drocyte and is the targeted cell for most vaccination strategies. However it is well documented that dendritic cells are very inefficient at the uptake of antigen – by the cellular processes of endocytosis and/ phagocytosis. Strategies to increase the endocytic capabilities of the cell would increase the presentation of immunodominant epitopes designed into the candidate vaccine molecules. However, to reiterate, dendritic cells are very inefficient at taking up exogenous antigens but excellent at priming the T lymphocyte cells whether $CD4^+$ which mediate humoral immunity or $CD8^+$ cells involved in cell-mediated immunity. Hence, in spite of the inspired design of the immunodominant epitope and using technologically advanced carrier systems, if the dendritic cell puts back it ears stubbornly, antigen presentation and consequently priming of the immune system will not occur leading to a nonfunctional candidate vaccine molecule.

A solution could be the administration of these candidate vaccine molecules with human antibodies which though non-immunogenic would induce endocytosis, thus prompting the endocytosis of the antigen molecule simultaneously. Thus leading to forced phagocytosis of antigen by antigen presenting cells such as the dendritic cell leading to the effective priming of the human immune system. The administration of the candidate vaccine molecules along with antibody and cytokines like interleukin-α should hypothetically lead to cell-mediated priming as interleukins have been shown to increase the cell surface expression of MHC class 1 molecules involved in the activation of a cell-mediated response leading to the killing of infected cells. The physical parameters involved in the endocytosis of the candidate vaccine molecule should be taken into consideration. For instance, tumour cells being highly endocytic at low pH, is a similar situation applicable to dendritic cells, and if so, can it be exploited in this life and death situation? The figures are no exaggeration as WHO estimates on average 110 deaths per min, most of which occur in Africa among the most vulnerable.

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NEWS

Herbal gardens in schools

The Government of India has set up the National Medicinal Plants Board (NMPB) under the Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homeopathy (AYUSH) under the Ministry of Health & Family Welfare to coordinate all aspects of medicinal plants sector across the country. Since its inception in November 2000, the Board has been providing financial assistance to various research and development projects under its promotional schemes through research institutes of Central and State Governments, Universities and non-government organizations. NMPB efforts have generated immense interests among different stakeholders of the medicinal plants sector.

Recently, the Board launched a new scheme for involving the school students in the medicinal plants sector. To inculcate a sense of belonging from childhood with surrounding biodiversity and its conservation, especially of medicinal plants, which provide a holistic health care in both traditional and modern systems of medicine, the Board has started to provide financial assistance for setting up herbal gardens in schools. Attempts are being made to select at least 500 schools from all over the country in the initial phase. The scheme seeks to cover schools up to senior secondary/intermediate level.

According to this new scheme, funding will be allocated on per hectare cultivation of medicinal plants. It is presumed that schools may not have much area for medicinal plants cultivation; therefore the funding will be provided for raising herbal garden of about 1/10 of a hectare in each school. For developing one herbal garden of about 1000 sq. m, the financial assistance will be limited to Rs 10,000 for setting up and Rs 4000 for maintenance during the second year. The cost of establishing herbal garden will include

Table 1. State-wise status of proposals received and the amount of funds to be allocated for developing herbal gardens in schools

State/Union Territory	No. of projects received	No. of projects approved for funding	Total amount of approved projects (in Rs)
Andhra Pradesh	1	0	0
Haryana	17	11	11,54,000
Chandigarh	3	3	42,000
Chhattisgarh	32	23	3,22,000
Kerala	133	108	15,12,000
Manipur	1	1	14,000
Madhya Pradesh	43	34	4,76,000
Maharashtra	2	0	0
New Delhi	15	3	42,000
Orissa	63	32	4,48,000
Pondicherry	9	4	56,000
Tripura	5	3	42,000
West Bengal	35	16	2,24,000
Total	359	238	33,32,000

land development, irrigation, transportation of planting material, organic manure, barbed wire fencing, etc. Since each state and Union Territory has its own State Medicinal Plants Board (SMPB) working for NMPB, the funding provided by NMPB will be routed through respective SMPBs.

For developing herbal gardens in schools, the concerned SMPBs will arrange to provide technical support with the help of state forest/horticulture/agriculture departments of Agricultural Universities/ Research Institutions, whatsoever is near the school. Besides, the SMPB will provide quality planting material. Only use of organic manure/bio-fertilizer is suggested for raising herbal gardens. A school may grow about 5–10 medicinal plant species out of the total 32 prioritized species of the Board. However, the selection of medicinal plant species for developing herbal gardens is not restricted to prioritized species of the Board. Marketing of cultivated medicinal plant species will be made through networking of SMPB, drug manufacturers and traders.

In order to meet the objectives, the Herbal Garden Scheme of the NMPB has been circulated to all SMPBs for wider dissemination of the scheme. Within six months (April to September 2006) a total of 359 project proposals on School Herbal Gardens have been received from 13 States/Union Territories. After screening and internal reviews of all the proposals received, 238 proposals were found suitable for financial assistance, which costs Rs 33,32,000. The state-wise break up of the proposals received and the amount of funds to be allocated to respective SMPBs are given in Table 1. Within a short period of six months, submission of project proposals by 359 schools located at different corners of the country, reflects the interest and awareness of schools in medicinal plants. This interest will be a milestone in developing the medicinal plants sector and the conservation of biological diversity in the days to come.

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RNA interference – gene silencing by double-stranded RNA: The 2006 Nobel Prize for Physiology or Medicine

The classical view of the flow of genetic information at the molecular level envisages that within a living cell, the information encoded in the master molecule, the deoxyribonucleic acid (DNA), is first transcribed into RNA with the help of an RNA polymrase enzyme, and is then translated into proteins using the protein synthesis machinery available within the cell (Figure 1). This flow of genetic information from DNA via mRNA to protein was termed the central dogma of molecular biology by the British Nobel Laureate Francis Crick. However, except for some housekeeping genes, synthesis of proteins due to individual genes is not constitutive, and is now known to be regulated at different levels. For instance, initially in early 1960s, it was shown that the coding sequences in bacteria and other prokaryotes are organized in operons, which are under the control of regulator, promoter and operator genes. This work was recognized by the award of 1965 Nobel Prize for Physiology or Medicine to François Jacob, Jacques Monod and André Lwoff. Several modifications of central dogma and the classical operon concept were discovered later during 1970s, 1980s and 1990s. For instance, in 1970, it was shown that in some RNA viruses, RNA can be used for the synthesis of DNA (as an intermediate molecule) using an enzyme now popularly described as reverse transcriptase; this discovery was recognized by the award of 1975 Nobel Prize for Physiology or Medicine to David Baltimore, Renato Dulbecco and Howard Temin. During early 1980s, it was also shown that the genetic information within a eukaryotic cell occurs as split genes with intron and exon sequences, and that intron sequences are spliced out after transcription during RNA processing. This discovery was recognized by the award of 1993 Nobel Prize for Physiology or Medicine to Richard J. Roberts and Phillip A. Sharp. More recently during mid-1990s, it was shown that a large part of DNA in eukaryotes is actually used for synthesis of non-coding RNA (ncRNA), which plays an important role in regulating the expression of genes at the post-transcriptional level. It was shown that the ncRNA gives rise to double-stranded RNA (dsRNA), which is responsible for gene silencing; the phenomenon was described as RNA interference (RNAi). This 'discovery of RNAi involving gene silencing by dsRNA' has been recognized by the award of the 2006 Nobel Prize for Physiology or Medicine to two American scientists, Andrew Fire and Craig C. Mello. They reported for the first time in 1998 that in a very specific manner, gene silencing can be achieved through dsRNA-mediated degradation of mRNA[1]. This mechanism of RNAi is activated when specific RNA molecules occur in the cell as dsRNA, which activates biochemical machinery degrading mRNA molecules having nucleotide sequence identical to that of the dsRNA. When such mRNA molecules disappear due to dsRNA-mediated degradation, obviously the corresponding protein cannot be synthesized, so that the corresponding gene is apparently silenced.

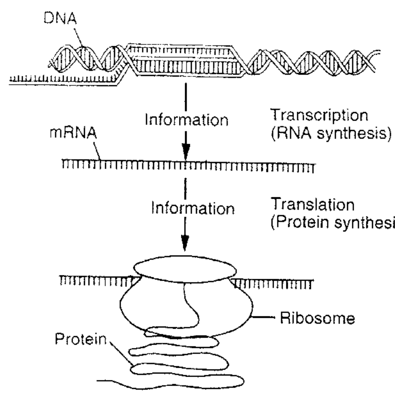

Figure 1. Central dogma showing the flow of information from DNA to protein via RNA.