“अवसर” पुरस्कार

पीएचडी श्रेणी में लोकप्रिय विज्ञान लेखन के लिए एक लाख रुपये, वर्ष 2019 का प्रथम पुरस्कार

सुश्री एस. क्रिस फेल्शिया
सीएसआईआर – केंद्रीय वर्ग अनुसंधान संस्थान, चेन्नई को

उनके लेख “बैसी: द फाइट फॉर अर्थ” के लिये

28 फरवरी, 2020 को राष्ट्रीय विज्ञान दिवस के अवसर पर आयोजित समारोह में प्रदान किया जाता है

“AWSAR” AWARD

First Prize of Rupees One Lakh for Popular Science Story under PhD Category for 2019 to

Ms. S. Chris Felshia
CSIR - Central Leather Research Institute, Chennai

For her Story “Baci: The Fight for Earth”

Given on 28 February, 2020 at a function organised to celebrate the National Science Day.

प्र. आश्वत्तोष शर्मा / Prof. Ashutosh Sharma
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This article is based on the research article entitled “Efficacy of free and encapsulated Bacillus *lichenformis* strain SL10 on degradation of phenol: A comparative study of degradation kinetics” *Journal of environmental management, Elsevier Publishers*

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Baci: THE FIGHT FOR EARTH

Preface:

*Environmental pollution is the greatest challenge which the world is facing today. This story is about Baci who lived a happy and joyous life with his family and all of a sudden he lost his peaceful life due to the emergence of machines. Let us see in this story about how he fights back and restores the environment.*

Story:

Hi there, do you see me? I am Baci. I mean that’s what my friends used to call me anyway. My parents named me Bacillus SL10 (Fig 1). I know, great name right! Wait till you hear my sister’s name, Bacillus MCG03. Laughter fest, am I right?

Anyways, I wanted to tell you my life story – don’t worry; it is not an artless story. It is a tale filled with bad guys, goblins, chemicals, and nutrients but most importantly it is full of passion and determination. Yes, you heard it right. Let me spin you this tale of yonder, one where the good guy wins in the end!

![Fig 1: Bacillus SL10](image)

**Chapter I: My Beautiful Home**
Long long ago, I lived in this beautiful place called Earth. It was so beautiful that whenever I close my eyes, I can still picture it. I used to love to play under the sun with my sister and my friends all through the day. Life was so happy and carefree.

Chapter II: The change in my life

It all changed on that fateful day. That dark and dreadful day machines came into use, industrialization, use of chemicals for almost everything to ease the difficulties of mankind. From these buildings dark colour water came gushing out. In a matter of days, all the trees were gone, the rivers and lakes became murky and black, the swans couldn’t swim in the lake, the fish died and so did the animals. The sky wasn’t blue anymore; only a black layer of smoke was all that existed!!

As the days went by, things became even worse. I couldn’t find my friends. Our parents locked us in our home for fear of capture or even death! There was no more food to eat or water to drink because it was all polluted. And I was not able to believe my eyes when my sister and I became so sick that we couldn’t play together anymore. I was so scared. The reason why we became sick was because of the chemicals and gases let out from the industries. The most commonly let out chemical was phenol and its derivatives.

These phenolic compounds were the chemicals of major concern. They tend to persist in the environment over a long period of time. Due to its recalcitrant nature, it accumulates and exerts toxic effect on human and animals. Chlorophenols are still being used as pesticides, fungicides, bactericides, herbicides, in agricultural sectors, paint paper industry etc. These compounds are carcinogenic in nature and also toxic even at very low concentration. These compounds are mostly synthesized in the industries and are being let out into the water bodies which in turn affect the land and the water system. These are listed as priority pollutants by United States Environmental Protection Agency (USEPA) and the European Union. They contaminate air, water and land and known to be a major source of destruction to mankind.

We ran for our lives!!!
Bam! It happened like magic!

We met Chris!

She came one day, dressed all in white with a big ladle in her hand. She scooped us all up in one scoop and took us all to the fairyland. This place was magical. There were many people like her there, dressed in white and moving about with purpose. Chris introduced herself to us and told us that we too have a purpose.

“Do you mean to say that I too have a purpose?” I asked her curiously.

“Yes, you do”, she said, with the warmest smile. Then without batting an eyelid, she looked at me and said, “Your help is definitely needed to save Earth!”

**Chapter IV: One Part Purpose + One Part Determination**

Chris and I became the best of friends. We spent hours together in something called an airflow chamber, busy at work. It was so cool in there because of the air that flows through it constantly. I can breathe better now because of the safe and clean air.

We take long lunch breaks too. Chris gives me something called agar where we sat and ate (which to be honest sounds funny). Then I spent hours in an incubator – Chris says I need my ‘strong-woman’ sleep. She teaches me these cool moves to fight the giant, dreadful chemicals which are let out from the industries. The waste water released from these industries contains high amounts of something called phenol and that’s why my beautiful home was ruined.

Chris says I have the power to fight the phenol and phenolic compounds.

She calls me her secret weapon. I believe it’s true. You see, I have something called a hungry belly – I eat away the benzene ring that is attached to the hydroxyl group of these phenol and phenolic compounds, and when I do this, the bad things die.

The reason I eat phenolic compounds is because I have a protein which is synthesized in my body called the catechol 2,3 dioxygenase enzyme, the amount which is synthesized in my body is 0.5mU
(mU is nothing but 1 nanomole of enzyme being produced per min). It gives me special power to eat the phenols.

Chris confirmed the presence of these non toxic compounds through a machine known as high pressure liquid chromatography, where she injected some samples from our flask !!she got some sharp peaks which she confirmed with standard compounds obtained from shops nearby.

Phenol became my favourite meal and I was able to eat 2000 mg/L.

Huge amount!! I m going to put weight 😊

Baci: Chris the amount which I m eating,”Will it be enough to clean all the phenols present in the waste water”?

Chris: No Baci! No way ~what a question?

Baci: How much of phenol is actually present in wastewater Chrisyy?

Chris: Around 5000 mg/L!! Bam!!

Baci: Whoa!! That’s a lot

Baci: Okay fine give me somemore phenol I can try Chrisyy~ my mission is to kill these compounds! ‘Environment destroyer’ (Angry tone) !!!

Chris: Okay !! Baci “from tomorrow I will give you 3000 mg/L”, I will put you in incubator with an rpm of 150, this will help you move around with ease, you will get sufficient air, where you can eat and sleep!!

Next day …..

Chris Called “Baci!! ‘Get ready’ I m giving 3000 mg/L”

Okay common let’s do it Chrisy!! Baci shouted
Baci: Chris it’s suffocating!!!, please “STOP”, I’m getting burning sensation on my skin “Please pour water”!!!

Even a little higher concentration of phenol is making us sick. We were not able to tolerate this and their presence irritated our skin and we got rashes and wounds.

So we told Chris to help us solve this problem. The same day, Chris and her team had a meeting where they had an intense discussion about how to solve this delicate issue of eradicating the higher concentration of phenol without hurting us!!

Next day One research scholar in Chris’ team asked why don’t we give them a shield?

Chris was like what shield?!? like the “Armor and sword during battle”?

Chris friend told yes, we can cover them with whey protein and then put them inside phenol. It will protect their body from burning sensation.

Even I was excited!! It’s like getting a new dress. Chris and her team called this process as encapsulation.

Finally Chris encapsulated us using whey protein; it was all white (Fig 2)!! Slimy and felt good at once. We felt safe and sound inside the encapsulated surface; it protected us from phenol giving us a cooling effect we were able to eat around 3000 mg/L within 96 h lethargically.

![Encapsulated Baci in whey protein](image)

“‘The end product obtained was water and Carbondioxide.’”

We accomplished!! We were very happy!! Chris and her team were also happy
And that’s how we are helping to save our earth. Together with Chris, I am saving my home by destroying one phenol compound at a time! The overall graphical representation is given in Fig 3.

Fig3. Overall graphical representation of degradation by Baci.