

PLENARY PRESENTATIONS

MOLECULAR DIALOGUES BRIDGING ONCOLOGY AND ENVIRONMENT: THE TRANSDISCIPLINARY ROLES OF AHR AND ACHE

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Persistent toxic substances, such as classical dioxins and emerging dioxin like compounds, pose significant cancer risks, yet the molecular circuitry linking environmental exposure to tumorigenesis or tumor progression remains unclear. Aryl hydrocarbon receptor (AhR) serves as a critical environmental sensor of dioxins, while acetylcholinesterase (AChE) is increasingly recognized as a non-classical player in neuronal and carcinogenic processes. This talk will elucidate how AhR and AChE form a molecular bridge connecting environmental chemistry, tumor biology, and pharmacology.

We demonstrate that AhR activation by 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) transcriptionally suppresses neuronal AChE via dioxin-responsive elements, revealing a novel neurotoxicity mechanism. Expanding on this, our recent studies uncover AhR's dualistic roles in tumor progression: inducing the tumor suppressor IL24 to inhibit migration in glioblastoma, while promoting directional migration via axon guidance pathways in neuroblastoma. Furthermore, pan-cancer analysis reveals significantly altered AChE expression across malignancies with dual prognostic significance, positioning AChE as a potential biomarker in cancer neuroscience.

Collectively, these findings establish a sophisticated molecular dialogue between environmental triggers and cellular fate. By integrating environmental toxicology with cancer biology, we provide a transdisciplinary framework to understand how xenobiotic signaling reshapes the tumor microenvironment via the AhR and/or AChE, offering insights for precision pharmacology and novel anti-tumor interventions.