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inStem develops molecular sensor to identify cancer drugs

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The tyrosination sensor is the first tubulin nanobody - or sensor - that can be used to study the dynamics of microtubule modifications in living cells.



Researchers from inStem in Bengaluru, in collaboration with Curie Institute, Orsay, France, funded by Indo-French Centre for the Promotion of Advanced Research (IFCPAR/CEFIPRA), a bilateral organization supported by Department of Science & Technology (DST), Government of India and Government of France, have recently developed a molecular sensor, which can identify cancer drugs by detecting how such chemicals modify microtubules inside living cells.

Microtubules are part of the cytoskeleton, a structural network within the cell's cytoplasm, and they alter in response to several chemicals.

Understanding tubulin modifications has remained a challenge till date because of unavailability of tools that can mark them in living cells, researchers decided to overcome this shortcoming and developed the first tubulin nanobody - or sensor to study the dynamics of microtubule modifications in living cells and use this for identification of new cancer therapeutic drugs. This work has been recently published recently in the *Journal of Cell Biology.*

The researchers from Bangalore and Orsay devised a method to design synthetic proteins, known as nanobodies, which can bind specifically to modified microtubules. These nanobodies are similar to antibodies made in our body as a defense mechanism against pathogens. However, unlike antibodies, the nanobodies are smaller in size and easily amenable for protein engineering. The nanobody was then coupled with a fluorescent molecule to serve as a detection tool, called sensor.

They developed and validated a live cell sensor against a unique microtubule modification called tyrosinated form of microtubules that is already known to be important for cell division and intracellular organization.

The tyrosination sensor is the first tubulin nanobody - or sensor - that can be used to study the dynamics of microtubule modifications in living cells. CEFIPRA researchers have shown the application of this sensor in studying the effect of small-molecule compounds that target microtubules. These chemicals are frequently used as anti-cancer drugs. Thus, the tyrosination sensor will facilitate studying microtubule functions for many researchers and will aid identifying new drugs of therapeutic value.