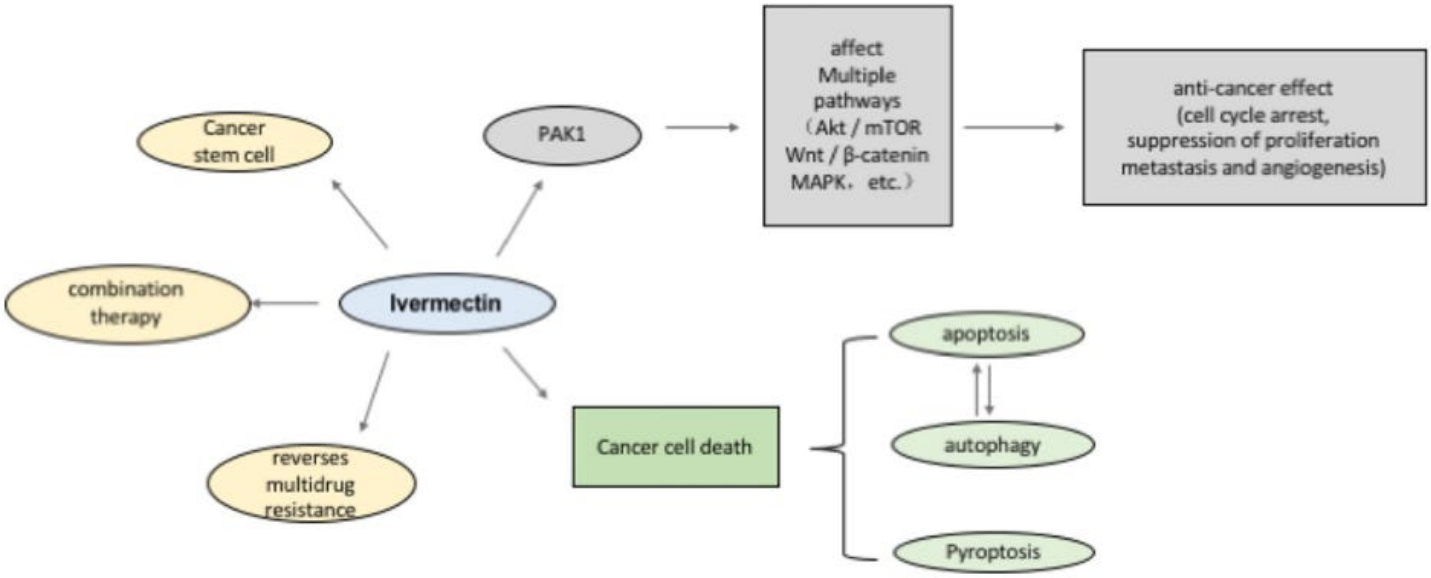
Actions of Ivermectin on Cancer



The Mechanisms of Ivermectin on Cancer. Ivermectin has powerful antitumor effects, including the inhibition of proliferation, metastasis, and angiogenic activity, in a variety of cancer cells. This may be related to the regulation of multiple signaling pathways by ivermectin through PAK1 kinase. On the other hand, ivermectin promotes programmed cancer cell death, including apoptosis, autophagy and pyroptosis (i.e., cell death that releases pyrogenic cytokines via caspase-1). Ivermectin induces apoptosis and autophagy is mutually regulated. Interestingly, ivermectin can also inhibit tumor stem cells and reverse multidrug resistance, multidrug resistance and exerts the optimal effect when used in combination with other chemotherapy drugs.

Abbreviations: ASCA= poptosis-associated speck-like protein containing a CARD; ALCAR = acetyl-L-carnitine; CSCs = Cancer stem cells; DAMP = Damage-associated molecular pattern; EGFR = Epidermal growth factor receptor; EBV = Epstein-Barr virus; EMT = Epithelial mesenchymal-transition; GABA = Gamma-aminobutyric acid; GSDMD = Gasdermin D; HBV = Hepatitis B virus; HCV = Hepatitis C virus; HER2 = Human epidermal growth factor receptor 2; HMGB1=High mobility group box-1 protein; HSP27 = Heat shock protein 27; LD50 = median lethal dose; LDH = Lactate dehydrogenase; IVM = Ivermectin; MDR = Multidrug resistance; NAC = N-acetyl-L-cysteine; OCT-4 = Octamer-binding protein 4; PAK1 = P-21-activated kinases 1; PAMP = Pathogen-associated molecular pattern; PARP = poly (ADP-ribose) polymerase; P-gp = P-glycoprotein; PRR = pattern recognition receptor; ROS = Reactive oxygen species; STAT3 = Signal transducer and activator of transcription 3; SID = SIN3-interaction domain; siRNA = small interfering RNA; SOX-2 = SRY-box 2; TNBC = Triple-negative breast cancer; YAP1 =Yes-associated protein 1. Source: Tang, 2021; https://www.sciencedirect.com/science/article/pii/S1043661820315152#