

An Indian-Australian research partnership

**Project Title:**

**Probing structure and recognition dynamics of proteins from SCF complex ubiquitin ligase**

**Project Number**

**IMURA0728**

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**IITB Department:**

Biosciences and Bioengineering

**Research Clusters:**

**Research Themes:**

**Highlight which of the Academy's CLUSTERS this project will address?**  
*(Please nominate JUST one. For more*

**Highlight which of the Academy's Theme(s) this project will address?**  
*(Feel free to nominate more than one. For more*

information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a> )		information, see <a href="http://www.iitbmonash.org">www.iitbmonash.org</a> )	
1	<i>Material Science/Engineering (including Nano, Metallurgy)</i>	1	<i>Advanced computational engineering, simulation and manufacture</i>
2	<i>Energy, Green Chem, Chemistry, Catalysis, Reaction Eng</i>	2	
3	<i>Math, CFD, Modelling, Manufacturing</i>	3	<i>Infrastructure Engineering</i>
4	<i>CSE, IT, Optimisation, Data, Sensors, Systems, Signal Processing, Control</i>	4	<i>Clean Energy</i>
5	<i>Earth Sciences and Civil Engineering (Geo, Water, Climate)</i>	5	<i>Water</i>
6	<i>Bio, Stem Cells, Bio Chem, Pharma,</i>	6	<i>Nanotechnology</i>
7	<i>Food</i>	7	<i>Biotechnology and Stem Cell Research</i>
8	<i>Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng HSS, Design, Management</i>		<i>Humanities and social sciences</i>

### The research problem

Ubiquitin-dependent proteolysis machinery regulates protein abundance and in turn serves as a central regulatory function in many biological processes. The SCF (Skp1-Cullin-F-box protein) complex ubiquitinates a broad range of proteins involved in cell cycle progression, signal transduction and transcription. In SCF complex, Skp1 is an adaptor protein, which directly interacts with F-box proteins and cullin-1. This complete assembly is responsible for targeting proteins for the ubiquitin-mediated degradation. Different SCF complexes vary in their F-box proteins, which are specific for the ubiquitination of their substrate proteins. Therefore, understating of structural basis of recognition of F-box and functionality of different proteins is crucial for delineating their role in the cell cycle regulation. In this project, we will explicate structure, dynamics and protein-protein interactions of skp1, F-Box proteins using various biophysical and biochemical approaches. Such information will be crucial for designing specific drug for a particular type of cancer.

### Project aims

To understand atomic resolution structure and dynamics of proteins involved in the SCF complex, and thereby understanding the mode of regulation and recognition.

### Expected outcomes

Project will provide exact insight into binding surface of Skp1 to F-box protein, which is an important druggable surface for anti-cancer drugs.

To achieve this we have following objectives:

**Specific objectives.** We have following specific objectives:

**Objective 1:** *To overexpress/co-express and purify Skp1, Fbox, and Cull<sub>N-ter</sub>*

**Objective 2:** *Binding kinetics and energetics studies of Skp1, Cull<sub>N-ter</sub>, and Fbox proteins*

**Objective 3:** *Characterization of structure and dynamics of Fbox-Skp1, and Skp1- Cull<sub>N-ter</sub>, Fbox-Skp1-Cull<sub>N-ter</sub> complex*

**How will the project address the Goals of the above Themes?**

*Deducing three dimensional structure and dynamics will provide detail insight into druggable surface of the SCF complex, which will be crucial for drug design.*

**Capabilities and Degrees Required**

Eligibility :

- 1) BM.Tech or MSc in Biotechnology/ Biochemistry/ Chemistry or (Master's degree is preferred)
- 2) Should have Maths/Physics and Chemistry in 10+2 standard
- 3) Should be sound in English (speaking and writing)
- 4) Should have passed at least any one national level test like GATE, CSIR NET, UGC  
NET, DBT BET
- 5) Should be physically fit

**Potential Collaborators**

*Please visit the IITB website [www.iitb.ac.in](http://www.iitb.ac.in) OR Monash Website [www.monash.edu](http://www.monash.edu) to highlight some potential collaborators that would be best suited for the area of research you are intending to float.*