which ^{89}Sr may become the agent of choice. There remains, however, uncertainty as to the mechanism by which pain relief is achieved. There are a number of features which suggest that tumour shrinkage *per se* is not essential for pain relief. Firstly there is no clear dose-response relationship for pain relief, whether from external beam treatment or ^{89}Sr. Low doses are undoubtedly effective with significant pain relief being seen after single treatments of only 4 Gy [10]. No clear relationship between primary tumour type and response is seen and in particular, radioresistant tumours appear equally responsive in terms of pain relief as radiosensitive tumours [3, 11]. After strontium therapy in prostate cancer, no correlation is seen between pain relief and changes in acid phosphatase or bone scan. Another interesting observation is the rapid relief of pain seen particularly after HBI and which occurs with both UHBI and LHBI, excluding a specific endocrine effect. Little is known about the detailed pathology and radiobiology of bone irradiation in man nor of the neurophysiological mechanisms of bone pain due to metastatic disease; effects on humoral pain modulators, tumour secretions or nerve transmission have all been postulated as important factors in pain relief, but remain unproven. There is a need for studies to elucidate the biological basis for the analgesic action of radiation on bone metastases to reconcile the published clinical dose-effect data with current practice.

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Prevention Conference Overview

SINCE 1985 the International Council for Coordinating Cancer (ICCCR) has sponsored numerous conferences and symposia on cancer designed to provide a forum to discuss specific research findings, expand international communication and create research networks between scientists.

This year ICCCR announced that it would focus "nearly exclusively" on prevention research. Dr Vincent T. DeVita, Jr, president of ICCCR made this announcement just prior to the opening of ICCCR's first international Conference on Cancer Prevention: Facts, Maybes and Rumors. "There are various areas in cancer research that are uniquely international and poorly supported", Dr DeVita said. "Cancer prevention, some areas of AIDS research and the molecular biology of virus-related cancers are of special interest. In fact, most of our data on cancer prevention come from international population studies. However, a great deal of prevention research lacks support, either because the projects have their origins in more than one country or because of the multifaceted nature of the studies. In this case they cannot be submitted to funding agencies on a project by project basis".

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With this prevention vacuum in mind, the Steering Committee and its chairman, Dr C. Everett Koop, former US Surgeon General, organised a 2-day conference in February at the National Institutes of Health Campus in Bethesda, Maryland, which attracted more than 160 senior scientists and policy-makers from around the world. The stated aims of the conference were to define a more precise picture of current prevention research and to provide the opportunity for prevention experts to collaboratively define research agenda.

The Steering Committee felt that it would be critical to the stated long-term goals of the conference to establish the facts behind cancer causation that have been scientifically proven; the maybes that are intriguing and under active examination; and the powerful rumours that are unproven and often distort media and public opinion about cancer.

The conference was dedicated to the memory of Dr Joseph Cullen, a world leader in cancer prevention who as deputy directory of NCI's Division of Cancer Prevention and Control spearheaded the American government's campaign against tobacco use.

Presentations included four areas: tobacco and smoking; nutrition, diet and cancer; viruses/cancer risk factors and environment; and lifestyle and cancer. With a clearer understanding of the underlying causes of cancer, the conference

concluded with a highly interactive round table session on how to deal with information on cancer prevention.

Dr Koop set the tone for the conference in his remarks. "We cannot provide health information to the public without putting the risk into perspective. The public has to understand the difference between real risk and hazards, and the scientific community has a responsibility to help guide the public to understand the use the wealth of information provided by the media".

The first session of the conference was devoted to tobacco and smoking and the well known correlation between smoking and lung cancer, as well as other tobacco-related cancers. Conference speakers launched a stinging attack on the "tobacco cartel" for "exporting death" to third world countries and for "targeting advertising and promotional efforts to youth, minorities and the poor".

Dr Judith MacKay, director of the Asian Consultancy on Tobacco Control in Hong Kong, said that just one of the effects of USA tobacco exports to third world countries is that "one half billion people alive today will be killed by tobacco", and that "fifty million Chinese children alive today will die of a tobacco-related disease". The statistics show that global tobacco-related mortality will rise from the current 2.5 million per year to over 10 million annually by the year 2050.

Other facts about cancer causation include the risks of over-exposure to sunlight, excessive exposure to radiation, certain occupational exposures (usually long-term and high-dose), and alcohol abuse, particularly in conjunction with cigarette smoking.

A second important area for research on cancer prevention includes the role of nutrition and diet. This represents the maybes. While it may be true that excess fat in diet can cause or produce the likelihood of breast cancer in women, there is a need for increased and responsible research. It is important to determine the link between diet and specific cancers, as it is estimated that diet and nutrition play a role in 35% of cancer deaths. We need to understand what changes in our national diet might have the most effect in preventing certain cancers, particularly those of the colon, breast, uterus and prostate.

And the rumours: not only do they undermine the usefulness of the facts but they encourage a kind of mass hysteria and frenzy that can result in cancer phobia. It is clear that far too often the results from animal testing have been reported as applicable to human beings. A case in point was the concern about the use of Alar on apples. We have often fed chemicals to rats in doses more than 100 times greater than those given to humans and then called these substances toxic.

It is detrimental to all our efforts to overlook the known and proven causes of cancer and concentrate on these rumours. Each of us has a responsibility to assess the wealth of health information and assess risk.

Although the USA is a country obsessed with questions of health, it is important for all of us in Europe to look more carefully at what can be done in the area of cancer prevention.

ICCCR will be organising a second prevention conference for the autumn of 1992 in London.

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Treating Cancer: the Potential Role of Stem Cell Inhibitors

SUBSTANTIAL ADVANCES have been made in the development and use of antineoplastic drugs and several cancers can now be cured by chemotherapy. Many, however, are still refractory to current treatments. Most chemotherapeutic agents are cytotoxic to cells in cycle and therefore will not only kill a significant portion of tumour cells but will also kill any normal cells which are in cycle. Thus in many cases, the doses of chemotherapeutic agents are limited by the effects of the drugs on normal cycling cells, particularly those of the haemopoietic and epithelial lineages. Recent progress in our knowledge of the growth factors which induce proliferation and differentiation in the haemopoietic system has led to the use of haemopoietic growth factors such as G-CSF and GM-CSF (granulocyte and granulocyte–macrophage colony-stimulating factors, respectively) to boost the haemopoietic system after chemotherapy, in order to shorten the time during which patients are at a severe risk of infections due to the drug-induced ablation of the myeloid cells in peripheral blood. Since many chemotherapeutic regimens involve serial treatments over periods of weeks, the drug treatment leads in many cases to a severe reduction in marrow functions. Thus, if the most primitive cells in the marrow could be temporarily protected by agents which maintain normal cells out of cycle during chemotherapy, significant progress in improving the efficacy of chemotherapeutic regimes should result [1].

In normal unstressed bone marrow, the majority of haemopoietic stem cells are quiescent, with only about 10% being in active cell cycle at any one time. This percentage can, however, rise dramatically following damage to the more mature components of the system, allowing replenishment by differentiation of these cells. Once a normal bone marrow cellularity is attained, the stem cells return to quiescence. It is clear from these observations that the stem cell compartment within the haemopoietic system is under tight proliferative control.

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