



## VIGYAN PATRIKA

### How would you explain your paper's key results to the non-scientific community?

The study is about the genetic regulators responsible for the barrier function of the skin. All organisms have a protective covering around them which isolates them from the surrounding. At the same time, it acts as an interface between the organism and its environment. In multicellular organisms, this covering is called skin. Evolution-driven environmental adaptation has resulted in various modifications in different organisms. For example, reptiles' skin is thick and covered with scales that protect them from dehydration and predators. On the other hand, human skin is thinner and contains hairs and sweat and oil glands. These structures keep the skin moist and help to maintain body temperature. One function that remains conserved irrespective of an organism and its environment is the barrier function of the skin. Skin provides a large surface area for the diffusion of toxins but also acts as the first line of defense. Therefore, maintaining skin structure and barrier function is very important. However, the genetic constituents that regulate skin barrier functions remains understudied.

For the study, we chose *Caenorhabditis elegans* (*C. elegans*) as a model system. Approximately 83% of *C. elegans* proteins have homologs to humans (Lai et al., Genome Research, 2000). *C. elegans* is a small nematode that feeds on bacteria in rotting vegetations.

# Skin- The genetics and it's transcription in *C.elegans*

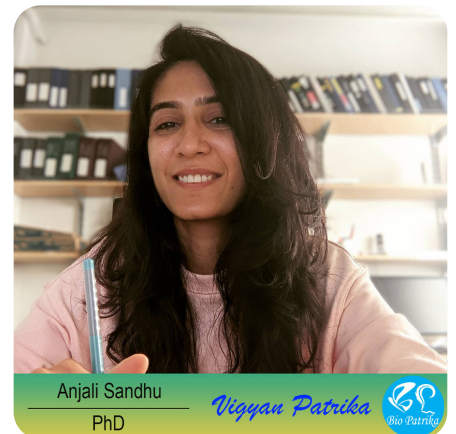
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Work done in Dr. Varsh Singh's lab, MRDG, Indian Institute of Science, Bangalore

While foraging, it can be exposed to environmental and bacterial toxins. Diffusion of toxins inside the body could cause stress to the body. Eventually leading to the death of the organism. Collagens are fibrous proteins that are present in human as well as *C. elegans*'s skin. There are approximately 177 collagen genes in *C. elegans*. We tested 91 collagens out of 177 for their requirement to maintain it's skin barrier function. We found 6 collagens that are essential for maintaining skin structure and function in *C. elegans*. In absence of either one of these collagens, enhanced skin permeability for exogenous molecules and decreased survival of *C. elegans* upon exposure to toxins such as paraquat, a herbicide. Our study suggests that these 6 collagens play an essential role in maintaining skin structure and barrier function.

### What are the possible consequences of these findings for your research area?

Skin barrier malfunction has been associated with several human diseases such as Gaucher's disease, Atopic dermatitis, Psoriasis, etc. *C. elegans* can serve as a tool to identify global regulators of skin function and structure. It can also be used to study skin's response to the infiltration of high molecular weight toxins such as commonly used herbicides and pesticides. *C. elegans* collagen defective animals can further be used to study wound healing in the skin, keloid formation, and fibrosis in barrier function compromised conditions.



Anjali Sandhu was born in Haryana. Her achievements are results of the hardships and strength that she possess. She finished her schooling from Delhi and went onto pursue Biology major from Maharani College, Rajasthan. Due to the financial crisis in her family, she gave tutions in evening and pursued her college studies during the daytime. It's during this time in her graduation she developed interest in science and the unknown. Despite her struggles she enrolled for an integrated Ph.D. programme at IISC, Bangalore. Slowly the hardships took the backseat and her journey from unknown to known became the reality. The upbringing of her parents as she remembers gave her strength to be independent and pursue her dreams where as her failures made her stronger. She wants to inspire and guide other girls/women in similar or other hardships through her work. She says "one step at a time is enough to take one near to their goals". All the struggles in life made her what she is today and as she says "I would not want to change anything in my life" with pride and sparkle in her eyes, Anjali Sandhu completes her interview.

### What was the exciting moment (eureka moment) during your research?

Research planning requires immense amount of time and effort. Most time goes into setting up, and optimizing an experiment. A well-designed experiment's success thus comes with an immense satisfaction no less than a eureka moment. One such moment was when we see transcriptional playing it's role and all our efforts showing the expected result To identify transcriptional regulators of permeability collagens in *C. elegans*, we decided to do a large-scale RNAi screen for transcription factors. It was challenging because first, we did not have all the transcriptional RNAi clones in our library, and on top of that some of the clones did not grow. Secondly, RNAi efficiency can vary from gene to gene. So, I was not sure if we will find anything. Thankfully, our hard work paid off when we found three hits. We tested the these hits and identified at least one of the transcriptional factors as a major regulator of permeability determining collagens expression. I felt wonderful and relieved at that moment.

### What do you hope to do next?

In the future, we would like to study how *C. elegans* sense and reponed to skin defect. Animals defective in any of the permeability determining collagens, surprisingly, show better survival under specific conditions. This suggests that *C. elegans* can sense defects in the skin and responds to them by initiating a defense mechanism. In mammals, skin barrier function defect-associated diseases such as atopic dermatitis are shown to be linked to increased inflammation which is one of the defense mechanisms to respond to skin injury. *C. elegans* collagen defect-associated defense activation gives us an opportunity to find potentially conserved factors that regulate skin stress response in humans and *C. elegans*.

### Where do you seek scientific inspiration?

Inspiration is all around us. All we have to do is to keep the curiosity in us alive and have an open mind.. It is in the people we love, care, sympathize with inspire you to be a better version of yourself, It comes when we take a minute to broaden our horizons of thoughts. Understanding the science behind a phenomenon or disease in order to improve the quality of life for everyone keeps me going.

In response to a shooting star, some people close their eyes and make a wish. But those who keep their eyes open might discover the sword of curiosity and walks to the hidden world of nature by simply asking what, why, and how. That's the motto I work with.

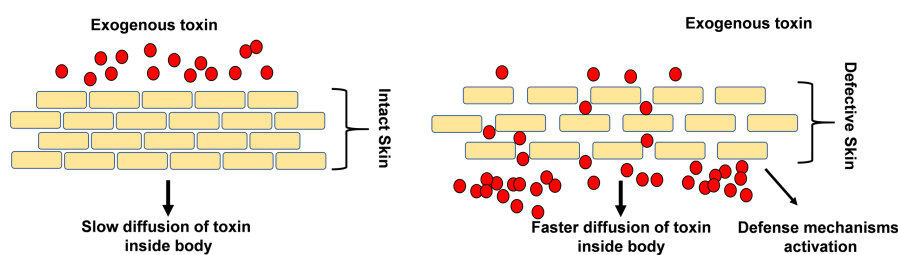
“*C. elegans* can serve as a tool to identify global regulators of skin function and structure”

### How do you intend to help Indian science improve?

Society progresses with the exchange of scientific knowledge within and among communities. India needs good scientists and entrepreneurs to develop and flourish. We need role models who can inspire the young generation and create new opportunities, platforms, and resources. With no big promises, I hope to be someone who can guide the young generation and cultivate new ideas. If my work could ever inspire or change a single life for good, it all be worth it.

### Reference

**Anjali Sandhu**, Divakar Badal, Riya Sheokand, Shalini Tyagi, Varsha Singh, Specific collagens maintain the cuticle permeability barrier in *Caenorhabditis elegans*, *Genetics*, Volume 217, Issue 3, March 2021, iyaa047, <https://doi.org/10.1093/genetics/iyaa047>



Skin as the first line of defense