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Key Words: cancer cell proliferation, intestine, liver and bladder cancers, anticancer phytochemicals, apoptosis, molecular mechanisms in chemoprevention.

Abstract: Our research group is studying the anticancer activity of phytochemicals contained in alimentary plants and seeds. When not commercially available, phytochemicals are purified by chromatography techniques and tested on tumor cell lines, derived from the organs, which are first sites of absorption, metabolism and accumulation. The anticancer effect is studied in dose-response cytotoxicity tests ,aimed at establishing the window of active concentrations. The apoptotic or antiproliferative mechanism is studied at molecular level by flow cytometric analysis and RTqPCR as well as by caspase activity assay. Synergism is searched among phytochemicals and conventional anticancer drugs, for reducing toxic side effects in normal cells. In the last two years, attempts were performed to obtain cancer stem cells (CSC) and mammosphere by enrichment of cancer cell lines, which contain a certain percentage of CSC. The aim of this approach is to test cytotoxic activity of natural or chemically modified phytochemicals on CSC in vitro. After that, the focus of our research is the in vivo approach, through administration of the drugs in knock-out or nude mice, where a tumor xenograft has been induced by CSC injection. An interesting application is also the discovery of those phytochemicals, which are able to target both the bulk of overproliferating cancer cells and the CSC.

- Two main references:
- **Vitexin-2-O-xyloside, raphasatin and (-)-epigallocatechin-3-gallate synergistically affect cell growth and apoptosis of colon cancer cells.** Papi,A., Farabegoli,F., Iori,R., Orlandi,M., De Nicola,G.R., Bagatta,M., Angelino,D., Gennari,L. and Ninfali,P.: 2013c, , *Food Chemistry.* **138,** 1521-1530.
- **'Phytochemicals as Innovative Therapeutic Tools against Cancer Stem Cells'.** Scarpa,E.S. and Ninfali,P.: 2015, *International Journal of Molecular Sciences.* **16,** 15727-15742.