

Hidden Powers of the Pineapple

Scientists at the Queensland Institute of Medical Research (QIMR) have discovered two molecules from pineapple stems that show anti-tumour activity in laboratory studies. One molecule called CCS blocks a protein called Ras, which is defective in approximately 30% of all cancers. The other molecule called CCZ, stimulates the body's own immune system to target and kill cancer cells.

Dr Mynott and her team at QIMR discovered CCS and CCZ while investigating the properties of bromelain, a crushed pineapple stem extract. Bromelain is a rich source of enzymes and is widely used as a meat tenderiser, to clarify beer and tan leather hides. They discovered that bromelain also had some pharmacological properties and could activate specific immune cells while, simultaneously, blocking the immune function of other cells.

"We suspected that different components of the crude mixture might be responsible for bromelain's biological effects. In searching for these components, we discovered the CCS and CCZ proteins and found that they could block growth of a broad range of tumour cells, including breast, lung, colon, ovarian and melanoma," said Dr Mynott.

According to the National Cancer Institute, cancer has now overtaken cardiac disease as the largest killer in the USA. The incidence of cancer increases with age, with approximately 80% of cancers occurring in people over the age of 55. The major limitation of current cancer therapies is they are non-specific and affect both normal and tumour cells. Future cancer treatments will be rational and highly specific to selectively destroy the cancer cells, counteracting the mechanisms by which cancers grow. Data already generated show that CCS and CCZ have the desired specificity and selectivity.

"An interesting characteristic of CCS and CCZ is that they are proteases. Proteases are traditionally thought of as degradative enzymes which breakdown proteins, such as in the process of digestion. Other reports on the role of proteases in disease have centred on their potential to cause damage. CCS and CCZ are the first examples of proteases that have been shown to modulate cell signal transduction pathways and have specific immunomodulatory activities," said Dr Mynott.

"The way CCS and CCZ work is different to any other drug in clinical use today. Therefore, CCS and CCZ will represent a totally new way of treating disease and potentially a whole new class of anti-cancer agent. In general, products with novel mechanisms of action are more likely to represent real breakthroughs in the treatment or prevention of disease."

QIMR has just been awarded further funds from the NH & MRC, which will be used to provide further proof of CCS and CCZ as drug development targets. In particular, of critical importance to attract investment by a commercial partner is the demonstration of i) additional in vivo proof of principle, ii) reliable supply of the material and iii) safety. All these factors will be addressed in a two year research program. If the objectives of the research plan are all achieved, CCS or CCZ will be extremely attractive targets for further investment by a major pharmaceutical company and would rapidly progress to human clinical trials.

7 July 2005

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