National Institute of Technology Rourkela

Progress Seminar

Seminar Title	: Deciphering the role of NRF2-activating compound in autophagy-dependent NLRP3 inflammasome inhibition in oral cancer
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Supervisor	: Prof. Sujit Kumar Bhutia
Venue	: LS Seminar Room
Date and Time	: 21 Feb 2025 (4.30PM)
Abstract	: Phytochemicals are well known for their potent antioxidant properties, which play a crucial role in protecting cells from oxidative stress induced by reactive oxygen species (ROS). Among various medicinal plants, *Bacopa monnieri* has gained significant attention for its cognitive-enhancing and antioxidant properties. These effects are primarily attributed to its rich composition of bioactive compounds, including bacosides, flavonoids, and phenolic acids. Recent studies highlight the role of these phytocompounds in modulating key cellular signaling pathways, particularly the nuclear factor erythroid 2&ndashrelated factor 2 (NRF2) pathway, which regulates the expression of antioxidant and cytoprotective genes. Notably, recent findings demonstrate an intricate crosstalk between autophagy and NRF2 signaling, emphasizing their synergistic role in cellular defense mechanisms. In this context, bacosine&mdasha flavonoid derived from *Bacopa monnieri*&mdashhas been shown to mitigate ROS production and enhance the activation of NRF2 along with its downstream targets. Furthermore, bacosine effectively reduces arecoline-induced ROS production while promoting autophagic activity. Specifically, bacosine treatment increases LC3 puncta formation, facilitates autophagosome-lysosome fusion, and enhances lysosomal activity, ultimately inducing autophagic flux.Interestingly, the role of NRF2 in bacosine-induced autophagy was confirmed using both pharmacological inhibition (ML-385) and genetic suppression (siNRF2), both of which attenuated autophagic responses in oral cancer cells. Additionally, bacosine was found to suppress arecoline-induced inflammasome activation, further reinforcing its cytoprotective potential. Beyond its role in redox balance and autophagy, bacosine was also observed to promote mitochondrial biogenesis via the NRF2-PGC1-&alpha-TFAM axis, highlighting its broader impact on cellular homeostasis.