Preventing Hepatitis B, Hepatocellular Cancer: Made in Taiwan

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In most developed nations, cancer is second only to heart disease as a cause of death; in less developed countries, it is second to infectious disease. It is estimated that if the current trends of rising worldwide incidence continue, cancer will become the leading cause of death in the 21st century. This is particularly troubling since many of the factors contributing to cancer (eg, occupation, diet, lifestyle, and tobacco use) are known.

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The politics of science have had an enormous impact on the development of public policy programs for the prevention and treatment of many types of cancer. Highly politicized and well-financed interest groups include environmentalists, tobacco companies, labor unions, physicians, scientists, and patient advocates. They have the capacity to affect which diseases and therapies are and are not researched, evaluated, and treated, and which information is disseminated and by what means. Balancing these often conflicting interests affects the success of large-scale initiatives. Despite these obstacles, broad education, prevention, and treatment measures must be considered, to establish control over the incidence and costs of cancer.

Excellent practical examples of highly organized and effective initiatives are the programs developed to eradicate hepatitis B virus infection and hepatocellular carcinoma. These programs have proven so successful that the World Health Organization considers hepatitis B vaccination the most important cancer prevention program today, with the exception of smoking cessation programs. More than 75% of the world's chronic hepatitis B carriers live in the Asia-Pacific region. In countries with large economic resources and a significant hepatitis B problem, such as Malaysia, Singapore, and Taiwan, national immunization programs have reduced hepatitis B carrier rates from approximately 10% to 1%-2% in 3 to 5 years.[1] In China, the seropositivity rate for HBsAg has been reduced from 16.3% to 1.4% since 1986.[2] In Thailand and the Philippines, despite fewer resources, similar improvements have been noted. However, in countries that are poor and involved in political turmoil, such as Myanmar, Indonesia, and Cambodia, programs have not been initiated because of a lack of political commitment and economic resources. Likewise, most African countries are unable to obtain funding for vaccination programs, despite political interest and even though it is estimated that vaccination would control more than 75% of hepatitis B cases in Africa.[3]

In areas with a lower incidence, vaccination program development has been variable. New Zealand has been a pioneer in hepatitis B immunization, while Australia has not adopted any program. In the South Pacific island countries, a UNICEF-sponsored Vaccine Independence Initiative has provided the opportunity to test novel delivery methods, including disposable injection devices and combination DTP-HB vaccines.

The Taiwan Example

The central elements of a successful program for large-scale hepatitis B management include political commitment, a reliable source of recurrent funding of public sector programs, and delivery mechanisms integrated with primary maternal and child health care. An example of how the integration of these elements has provided an effective hepatitis B vaccination program is the hepatitis B eradication program in Taiwan.

A nationwide hepatitis B vaccination program was initiated in Taiwan in early 1983 with the goal of...
decreasing the incidence and costs of hepatitis B infection, hepatocellular carcinoma, and cirrhosis.[4] A National Hepatitis Advisory Steering Committee was organized at the cabinet level with representatives from the Department of Health, the National Science Council, and Government Ministries and Offices. Each of these committees was assigned specific hepatitis B virus-related tasks (see table ).

Beginning in July 1984, voluntary screening of expectant mothers for HBsAg during the last trimester of pregnancy was begun, with 78% participation during the first 15 months.[5]

Each identified carrier mother was registered with the appropriate Health Station. A vaccination booklet and coupons for future vaccines and hepatitis B immune globulin (HBIG) injections were mailed to each participant.

Infants of HBsAg carrier mothers received a four-dose regimen of hepatitis B vaccine. Those babies born to highly infectious mothers also received a dose of HBIG within 24 hours after birth.

As follow-up, seroepidemiological studies were conducted using a random sample of the previously vaccinated infants. Local public health nurses visited each selected child and obtained blood samples at 18, 24, 36, and 48 months; these were analyzed for HBsAg, anti-HBs, and anti-HBc.

Infants of highly infectious mothers had HBsAg positivity rates of 14.2% (vaccine plus HBIG) and 19.7% (vaccine only) when on schedule, and 17.0% when off schedule.[5] Infants of moderately infectious mothers had HBsAg positivity rates of 3.0% when on schedule and 6.4% when off schedule. These low positivity rates persisted throughout the 48-month follow-up period. This represents a dramatic improvement over the 40% to 96% vertical transmission rate seen before program implementation.[6]

The costs of medical care and loss of income related to hepatitis B virus infection in Taiwan have been estimated to be US $318.3 million during the period from 1984 to 1994, whereas the cost of immunization was US $100 million for this same period, thus demonstrating the cost effectiveness of this effort.[7]

Cancer-related benefits have also been observed. The annual incidence of hepatocellular carcinoma for children aged 0 to 14 years declined from 4.48-7.13 cases per 100,000 in 1981/1991 to 1.74-2.39 cases per 100,000 in 1992/1993.[8] These benefits are expected to become more dramatic beginning in 2004, when the time period from immunization corresponds to the latency period for hepatocellular carcinoma attributed to chronic hepatitis B infection (20 to 40 years).

Worldwide, well-implemented hepatitis B vaccination programs have reported similar success, demonstrating the cost effectiveness of this intervention as a preventive measure for cancer. It is estimated that routine infant hepatitis vaccination programs in the United States cost $1,852 per year of life saved, while smoking cessation with nicotine gum therapy costs $7,450 per year of life saved.[9]

Nationwide policies to effectively combat the rising incidence and costs of cancer are possible, as demonstrated by programs developed to eradicate hepatitis B and hepatocellular carcinoma. Such programs require a political and financial commitment at the highest levels of government; centralized implementation and monitoring; and broad support for a scientifically based consensus on the best educational, prevention, and treatment measures for the public good.

**Tasks for Development of a Hepatitis B Vaccination Program: Taiwan**

- Basic science and comprehensive research
- Coordination of education, epidemiology, and control efforts
- Direction of follow-up and surveillance studies
- Establishment of data

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