Plant based therapies to prevent/treat cancer


“…prejudice and insufficient credible, reproducible research have impeded the research of plant based compounds for use by cancer patients. More care from both investigators and reviewers in designing and publishing studies is essential to come to a consensus on the efficacy and safety of plant based compounds.”

Approximately a quarter of the medications used in modern medicine, including over 100 prescription drugs, are from plants. Well-known examples are aspirin, which comes from the willow bark, pilocarpine from a Brazilian shrub, digitalis from foxglove, and curare from plants along the Orinoco River in South America. Plants are able to synthesize complex chemicals that laboratories cannot readily synthesize. Anti-tumor agents derived from plants include taxol from the yew, demecolcine and colchicine from the crocus, etoposide from mandrake, vinblastine and vincristine from periwinkle, podophyllotoxin from Linum spp., among others [1].

The design of plant extract studies should be rigorous and carefully thought out.

Patients use plant remedies to prevent cancer, to treat the symptoms of cancer and side effects of treatment, and even to treat cancer. Plant based therapies include single chemicals extracted from the plant, multiple chemicals within the plant, or part of a plant. As mentioned earlier, there are numerous credible successes in the treatment of human disease with single compounds extracted from plants. There are few successes with extracts of multiple compounds, or with part of a plant. As such, plant extracts or part of a plant are often considered nontraditional, or alternative medicine, treatments. Such alternative treatments are variably described as herbal or botanical, the difference being that an herb generally refers to a plant that does not have bark while botanical includes roots, leaves, bark and berries.

Green tea, similar to fresh fruits and vegetables, contains antioxidants with chemopreventive properties, and the anti-proliferative properties of soy, red clover and grape seed extract may come from the mixed estrogen agonist/antagonist activity of phytoestrogens [2]. Resveratrol has potent anticancer properties [3]. Some herbal therapies, such as Maitake mushroom and ginseng, are used to boost the immune system during radiation and chemotherapy. To treat hot flashes induced by cancer treatment, women often use black cohosh, soy or red clover [2].

Our current knowledge of how and when to use plant extracts to prevent or treat cancer is limited. Many publications that assess the role of plant extracts in cancer prevention and treatment end with statements similar to the following: “…conclusions as to the potential therapeutic application of green tea are currently impossible to make owing to the small number of studies conducted, the lack of any clinical trial evidence, the lack of a consistent dose–response relationship, and the potential for interaction with standard care” [4]. Research on the use of plant extracts and cancer is a relatively new field and plagued with unique problems. We will discuss some of the problems specific to studying plant extracts, and recommend steps that investigators and reviewers can take to overcome them.

The active ingredient(s) of most plant extracts are unknown or poorly understood. Marker compounds that are reliably present in the extract serve for quality...
control, but often there is no evidence that these compounds are responsible for therapeutic effects. Plant extracts contain a milieu of many chemicals, and while we may know the biological activities of some of the chemicals, certain chemicals have more mechanisms than we are aware of, and others have activity that we are not yet aware of. It is likely that the biologic activity of extracts is in part related to the coexistence of the chemicals, and therefore studying each chemical separately may not provide an accurate reflection of the activity of the extract. The question of metabolites further complicates the picture. Is it the parent compound, or one or more metabolites, that is active? “…there is still a vital question to be addressed, which is whether resveratrol itself can accumulate to bioactive levels in target organs. Opposing results and controversies involving the available data are leading to the suggestion that the function of resveratrol metabolites remains a mystery” [5].

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Some investigators fail to monitor the quality and consistency of plant extract preparations, or to report the source or formulation of the plant extract. For example, most black cohosh studies used the product Remifemin®. Several years ago, the manufacturer changed the formulation from an ethanolic to an isopropanolic extract. Since the marker compounds – deoxyactein, actein (S), actein (R) and cimiracemoside A – vary depending on preparation [6] and are not detectable in this new formulation [7], we cannot draw conclusions regarding the new Remifemin or other black cohosh preparations from studies conducted on the old Remifemin preparation. Second, although failing to report the source and formulation of test agents is a serious deficiency, it is seldom taken into account when assessing the quality of a study.

Concerns over safety can hinder research progress. A single case report may implicate one or a number of plant extracts as causing toxicity. Such case reports should be taken seriously, but should not necessarily be used as a reason to stop all research, particularly if the evidence is weak and unsubstantiated. Stronger evidence will include preclinical data that confirm the adverse effect and suggest a mechanism, and the research and medical community should come to an agreement regarding the safety of the substance before discouraging investigation.

Side effects such as nausea, hot flashes, fatigue, irritability or loss of general well-being that some plant extracts are reported to relieve are difficult to quantify. Some individuals are prone to a placebo effect. For most plant extracts, the physiological and molecular mechanism(s) of action are poorly understood. Measurement tools to assess treatment effect are subjective and inconsistent. Finally, animal models of diseases that plant extracts reportedly treat are scarce, unvalidated or of questionable relevance. All of these limitations challenge scientists who evaluate the role of plant extracts in the prevention and treatment of cancer.

On the one hand, many individuals continue to use plant extracts regardless of positive and negative reports of efficacy and safety. Negative reports influence reviewers of grants and manuscripts, who may reject or accept funding requests and publications on the basis of limited evidence and personal bias rather than a general consensus within the scientific community. The culture and biases on both sides impede research, from medical practitioners who honestly believe that herbal medicine is at best of no benefit and at worst dangerous, to patients who fervently believe that many of the world’s illnesses, including their own cancer, will be cured by herbal medicine that includes one or multiple plant extracts. As with other treatments, plant extracts have quirks of dose effects and timing of exposure. Phytoestrogens present in soy appear to offer protection against breast cancer when consumed during developmental windows, such as around the time of menarche [8]. A meta-analysis found that “few prospective studies assessed the effects of soy phytoestrogens on breast cancer risk. None of the studies found protective effects. …these prospective studies did not focus on ‘age at consumption’, which seems to be important based on results from dietary case control studies done so far” [9].

We make the following recommendations regarding research in plant extracts:

• The chemical composition and bioactive constituents of the extract should be identified. This is one area of research that has seen significant progress for some plant extracts [10], but given the complexities, there is still much work to be done;

• The design of plant extract studies should be rigorous and carefully thought out. This is true of all studies, but it is particularly important for botanical supplements, because of their tenuous status in the scientific and medical communities;

• Studies should report detailed descriptions of the botanical supplement used, such as its source, how it was prepared and the quality controls used. Reviewers and editors should be vigilant regarding insisting on this information before accepting manuscripts for publication. It is ironic that publications that lack key details themselves are used to justify rejection of future publications on the basis that the topic is not worth studying!

• Exercise caution when interpreting studies of plant based treatments. It is premature to claim based on a single report that a plant based treatment does or does not work, or is or is not safe.

In summary, prejudice and insufficient credible, reproducible research have impeded the research of plant based compounds for use by cancer patients. More care from both investigators and reviewers in designing and publishing studies is essential to come to a consensus on the efficacy and safety of plant based compounds.

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