# Seethalakshmi

Thrissur, KL

Number of observations: 6

Female: 5 | Male: 1

All via **voter's ink**



# Janani

Thrissur, KL

Number of observations: 1

Female: 1

Via **Henna**



# Aswathy

Thrissur, KL

Number of observations: 4

Female: 3 | Male: 1

Via **voter's ink**



# Ishita

Jorhat, AS

Number of observations: 1

Female: 1

Via **voter's ink**



# Objectives of the nail regeneration project:

## Questions:

1. What is the difference in the rate of nail regeneration b/w males and females?
2. Does estrogen affect the rate of nail growth and regeneration?
3. How is regeneration capability in humans affected by ageing?

# Female and Male nail comparison

## (different age comparison)

### Nail Regeneration In Males -

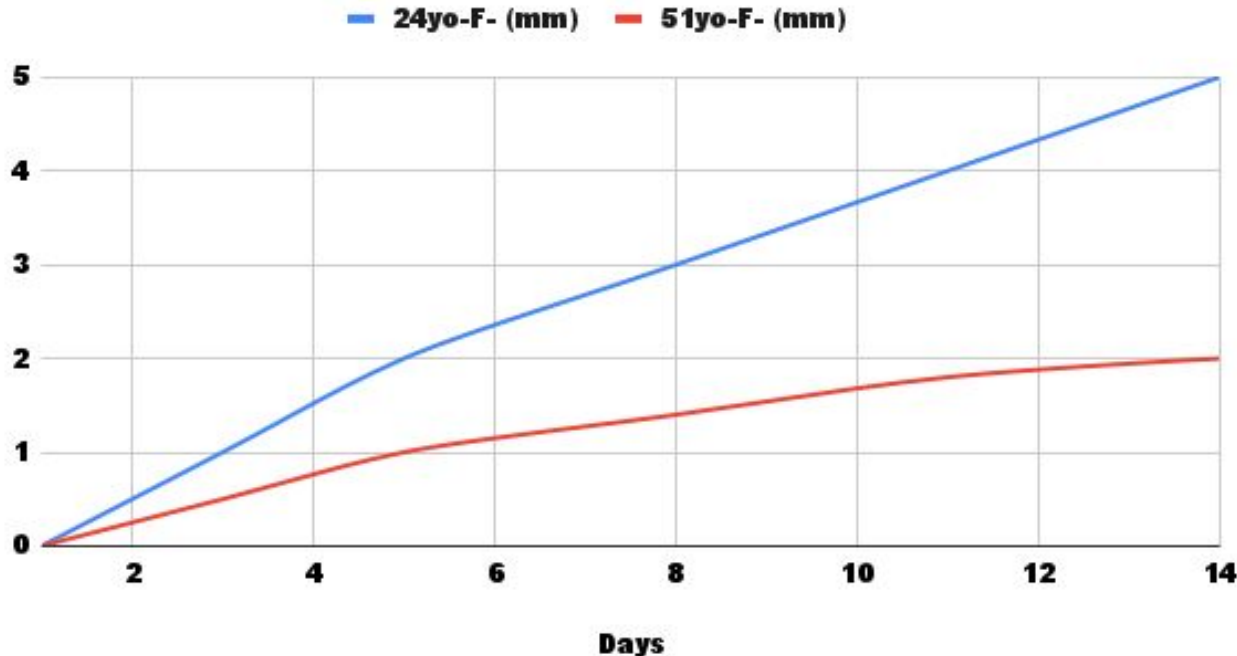
S.No	AGE (YRS)	GROWTH IN MICRONS	GROWTH IN MICRONS /DAY	MEAN FOR AGES 40-49	MEAN FOR AGES 50-65
1	42	2612.38 IN 5 DAYS	522.48	296.79 $\mu$	221.93 $\mu$
2	47	1353.93 IN 5 DAYS	270.79		
3	47	3300.00 IN 34 DAYS	97.10		
4	62	4800.00 IN 27 DAYS	177.78		
5	50	1454.00 IN 10 DAYS	145.40		
6	59	1901.57 IN 5 DAYS	380.31		
7	58	3500 IN 19 DAYS	184.21		

## Nail Regeneration In Females -

S.No	AGE (YRS)	GROWTH IN MICRONS	GROWTH IN MICRONS /DAY	MEAN FOR AGES 40-49	MEAN FOR AGES 50-65
1	44	2300.00 IN 14 DAYS	164.28	180.64 $\mu$	139.17 $\mu$
2	47	1000.00 IN 14 DAYS	71.43		
3	48	3500.00 IN 14 DAYS	250.00		
4	49	2300.00 IN 14 DAYS	164.28		
5	43	1776.00 IN 7 DAYS	253.71		
6	44	1124.86 IN 5 DAYS	224.97		
7	47	1222.15 IN 9 DAYS	135.79		
8	51	1975.90 IN 10 DAYS	197.60		
9	59	1103.79 IN 5 DAYS	220.76		
10	52	2107.80 IN 22 DAYS	95.80		
11	60	1872.65 IN 24 DAYS	78.00		
12	52	1600.00 IN 14 DAYS	114.29		
13	53	1800.00 IN 14 DAYS	128.57		

## Comparison of female nail's regeneration at different ages: (pre-menopause vs post-menopause)

24yo-F- (mm) and 51yo-F- (mm)



- Estrogen levels high In 24 year old female.
- Estrogen level declines post-menopause.
- Rate of Nail growth was almost double in 24-yo female.
- Suggests that Estrogen might be responsible for rapid nail regeneration.
- More datasets are required to perform Statistical tests for significance.

## Comparison of female nail's regeneration at different ages: pre-menopause (left) vs post-menopause (right)



Female-24 years old

Data compiled by: Alka Kushwaha, Allahabad, UP



Female-51 years old

Data compiled by: Enas Shirin, Tanda, UP

# conclusions

- **Nail can be a model system for Regeneration**
- **Rate of Nail Regeneration decreases with age**
- **Estrogen levels affect Rate of Nail Regeneration**
- **We need more Data, More Collaborators**

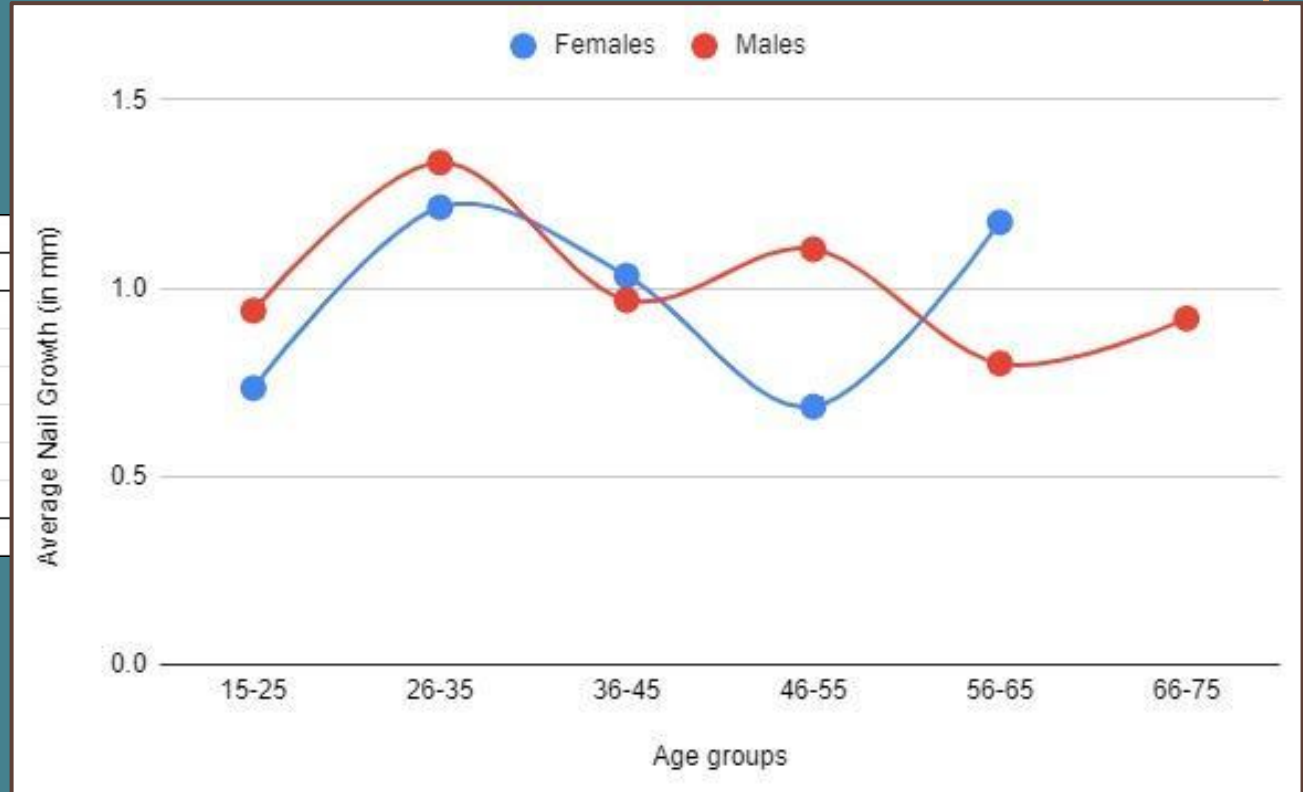
# Nail regeneration - context to curriculum map



# Let's celebrate goof-ups! How to plot graphs correct?

Graph from last year's CUBE National Meet!

Age groups	Tally	
	Female	Male
15-25	14	3
26-35	1	1
36-45	7	3
46-55	14	10
56-65	5	5
66-75	0	4
Total	41	26



# Thank you!

## **CUBISTS in Nail Regeneration project:**

- Smiti
- Misbah
- Enas
- Batul Pipewala
- Alka Kushwaha
- Shirley Chawla
- Ishita
- Lakshmy
- Seethalakshmi
- Janani
- Aswathy
- Lydia
- Rahul Kushwaha

## Please feel free to ask, suggest, discuss and join!