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Cancer Progress Development of Chemopreventive Agents Derived from Food

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Introduction

Food-derived products are very attractive for development as chemopreventive agents that may find widespread, long-term use in populations at normal risk due to their safety and lack of perception as "medicine." Several diet-derived treatments are among the more than 40 promising compounds and agent combinations currently being tested in clinical trials as chemopreventive agents for cancers such as breast, prostate, colon, and lung. Green and black tea polyphenols, soy isoflavones, the Bowman-Birk soy protease inhibitor, cur cumin, phenethyl isothiocyanate, Sulforophane, lycopene, indole-3-carbinol, perillyl alcohol, vitamin D, vitamin E, selenium, and calcium are just a few examples. Many food-derived agents are extracts, which contain numerous chemicals or chemical classes. The National Cancer Institute (NCI) has recommended co-development of a single or a few suspected active chemicals found in the food-derived agent for creating such agents. The active chemicals give mechanistic and pharmacologic information that can be used to assess the extract's chemopreventive potential, and these compounds could be used as chemopreventive in higher-risk individuals (patients with pre cancers or previous cancers). Other important aspects of developing food-derived products include careful analysis and definition of the extract to ensure reproducibility (e.g., growth conditions, chromatographic characteristics or composition), as well as basic science studies to confirm epidemiologic findings linking the food product to cancer prevention [1].

Human cancer development takes 20-40 years or more in many major cancer targets, and the scope of chemoprevention includes cohorts at all stages of this process, from healthy subjects at low risk to populations at intermediate risk due to environmental and lifestyle factors, genetic predisposition, and precancerous lesions, and finally to previous cancer patients at high risk for second primaries. Food-derived compounds are very attractive for development as chemopreventive agents because of their expected safety and because (unlike synthetic pharmaceuticals) they are not seen as "medicine." They may find widespread, long-term use in populations at normal risk. Characterization of efficacy and safety, biomarkers of efficacy and risk, and appropriate cohorts for therapeutic intervention are all crucial for advances in chemoprevention using diet-derived medicines, just as they are for other treatments [2].

Many food-derived agents are extracts that contain numerous chemicals or chemical classes (e.g., tea, soy isoflavones or other soy fractions, curcuminoids). The National Cancer Institute (NCI) has pushed for a scientific approach to their assessment and development. Typically, a single or a few potential active chemicals found in the food-derived agent are isolated or synthesised and produced in conjunction with the food extract. Green tea polyphenols are working together to generate epigallocatechin gal late (EGCG) [3].

Once it is proven that the putative active components and the extract have similar cancer-related targets and effects (e.g., dose-response curves are parallel), the more expensive and potentially dangerous purified substance may be abandoned in favour of the more nearly natural product. Alternatively, the purified product may be more potent and, even if more toxic, appropriate for use in higher-risk populations, such as patients with premalignant disease or tumours that have been previously treated [4].

The meticulous characterisation of the active substance(s) and the technology to ensure repeatable preparations is a second crucial idea in the development of food-derived chemopreventive medicines. For example, the precise extraction conditions and spectrophotometric features of the preparation to assure the similarity of multiple preparations of the agent may be significant, as may be the determination of growth conditions (e.g., hours of sunlight or soil nutrients) [5].

The initiation and progression of pre cancers have been linked to a variety of genetic abnormalities and other cellular elements. Interfering with the expression and/or activity of these molecules is one conceivable strategy for chemoprevention; examples of techniques, their putative molecular targets, and dietary substances that act on these targets are listed.

Conclusion

New studies in cancer-related functional genomics and proteomics are quickly expanding our understanding of carcinogenesis. The discoveries and new technologies will be employed in basic and translational research to help characterise molecular and genomic cancer biomarkers that can be used to assess cancer risk in prospective cohorts and as surrogate endpoints in therapeutic trials. New animal models of carcinogenesis (including transgenic and gene knockout mice) that mirror human disease can be utilised to evaluate surrogate endpoints. It will also be critical to develop new therapy regimens to increase the therapeutic ratio of chemo preventives. The development of technologies that allow local delivery to cancer targets, as described by the discussion above on topical delivery, is one potential. Agent combinations and pharmacodynamically guided dosage regimes are among the others. A safe chemopreventive technique is to use foods and dietary supplements. Basic science research to detect mechanisms and evaluate the chemopreventive potential of food components is required in addition to epidemiology investigations. Talalay's research on phase II enzyme activation by molecular components of broccoli sprouts is a model for demonstrating foods' chemopreventive

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potential. Another example is the findings of lycopene epidemiologic and molecular investigations.

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