

## Vaccine Industry in India – An Emerging Global Hub

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### Global Outlook

Asia is emerging as the vaccine hub of the world and India is on the go to play a key role in the vaccine market. The Global vaccine market is expected to reach \$10 billion during the current year 2011. This is forecasted to scale up to \$23.8 Billion by the year 2012 and to reach \$40 billion by the year 2015. A sharp increase in sales is expected in areas of Influenza and Hepatitis vaccines. The vaccines for cancer are expected to have a phenomenal growth due to increased disease incidence in the areas of cervical, prostate and lung cancer. Though the pediatric vaccines were dominating the vaccine market in the past, a change in this trend is expected due to a high demand forecasted for the adult vaccines. Global adult vaccine market was around \$3.7 billion during 2005 and this market is estimated to reach \$7.5 billion in 2012. The major contributors to the growth of the adult vaccine market would be Influenza vaccines, HIV vaccines and Cancer Vaccines. Cancer vaccines will also become a major player in the vaccine market, rising from its current level of \$135 million to more than \$8 billion by 2012.

### The Indian Scenario

The current revenue of the Indian vaccine market is estimated around US\$ 900 million in 2011 and is poised to grow at the rate of 23% during 2011-12. Around 70% of the total volume manufactured is exported. India is the major supplier of Vaccines to UNICEF which in turn supplies 40% of the total vaccine demand for childhood vaccination in more than 100 countries. The share of the private sector in the total volume of vaccines exported is roughly around 40%. The once neglected vaccine market is now considered as a source of steady income. The evidence for this being the take-over of Shantha Biotech by Sanofi Aventis and the possible take-over of Biological Evans by GSK. The reasons which makes the Indian companies very attractive for take-over are, Opportunity and assured income from exports and facilities on par with global standards which could be used for manufacturing to meet the global demand.

The rewarding vaccine market was brought to the limelight by the introductions of Prevnar, a vaccine for childhood infections by Wyeth and Gardasil, a vaccine for cervical cancer by Merck & Co. The last few

years witnessed a remarkable growth in the vaccine market due to the avian influenza, Bioterrorism organisms and infections like SARS.

### **Major players in India in the Vaccine Market**

1. Serum Institute of India Ltd
2. Panacea Biotech Ltd
3. Venkateshwara Hatcheries Private Ltd
4. Indian Immunological Ltd
5. GlaxoSmithKline Pharmaceuticals Ltd
6. Aventis Pharma Limited
7. Shantha Biotechnics
8. Eli Lilly India
9. Haffkine Bio Pharmaceutical Corporation Ltd (HBCL)
10. Intervet India
11. Lupin
12. Avesthagen
13. Wyeth
14. Sanofi
15. Merck

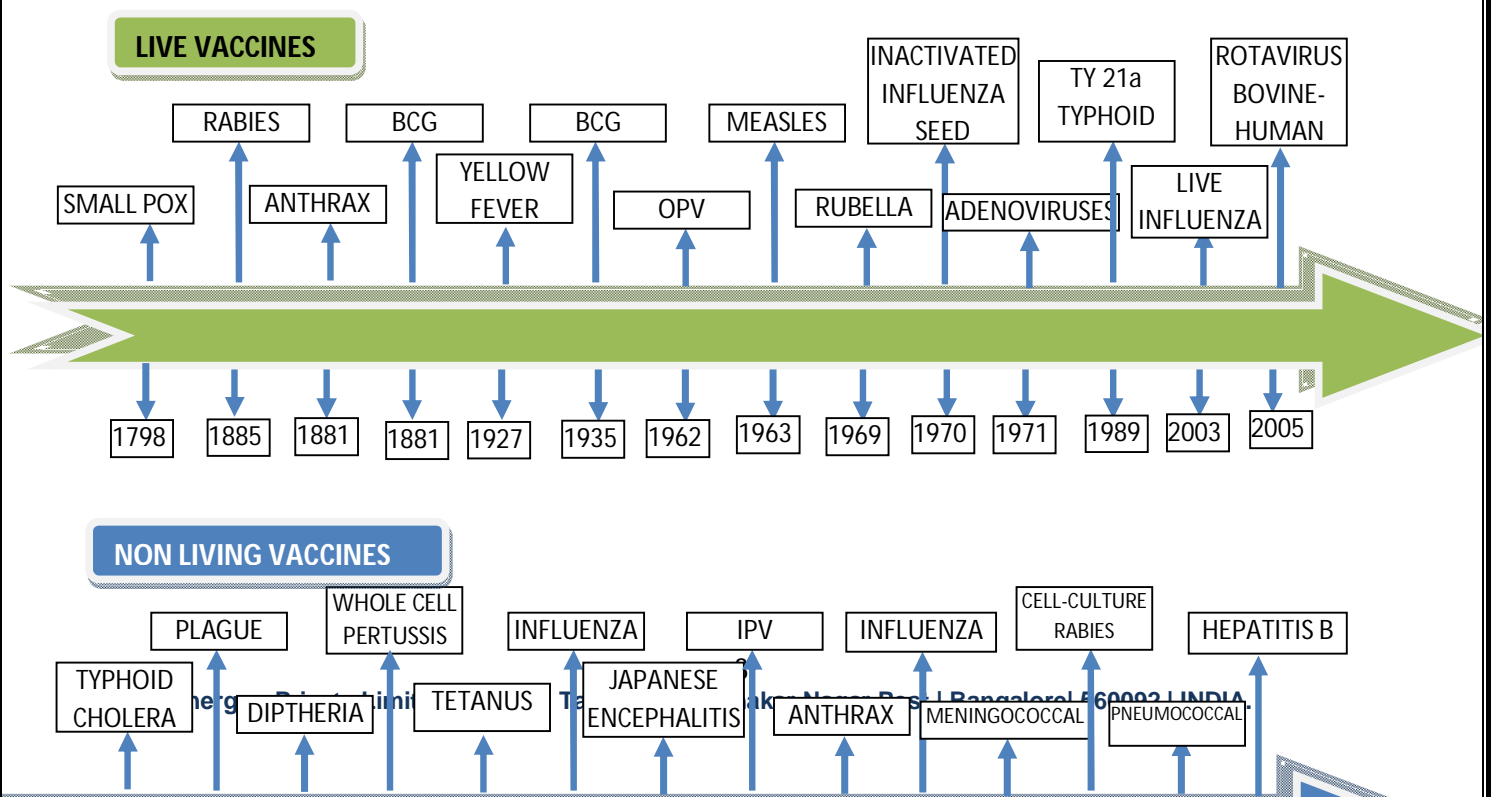
### **Key drivers for the vaccine market**

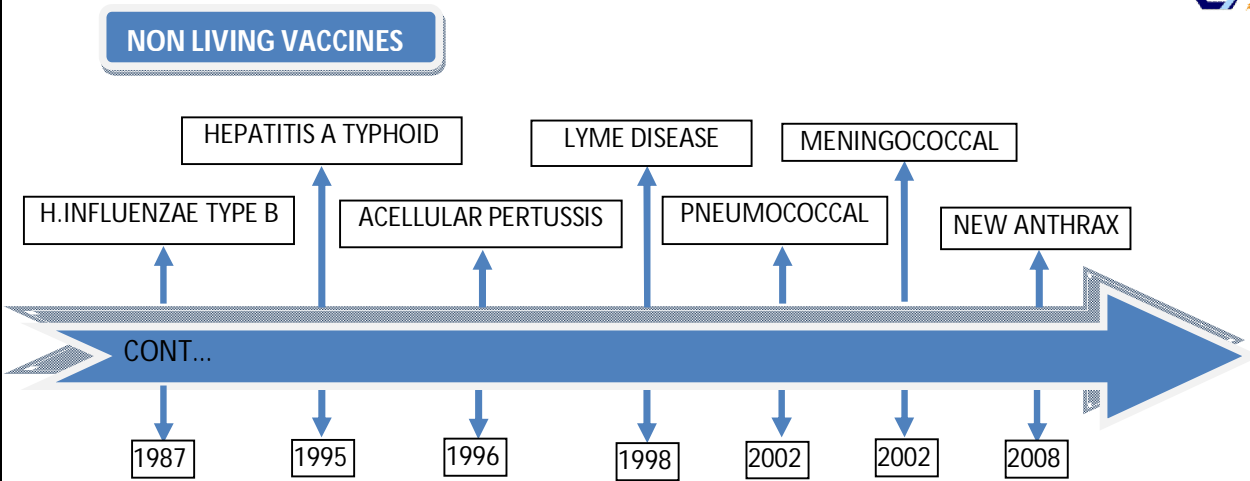
1. Relatively low cost of Manufacturing
2. Reasonable R&D expenditure
3. Leading edge technology / Combination Vaccines
4. Low cost of Clinical trials
5. Abundant Skilled Manpower and Scientists
6. Huge demand in the local market
7. Blockbuster potential of new vaccines

### **Key challenges for the vaccine market**

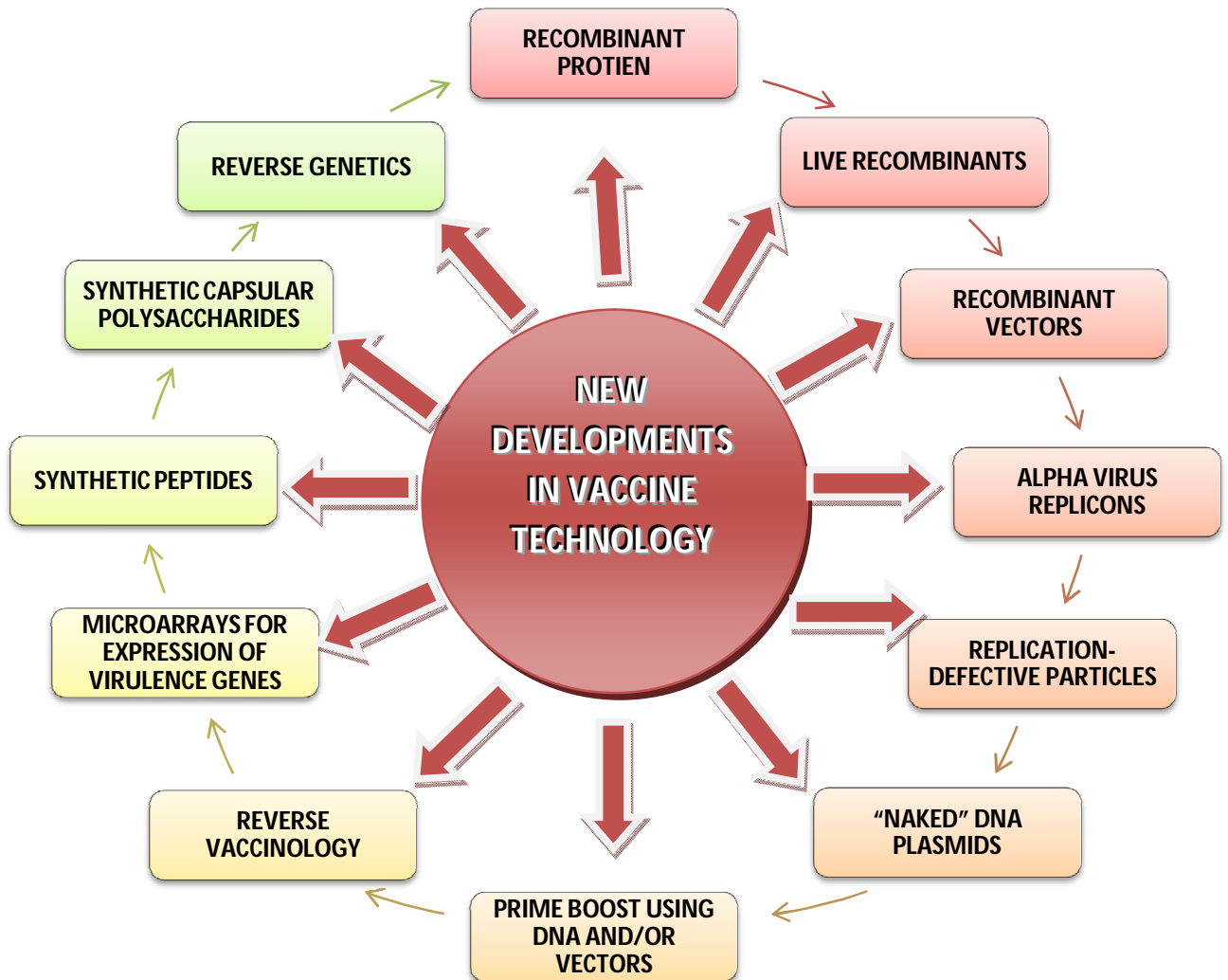
1. The most important challenge faced by the vaccine manufacturers in India is the Price point pressure. The six government listed vaccines are sold at a rate of Re.1 to Re. 1.5. Considering the import duties on raw materials and of the cost of production, storage and distribution the manufacturers face a grim situation to run their business profitably. The model of low cost high volume business has created margin pressure for some vaccines to their manufacturers.
2. The supply chain of the vaccines has to be strictly monitored for specific temperature which adds to the costing woes of the manufacturer. A shortfall in the private investments is strongly felt by the vaccine manufacturers. The cost of the institutional loans is high in comparison with the returns. The meek margins realized for certain vaccines strongly impact the relapse of funds into their R&D capabilities. Uncertainty in demand forecasting for the vaccine market may affect the profitability of the manufacturers.
3. Clear regulatory guidelines are still under development in India. The success of the vaccine depends upon the results of the clinical trials and the prevailing regulatory guidelines. The losses in this high cash intensive market can be mitigated by support from Government and NGOs in the form of immunization financing which secures the capacity of national governments to engage in comprehensive planning for their vaccine production initiatives.

## Vaccine History





### Developments in vaccine technology



There have been vast developments in the vaccine technology. The acellular purified fractions have replaced the conventional pertussis vaccine eliminating the side-effects during vaccination. The Replacement of toxoids in the place of non-pathogenic and immunogenic mutants of Tetanus and Diphtheria toxins is a landmark development. The recombinant technology is now used to prepare vaccines. Conjugated vaccines have been developed to reduce the number of injections. Human recombinant antibodies are used for treating terminal tetanus and rabies.

### Phase III vaccines in development - Pipeline

Company	Product	Market	Indication
Bavarian Nordic	Imvamune	Adult	Smallpox
Bharat Biotech	116E	Pediatric	Rotavirus
Crucell	Flavimum	Adult	Yellow fever
GlaxoSmithKline	Next-gen flu vaccine	Adult	Inactivated influenza for the elderly
	Hib-MenCYTT	Pediatric	Neisseria meningitis groups C & Y disease & Haemophilus influenzae type b
	Nimentrix	Pediatric	Neisseria meningitis groups A, C, W & Y disease prophylaxis
Merck	V503	Adult	Cervical cancer, 9 valent
Novartis	Menveo Infants	Pediatric	Meningitis
	Menveo Adolescent	Pediatric	Meningitis
Sanofi Pasteur	Pediacel EU	Pediatric	DTP, polio, Hib
	Menactra	Pediatric	Meningitis infant/toddler 9 - 12 months
	Adacel	Pediatric	DTP ages 4 - 6
	Hexaxim	Pediatric	DTP, Hepatitis B, polio, Hib

## Unmet Needs

### Cancer:

Medical Survival is very poor for lung cancer patients. Vaccines are looked upon to provide a cost effective and Low toxic therapies.

A number research works are in progress for developing vaccines for breast cancer.

Many Clinical Trials are in progress for Cancer Treatment Vaccines which include Bladder Cancer, Brain Tumors, Breast Cancer, Cervical Cancer, Hodgkin Lymphoma, Kidney Cancer, Melanoma, Multiple Myeloma, Leukemia, Lung Cancer, Non-Hodgkin Lymphoma, Pancreatic Cancer, Prostate Cancer, and Solid Tumors. Clinical trials for cervical cancer and Solid tumors are in progress for the development of preventive vaccines.

The increased incidence in the rate of diabetes has strong collateral effects with Incidence of influenza as diabetics are more prone to this disease. The need for addressing this demand is in the increasing trend.

## Vaccines safety reporting- US Scenario

The US government passed the National Childhood Vaccine Injury ACT of 1986. By this act the healthcare providers are responsible to report the adverse events and possible side effects of vaccination. In 1990 the Food and Drug Administration (FDA) and Centers for Disease Control and Prevention (CDC) created the Vaccine Adverse Events Reporting System (VAERS) to facilitate the public to report about the adverse events of vaccines licensed in USA.

### National Vaccine Injury Compensation Program (VICP):

VICP was established to take care of adequate supply of vaccines, Stabilize vaccine costs and establish a forum to report adverse events.

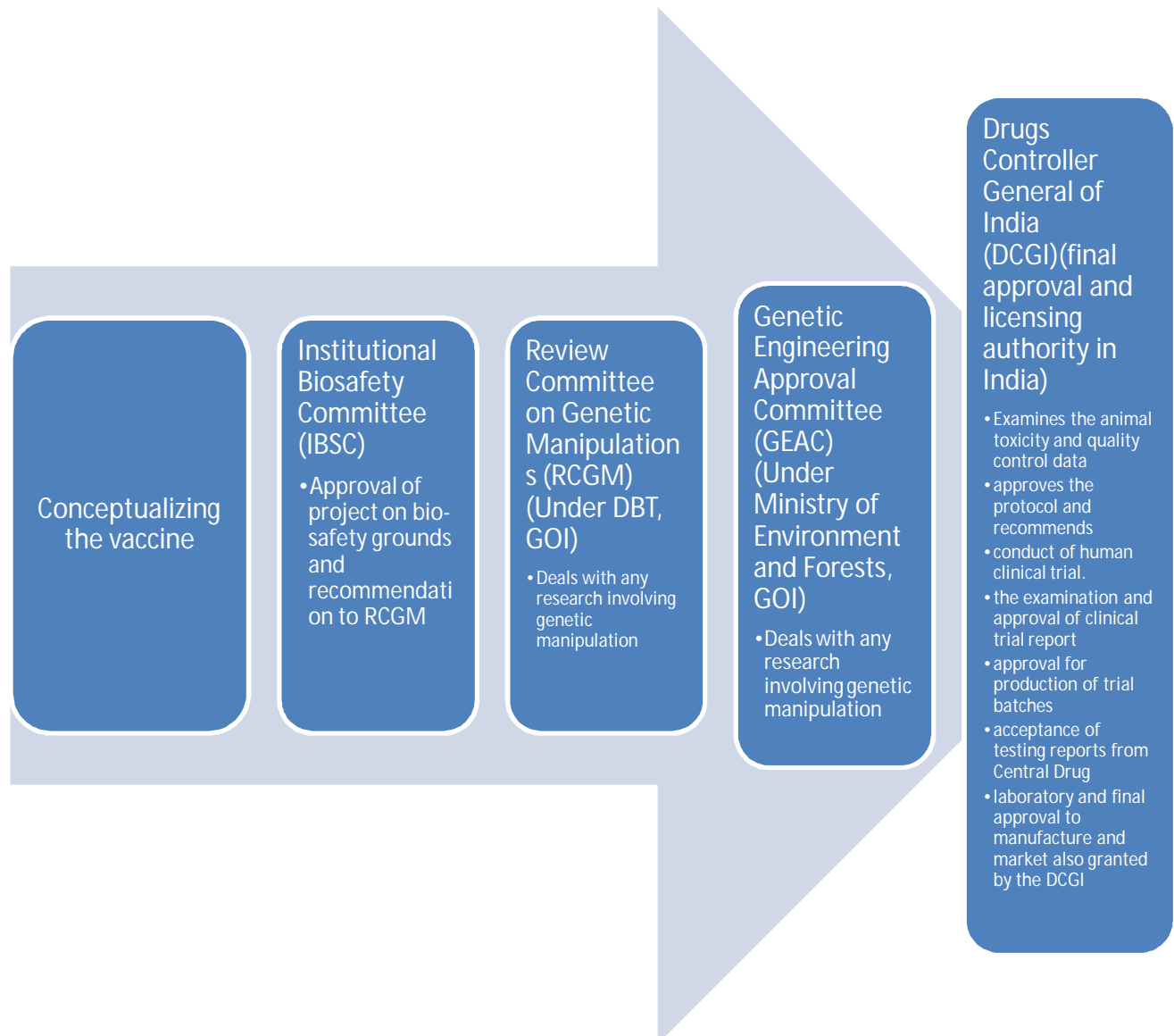
The VICP resolves all the vaccine injury claims and provides compensation to people affected by adverse events. The U.S court of federal claims decides on the cases.

Three Federal government offices have a role in the VICP:

- The U.S. Department of Health and Human Services (HHS);
- The U.S. Department of Justice (DOJ); and
- The U.S. Court of Federal Claims (the Court).

## Vaccines safety reporting- India Scenario

Vaccine – Approval and Development path in India:



The Indian Council for Medical research (ICMR) has provided all the guidelines and has prescribed the rules of conduct for clinical trials from Phases I to IV and for studies on combination vaccines. The ethical issues are addressed by these guidelines.

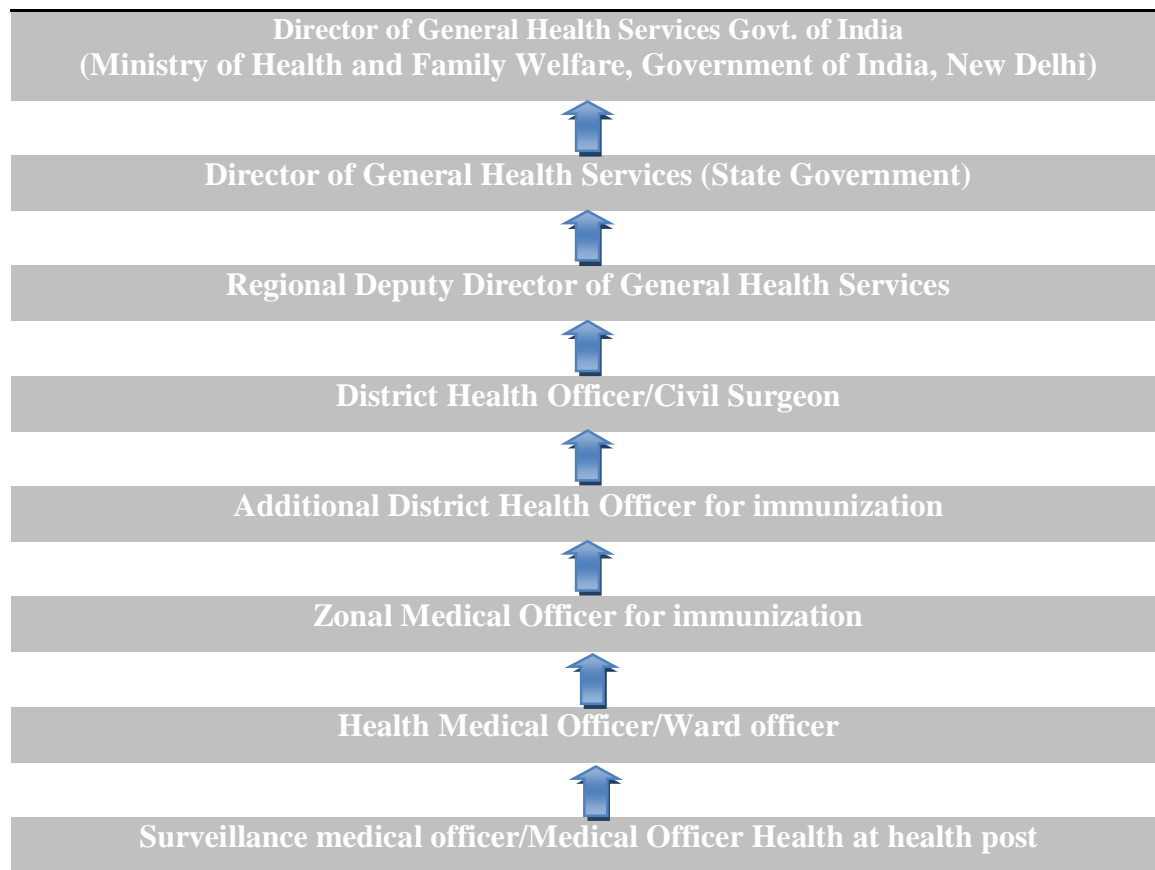
The ICMR set up new guidelines in 2006 which included conducting clinical research of vaccines in human subjects. All vaccine trials are expected to be carried out in accordance to these guidelines and were earmarked under,

1. Phase I-IV studies
2. Bridging studies
3. Combination vaccines
4. Vaccines administered simultaneously with a combination vaccine

Vaccine Pharmacovigilance in India:

The centers for Adverse Drug Reaction (ADR) monitoring and Adverse Events Following Immunization (AEFI) monitoring perform the role of Pharmacovigilance for vaccines. At present only the healthcare workers can report to the ADRs.

Reporting of Adverse Events following Immunization (AEFI)




## Futuristic landscape

The rapid growth of the vaccine market would lead to increased competition and would resemble the Pharmaceutical market. There would be a distinct first mover advantage for companies launching their vaccines early in the market with funding from various government agencies. Competition in the market is set to increase with the entry of more traditional companies. India must develop its own national strategies to meet its vaccination needs within its budgetary constraints.

### Source:

1. [http://www.terradaily.com/reports/Global\\_Vaccine\\_Market\\_To\\_Top\\_23\\_Billion\\_Dollars\\_99\\_9.html](http://www.terradaily.com/reports/Global_Vaccine_Market_To_Top_23_Billion_Dollars_99_9.html)
2. [http://www.terradaily.com/reports/Global\\_Vaccine\\_Market\\_To\\_Top\\_23\\_Billion\\_Dollars\\_99\\_9.html](http://www.terradaily.com/reports/Global_Vaccine_Market_To_Top_23_Billion_Dollars_99_9.html)
3. [http://www.rncos.com/Press\\_Releases/Multinationals-Identifying-Potential-of-India-Vaccine-Market-to-Grow-20.htm](http://www.rncos.com/Press_Releases/Multinationals-Identifying-Potential-of-India-Vaccine-Market-to-Grow-20.htm)
4. <http://business.in.com/article/boardroom/a-shot-of-india-the-vaccine-market/24822/1>
5. <http://www.indiapost.com/indias-vaccine-manufacturing-set-to-soar-to-800m-prof-steven-myint/>
6. [http://www.ncbi.nlm.nih.gov/pubmed/10732430?log\\$=activity](http://www.ncbi.nlm.nih.gov/pubmed/10732430?log$=activity)
7. <http://www.themedica.com/articles/2009/03/vaccine-industry-overview-and.html>
8. <http://www.cancer.gov/cancertopics/factsheet/Therapy/cancer-vaccines>
9. <http://www.cancer.gov/clinicaltrials/search/results?protocolsearchid=9231849>
10. <http://clinical.diabetesjournals.org/content/25/4/145.full>
11. <http://www.nature.com/naturemedicine>
12. Natural Medicine Supplement Volume 11, Number 4, April 2005
13. <http://www.cdc.gov/vaccinesafety/Activities/vaers.html>
14. Varricchio F, Iskander J, Destefano F, Ball R, Pless R, Braun MM, Chen RT. Understanding vaccine safety information from the Vaccine Adverse Event Reporting System. [P](#)ediatric Infectious Disease Journal 2004;23(4):287–294.
15. Zhou W, Pool V, Iskander JK, English-Bullard R, Ball R, Wise RP, Haber P, Pless RP, Mootrey G, Ellenberg SS, Braun MM, Chen RT. Surveillance for safety after immunization: Vaccine

- Adverse Event Reporting System (VAERS)—United States, 1991–2001. MMWR 2003;52(1):1–24.
16. Chen RT, Rastogi SC, Mullen JR, Hayes SW, Cochi SL, Donlon JA, Wassilak SG. The Vaccine Adverse Event Reporting System (VAERS).  Vaccine 1994;12(6):542–550.
  17. <http://www.ncbi.nlm.nih.gov/pubmed/15071280>
  18. <http://www.ncbi.nlm.nih.gov/pubmed/8036829>
  19. [https://extranet.who.int/aim\\_elearning/en/vaccines/je/implement/adverseEvents.pdf](https://extranet.who.int/aim_elearning/en/vaccines/je/implement/adverseEvents.pdf)
  20. <http://www.allforkidsindia.com/allforkids/Resources/VaccineOptions.aspx>
  21. <http://truthonmedecine.wordpress.com/tag/vaccine-adverse-event-reporting-system/>
  22. <http://iospress.metapress.com/content/1564p14k2p761772/>
  23. [http://cdsco.nic.in/pharmacovigilance\\_intro.htm](http://cdsco.nic.in/pharmacovigilance_intro.htm)
  24. <http://iospress.metapress.com/content/1564p14k2p761772/fulltext.pdf>