

Cytotoxicity of 13 South African Macrofungal Species and Mechanism/s of Action against Cancer Cell Lines

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Abstract : Macrofungi have been used for the past two thousand years in Asian countries, and more recently in Western countries, for their medicinal properties. Biological activities include antimicrobial, antioxidant, anti-inflammatory, antidiabetic, anticancer and immunomodulatory to name a few. Several biologically active compounds have been identified and isolated. Macrofungal research in Africa is poorly documented and to the best of our knowledge non-existent. South Africa has a rich macrofungal biodiversity, which includes endemic and exotic macrofungal species. Ethanolic extracts of 13 macrofungal species, including mushrooms, bracket fungi and puffballs, were prepared and screened for cytotoxicity against a panel of seven cell lines, including A549 (human lung adenocarcinoma), HeLa (human cervical adenocarcinoma), HT-29 (human colorectal adenocarcinoma), MCF7 (human breast adenocarcinoma), MIA PaCa-2 (human pancreatic ductal adenocarcinoma), PC-3 (human prostate adenocarcinoma) and Vero (African green monkey kidney epithelial) cells using MTT. Cell lines were chosen according to the most prevalent cancer types affecting males and females in South Africa and globally, and the mutations they contain. Preliminary results have shown that three of the macrofungal genera, i.e. Fomitopsis, Gymnopilus and Pycnoporus, have shown cytotoxic activity, ranging between IC₅₀ ~20 and 200 µg/mL. The molecular mechanism of action contributing to cell death investigated and being investigated include apoptosis (i.e. DNA cell cycle arrest, caspase-3 activation and mitochondrial membrane potential), autophagy (i.e. acridine orange and LC3B staining) and ER stress (i.e. thioflavin T staining and caspase-12) in the presence of melphalan, chloroquine and thapsigargin/tunicamycin as positive controls, respectively. The genus, Pycnoporus, has shown the best cytotoxicity of the three macrofungal genera. Future work will focus on the identification and isolation of novel active compounds and elucidating the mechanism/s of action.

Keywords : cancer, cytotoxicity, macrofungi, mechanism/s of action

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