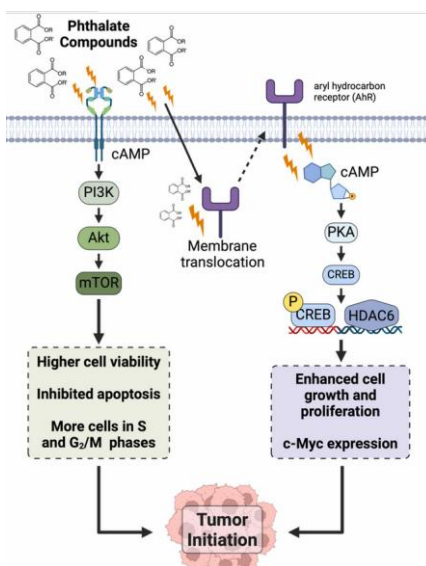


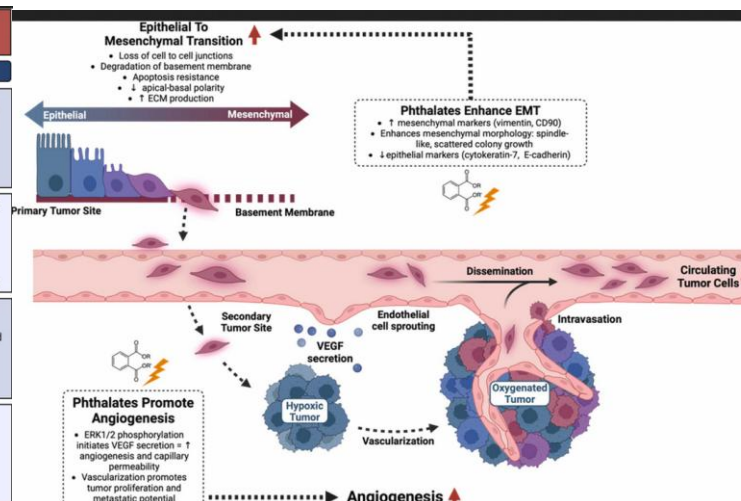
Review

Endocrine disruption to metastasis: How phthalates promote breast carcinogenesis

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Phthalates and Cancer Progression		
Phthalate	Observed Effect	Biological Mechanism
butyl benzyl phthalate di(2-ethylhexyl) phthalate dibutyl phthalate	Estrogenic Activity	↑ proliferation via PI3K/AKT ↓ apoptotic signaling Demethylation of ESR1
di(2-ethylhexyl) phthalate	Drug Resistance Mediation	Ahr targeting involved in drug inactivation and efflux, and drug target alterations via cytochrome P450 enzyme activation ↑ Intracellular Bcl-2:Bax ratio
mono-n-butyl phthalate mono(2-ethylhexyl) phthalate di(2-ethylhexyl) phthalate dibutyl phthalate	Metabolic Dysfunction	Oxidative stress, ↑ ROS causing DNA damage and lipid peroxidation Warburg effect?
butyl benzyl phthalate di(2-ethylhexyl) phthalate dibutyl phthalate	Enhanced Stemness	Upregulation of sonic hedgehog pathways and ΔNp63a ↑ tumorsphere formation capability and cancer stem-cell markers



INITIATION

PROGRESSION

PROMOTION

<https://www.reseau-environnement-sante.fr/wp-content/uploads/2025/12/Endocrine-disruption-to-metastasis-Tiburcio.pdf>