Indian pharmaceutical companies essay sample

Health & Medicine

1. OBJECTIVES

One objectives of the post-1994 policy regime was the incentivisation of pharmaceutical research and development (R &D). Innovative products were given exemption from price control; a number of financial scheme were made available to firms for undertaking R&D;
technology collaboration were brought under the automatic approval route; and most importantly, patent rights were granted for a period of 20 years for products as well as processes so what were the outcomes of these measures? Who are the major players? What are the therapeutics areas in which the R&D efforts are focused?

2. INTRODUCTION

An important aspect of the policy reforms in the Indian economy since 1991 has been the change in the perception on the respective roles of the public and private sector industries. In the pre-liberalisation phase, public sector industry in the pharmaceutical sector was assigned the leadership role and the private sector was required to support the efforts of the State. In the liberalisation phase the public sector is assigned with inferior position and the leadership role is assigned to the private sector firms who are also expected to make commercially sensible decisions.

The Industrial Policy Resolution of 1956 classified industries into three categories based on their priorities. “ Schedule A” industries were exclusively reserved for the public sector and “ Schedule B” consisted of industries, where the public sector would play a lead role and the private sector was expected to supplement the efforts of the State. “ Schedule C”

consisted of the remaining industries whose future development was left to the private initiatives. The pharmaceutical industry fell under Schedule B.

The Government of India established five public sector companies in India of which two played very important roles – Hindustan Antibiotics Ltd. (HAL) and Indian Drugs and Pharmaceuticals Ltd. (IDPL). IDPL was established with technical assistance from USSR and HAL with the technical assistance of World Health Organisation (WHO) and United Nations International Children's Emergency Fund (UNICEF).

The public sector research laboratories under the Council for Scientific and Industrial Research (CSIR), especially Central Drug Research Institute (CDRI), Indian Institute of Chemical Technology (IICT) and National Chemical Laboratory (NCL) also contributed considerably to the growth of the Indian pharmaceutical industry. Their contribution has been in the form of development of laboratory level processes that were transferred to private industry, which scaled up the technologies at the industry level. These laboratories also conducted research on the problems referred to them by the Indian companies. The process technologies developed by the CSIR laboratories includes technologies for ciprofloxacin, omeprazole, salbutamol, vitamin B6, lamivudine, diclofenac sodium and azithromycin. Almost all the top pharmaceutical companies in India have used the services of the CSIR laboratories

3. STRENGTHS AND WEAKNESS OF INDIAN PHARMA COMPANIES

Strengths:

* Mature Industry with strong manufacturing base

* Strengths in (innovative) process chemistry

* Abundance of raw talent

* Entrepreneurial spirit

* Highly talented and skilled Indian scientists working abroad (great potential for networking) * Low cost of Manpower

* Cost effective Manufacturing Facilities

* Rich Biodiversity

* Global Clinical Trials are now being contacted in India Weaknesses:

* Lack of funding and resources

* Lack of a ready ‘ talent pool’

* Low profile of high quality work being carried out

* Inadequate regulatory framework / infrastructure

* Low investment in R & D

* Missing Link between Research and Commercialization.

4. CHANGING TRENDS IN R & D

The global pharmaceuticals industry is highly research intensive and innovative firms spend on average about 15 per cent sales turn over in R&D. However, R&D expenditure as percentage of sales turnover (R&D intensity) of Indian pharmaceuticals industry remained less than 2 per cent. Perhaps the low R&D intensity is explained by the fact that Indian companies were engaged primarily in the manufacture of generics and development of non-infringing processes and not in new drug development, which involves huge investments. The process patent regime under the Patents Act 1970 enabled Indian companies to manufacture and market patented drugs using non-infringing processes. With the change in the Government’s approach to the private sector and the creation of new incentive mechanisms (product patent

rights), the R&D intensity began to increase from 2000-01 and reached its peak in 2005-06 (Figure 1). Figure 1: R&D-Sales Ratio in Pharmaceutical Industry in India (percentage)

Figure 1 show that the R&D intensity began to decline after reaching its peak in 2005-06. Why did the R&D intensity decline after 2005-06? Exactly what happened? Ranbaxy and Dr. Reddy's invested 16 per cent of sales turn over in R&D in 2005-06. The R&D intensity of DR. Reddy's reached 18 per cent in 2004-05 and Ranbaxy's 20 per cent in 2005-06. But this came down to 9 per cent for Dr. Reddy's and 11per cent for Ranbaxy by 2009-10. What prompted these two companies to invest heavily in R&D and later forced them to reduce the allocation?

Dr. Reddy's developed an anti-diabetic molecule (DRF 2593), which the company out-licensed to Novo Nordisk in 1997 for preclinical and clinical development. Dr. Reddy's also out-licensed two other Anti-diabetic molecules – DRF 2725 and DRF 4148 – to Novo Nordisk and Novartis, respectively, in the following years. Similarly, Ranbaxy out licensed its first compound (RBx 2258, for the treatment of benign prostate hyperplasia) in 2002 to Schwarz Pharma. Dr. Reddy's deal with Novartis contained a package of $60 million of which $5 million was upfront and $55 million was to be milestone payments. Ranbaxy's deal with Schwarz Pharma provided for $48 million returns to the company of which $6. 3 million was upfront and the remaining was in the form of milestone payments.

But the trouble began when the licensees found problems at the preclinical and clinical development stages. In 2003, Novo Nordisk suspended the trials

on DRF 2725 after finding tumours in the pre-clinical studies. In the same year Novartis also decided to discontinue the development of DRF 4148. In 2004, Novo Nordisk decided to terminate further clinical development of DRF 2593, as the phase II results did not suggest a sufficient competitive advantage for the molecule (Balaglitazone) compared to existing products. Schwarz Pharma in 2004 discontinued Ranbaxy's molecule (RBx 2258) due to disappointing results in phase II. These setbacks forced the two companies to review their R&D strategy and the direct outcome was pruning of R&D expenditure. The failure of the so-called " out-licensing business model" In 2009, Dr. Reddy's shut down its R&D office in Atlanta, US. In the same year, the company transferred its research division based in Hyderabad to a Bangalore based subsidiary Aurigenes, which offers research services to pharma firms. Dr. Reddy's has now only 30 scientists working on new drug development compared to 280 in the early years of the last decade.

Question: Why do these companies out-license the molecules instead of developing them in-house till the last stage? Do they have the science and technology (S&T) skills and other resources required for developing new chemical entities (NCEs)?

Figure 2: R&D Process for Developing New Drugs

Answer: As from figure 2 indicates that there are numbers of stages to reach into markets. In stage 1 and 2, biology studies are conducted to understand how disease works and this leads to identification of specific targets, in stages 3 to 5, teams of chemists, pharmacologists and biologists are

engaged in screening thousands of compounds to generate new potential compounds so that is why they go for out license the molecule.

Another reason may be the expenses if we see the expenses so 40 percent of R&D expenses are incurred during clinical phase, 27 percent for basic research, 19 percent for developing of production processes, 7 percent for implementing the regulatory requirements and other expenses are 7 percent.

Question: How did the leading Indian firms like Dr. Reddy's and Ranbaxy manage to develop new molecules till the pre-clinical stages, before out-licensing, if they did not have the skills to conduct R&D from stage one to Five?

Answer: The molecules developed by these firms do not fall under a completely new family of drugs, but are new molecules within an existing family of drugs that have already been well discovered. By working on targets that are already established and developing a new drug within a family that has been extensively researched, the company reduces some amount of uncertainties involved in new drug research. This model of R&D is known as ' analogue research'.

Indian companies also lag behind in the ability to invest in R&D. There have been reservations about the $1billion benchmark. The R&D investment of India's top three pharmaceutical R&D spenders' (Ranbaxy, Dr. Reddy's and Sun) in the last 12 years is way behind the $1 billion benchmark, with Ranbaxy at $728 million, Dr. Reddy's at $509 million and Sun at $232 million. And this investment is inclusive of R&D expenses for the production

of generics and new drug delivery systems (NDDS). While Pfizer, the largest pharma firm in the world, invested $7945 million in R&D in 2008 alone, even the combined R&D investment of India’s top 10 pharma R&D investors during the last 10 years amounts to only $3172 million, 40 per cent of Pfizer’s investment in just one year.

5. WAYS OF FUNDING FOR R & D

The various ways of funding R&D could be considered as follows: 1. Self-financing Research: This is based on (i) “ CSIR Model” i. e. recover research costs through commercialization – collaboration with industries to fund research projects and (ii) “ Dr Reddy’s Lab / Glenmark Model” i. e. recover research costs by selling lead compounds without taking through to development – wealth creation by the creation of Intellectual Capital. 2. Overseas Funding: By way of joint R&D ventures with overseas collaborators; seeking grants from overseas Health Foundations; 3. Venture Capital & Equity Market: This could be both via Private Venture Capital Funds and Special Government Institutions. 4. Fiscal Support & Non-Fiscal Support: Will also be valuable in early stages of R&D, for which a variety of schemes are possible as follows: * Customs Duty Concessions: For Imports of specialised equipment, e. g. high throughput screening equipment, equipment for combinatorial chemistry, special analytical tools, specialised pilot plants, etc. * Income tax concessions (weighted tax deductibility): For both in-house and sponsored research programmes. * Soft loans: For financing approved R&D projects from Government financial institutions / banks. * Tax holidays: Deferral, loans on earnings from R&D. 5. Government funding: Government grants though available, tend to be small and typically targeted to

government institutions or research bodies. There is very little government support for private sector R&D.

6. RESEARCH OPTIONS FOR INDIA

* Basic discovery research.
* Genetic and proteomic research.
* Decoding human genetic code.
* Biotechnology and biosimilars.
* Process research.
* Natural product screening and
* The ‘ open innovation’ model (Open source drug discovery):

As the name suggest, ‘ Open Innovation’ or the ‘ Open Source Drug Discovery (OSDD)’ is an open source code model of discovering a New Chemical Entity (NCE) or a New Molecular Entity (NME). In this model all data generated related to the discovery research will be available in the open for collaborative inputs. In ‘ Open Innovation’, the key component is the supportive pathway of its information network, which is driven by three key parameters of open development, open access and open source. Council of Scientific and Industrial Research (CSIR) of India has adopted OSDD to discover more effective anti-tubercular medicines.

7. THERAPEUTIC AREAS OF NEW DRUG RESEARCH & DEVELOPMENT

Table 1: compound of Indian companies at different stages of development

COMPOUND| THERAPEUTICS AREA| STATUS|

Dr. Reddy’s|

DRF 2593| Metabolic disorders| Ongoing. Phase III|

Several Compounds| Metabolic disorders| Ongoing. Phase I| DRL 17822| Metabolic disorders /Cardiovascular disorders| Ongoing. Phase I| Ranbaxy | RBx 11160 (Arterolane)| Anti-malaria combination drug| Ongoing. Phase III Studies in India and Thailand| Glenmark | GRC 10693| Naturopathic Pain, Osteoarthritis & other Agonist inflammatory pain| Ongoing. Entered phase II trials| GRC 8200 (Melogliptin)| Diabetes type-2| Ongoing. Entered phase III| GRC 3886 (Oglemilast)| COPD, Asthma| Ongoing. Phase II completed| GRC 4039 (Revamilast)| Rheumatoid arthritis, multiplesclerosis and other inflammatory disorders| Ongoing. Entered phase II| Biocon |

EG-GCSF| Oncology| Ongoing. Pre-clinical|
Bmab 100| Oncology| Ongoing. Pre-clinical|
Bmab 200| Oncology| Ongoing. Pre-clinical|
IN 105 (Oral Insulin)| Diabetes| Ongoing. Phase III|
Wockhardt |
WCK 771| Anti infective| Ongoing in phase II|
WCK 2349| Anti infective| Ongoing in phase I|
Lupin |
LL 2011| Anti-migraine (Amigra)| Ongoing. In phase III.| LL 4218| Anti-psoriasis (Desoside-P)| Ongoing. In phase II.| LL 3858/4858| TB (sudoterb)| Ongoing. In phase I.|
LL 3348| Anti-Psoriasis(Herbal Desoris)| Ongoing. In phase II.|

Table 1 show that R&D efforts are concentrated in global chronic disease conditions such as cancer and diabetes. Though there are two molecules on malaria and tuberculosis (TB), it should be noted that they have not been completely the outcome of corporate considerations. Ranbaxy’s anti-malarial

compound (Arterolane) came out of its partnership with Medicines for Malaria Venture (MMV), Lupin, the only company engaged in the development of TB drugs, has been the world leader in the production of TB drugs. It is also a preferred supplier to the Global Drug Facility (GDF), which supplies the drugs to more than 50 countries. For the development of the TB drug, Lupin has been in partnership with public funded research institutions, Under the New Millennium Indian Technology Leadership Initiative (NMITLI) programme of CISIR, the expertise of 12 institutional partners and Lupin were synergised in the TB research for the development of new targets, drug delivery systems, enhancers and therapeutics.

Lupin’s TB candidate is the first success achieved in developing a new TB therapy in the last 40 years globally. Unfortunately, the company now is in the process of shedding its TB research programme. “ We were not satisfied with the way the programme was running” says Nilesh Gupta, President the Executive Director of Lupin. “ Our focus will now be on diabetes and anti-inflammatory research. Globally these are hot areas”.

The focus of Indian pharma firms has shifted away from the domestic market and have got it aligned it with the R&D strategies of MNCs. Public sector facing crisis with withdrawal of private sector from neglected disease. Indian pharma firms have become integral part of the global R&D and production network of MNCs.

8. ROLE OF PUBLIC SECTOR

(ADDRESSING THE MARKET FAILURE OF THE NEW PATENT REGIME IN THE COUNTRY) There are essentially two ways in which the public sector can

address the market failure issue. One, the public sector pharma companies are encouraged to undertake R&D on drugs for the neglected diseases. Two, provide additional incentives to the private sector in the form of public private partnerships (PPPs) to conduct R&D on neglected diseases. The first option is not feasible as most of the earlier champions have become sick already.

The strategy of the Government in addressing the market failure has been the option two – through PPPs. PPPs have been justified as initiatives to synergise the strengths of the public funded R&D institutes such as CSIR laboratories, universities and academic institutions and the pharma industry. The collaborative research programme under Drugs and the Pharmaceuticals Research Programme (DPRP) of the Department of Science and Technology (DST), initiated in 1994-95, is a PPP specific to the pharma industry. Under the collaborative programme, research is done jointly by the publicly funded R&D institution and the pharma company under the monitoring of DST. The public funded institutions would provide the existing facilities and the service of their R&D personnel. As of 2010, 101 collaborative projects have been sanctioned in the area of tuberculosis, malaria, diarrhoea, diabetes, psychosomatic disorders, kala azar, cataract, dementia, HIV/AIDS, anti-fungal, anti-viral, anti-cancer, anti-bacteria, anti-rabies, anti-obesity, anti-asthma, arthritis, vaccine for dengue, Japanese Encephalitis and Hepatitis-B. Despite a large number of projects being granted, no NCE has been developed out of this programme.

There may be other factors also involved in no new products coming out of the PPP under DPRP. CSIR laboratories like CDRI do not have much

interaction with pharmaceutical industry in the new drug development. In India since 1947, 17 new drugs have been developed of which 15 come from the public sector like CDRI, HAL, etc. These institutes developed drugs, conducted clinical trials in India, obtained marketing approval in India and licensed to Indian firms for marketing. But none of the drugs has been commercially successful. A major constraint has been the lack of commercial orientation of these institutes.

Other PPPs from which the pharma firms benefit are the New Millennium Indian Technology Leadership Initiative (NMITLY) of the CSIR and Small Business Innovation Research Initiative (SBIRI) of the Department of Biotechnology. Under NMITLY 42 pharmaceutical R&D projects have been sanctioned in the last six years involving 287 partners, 222 in public sector and 65 in private sector. Similarly, SBIRI has sanctioned 32 R&D projects in pharmaceuticals.

The PPPs have been able to make the linkages between the public sector laboratories and research institutions and the industry. These partnerships, however, have been catering to the need of the industry to effectively participate in global R&D networks of pharma MNCs than to the need of the country to address the problem of the failure of the market in incentivizing the firms to bring out new therapies for neglected diseases. So, PPP are not an effective alternative to address the market failure.

Apart from the PPPs there are other incentives also available for the R&D in the pharmaceutical sector. The Drug Policy provides incentives in the form of

exemption from price control. The Drug Policy (Drug Policy 1986, as modified in 1994). R&D firms in India also benefit from tax and duty exemptions under various provisions. Firms having in house R&D facilities in India and recognised by the Department for Scientific and Industrial Research (DSIR) are eligible for 150 per cent weighted exemption on R&D expenditure under Section 35 (2AB) of Incomes Tax Act. This section is extended to depreciation on investment made in land and building for dedicated research facilities, expenditure incurred for obtaining regulatory approvals and filling of patents abroad and expenditure incurred on clinical trials in India. As of now, this facility is available till 2015. The R&D intensive companies (Gold Standard Companies) are eligible for the benefit of 200 per cent weighted tax exemption. Gold Standard Companies identified on the basis of certain criteria including investing at least 3 per cent of sales turnover in R&D, employing at least 200 scientists in India, have filed at least 10 patent applications in India based on research done in India, etc.

9. FOREIGN INVESTMENT IN R&D

100 per cent foreign investment is permitted through automatic route in pharmaceuticals in the country. A major limitation in the study on the impact of liberalisation of foreign investment on R&D is the availability of data. Most of the foreign R&D companies in India are not listed companies and as a result the information on the R&D focus of these firms is not available publicly. In a first of the kind of the study in India, the DSIR and the Indian Institute of Foreign Trade (IIFT) jointly conducted a study in 2005 based on questionnaire on the foreign R&D centres in India. Of the 119 foreign R&D centres, which responded to the questionnaire, 46 firms belonged to the

category of biotechnology and pharmaceuticals. Out of these 46 firms, those firms working exclusively on pharmaceuticals and their R&D activities are given in the following table 2.

Table 2: Foreign R&D Centres in India and Technologies Developed NAME OF THE COMPANY| TECHNOLOGIES DEVELOPED|
Astra Zeneca R&D| * Cardiovascular * Infection * Neuro science * Oncolology * Respiratory| Merck Development Centre Private Limited| * Anti-malarial * Cough and cold formulation * Dermatological * ORS * NSIAD * Antibiotics * Cardiovascular| Novartis India Limited| * Arthritis and bone metabolism * Cardiovascular and metabolic disease * Immuno pathology * Nervous system * Oncology * Transplantation| Novo Nordisk India Pvt. Limited| * Insulin analogues * Insulin delivery device| Indus Bio Science Pvt. Limited| * Carbohydrate derivatives * Heterocyclic building blocks * Reagents and building blocks * Chiral agents and building blocks * Nitriles, acids and amidines| Roche Scientific Company India Limited| * Transplantation * Oncology * Hepatitis * HIV|

The foreign R&D centres in India claim to do R&D in various therapeutic segments. But it is not clear in which stage of the drug development, their R&D is concentrated. A few of them like Indus Bio Sciences and Pharma Net India Clinical Services seem to be engaged in the development of processes, delivery systems and derivatives. However, we do not have clarity on the R&D activities of the affiliates of MNCs such as AstraZeneca and Novartis.

10. EMERGING R&D STRATEGIES IN PHARMACEUTICAL SECTOR:

Unlike in the pre-reform era when the government provided the direction and necessary support, now the firms are expected to be standing on their own feet and are required to take decisions based on commercial considerations. Indian pharmaceutical firms have been engaging in various kinds of business collaborations in R&D with MNCs. There are broadly three kinds of alliances involving MNCs: contract research and manufacturing services (CRAMS), collaborative research projects (CRPs) and out-licensing and in-licensing.

10. 1. Contract research and manufacturing services:
CRAMS are essentially outsourcing arrangements. CRAMS include manufacturing of active pharmaceutical ingredients and formulations; chemistry and biology research for new drug compounds; pre-clinical trials; and clinical trials. The CRAMS market in India was estimated at $2. 5 billion in 2009 and is expected to reach $6. 6 billion by 2013.

There are many factors forcing MNCs to outsource their production to India. Cost of manufacturing is substantially low in India – as low as 35 per cent of US costs and 28 per cent of cost in Europe (ICRA 2011). India also has the largest number of US Food and Drug Administration (FDA) approved manufacturing plants outside the US. 27 MNCs like AstraZeneca and Eli Lilly have already announced their plans to outsource substantial part of their manufacturing activities to firms in countries like India. Foreign companies are keen to outsource their production for containing their cost. India has become a favourable destination as it has the largest number of USFDA approved plants outside the US. India has more than 160 FDA approved plants in India whereas its competitor China has only about 30.

Earlier, it was the smaller Indian firms who were into contract manufacturing, but lately larger firms like Dr. Reddy’s are also into this business as part of much wider alliances such as marketing collaborations. The alliance between Dr. Reddy’s and GlaxoSmithKline (GSK). The drugs will be manufactured by Dr. Reddy’s and licensed and supplied by GSK in various developing countries in Africa, the Middle East, Asia Pacific and Latin America. In some markets, the drugs will be co-marketed by both companies. 29 Revenues will be shared with Dr. Reddy’s as per the agreement. Similar kinds of contract manufacturing alliances involving marketing tie-ups exist between a. AstraZeneca and Torrent;

b. Pfizer and Aurobindo;
c. Pfizer and Biocon; and
d. Boehringer Ingelheim and Cipla.

The contract research market in India is growing at a more rapid pace as compared to the global contract research market. The low cost of conducting research in India is an important factor for the outsourcing of research to India. R&D activities in India are estimated to be 60-65 per cent cheaper as compared to the costs in the US. Labour cost in India is in the range of 10-15 per cent of similar costs in the US. There is 25-50 per cent reduction in the upfront capital requirements in setting up R&D projects in India due to locally fabricated equipment and high quality local technology/engineering skills.

More than half (52 per cent) of the contract research in India takes place in clinical trials. There are other factors which make India an attractive destination for clinical trials. India provides a large population which is

ethnically and genetically diverse and suffering from various ailments. India has six out of the seven genetic varieties of human race and a large size of treatment-naive population (untreated) who are looking for cure and better treatment. English speaking population and a well developed communication network with information technology capabilities are also advantages in favour of India in clinical trials.

Table 3: Outsourcing by MNCs

Contract research organisations (CROs) have grown in number in India from 20 in 2005 to 100 in 2008 and are expected to number 150-200 y 2012. Contract research arrangements are for fixed periods on an identified therapeutic area. Those Indian companies that have proven strengths in selected areas of drug discovery but are not prepared to step into new drug development enter into this type of collaborations. The risk of the failure of the project is entirely borne by the outsourcing company and the compound developed under the partnership will be owned by it. A number of mid level Indian firms are actively engaged in this business. Jubilant Organosis, a Bangalore based company, has research collaborations with two leading MNCs and a foreign university. It has a five year contract, starting in 2009, with AstraZeneca to add to its pre-clinical pipeline in neuroscience. Jubilant also has a similar arrangement with Eli Lilly for a period of nine years starting in 2005.

Table 4: leading CROs in India

Companies in contract research (excluding clinical trials)| Companies in contract research (including clinical trials)| Aurigene (Dr. Reddy’s)Syngene

(Biocon)GVK BiosciencesJubilant OrganosysDivi’s LaboratoriesVimta LabsSuven Life SciencesDr. Reddy’s LaboratoriesNicholas PiramalShasun ChemicalsAvra LabsProcitius Research| Clingene (Biocon)Jubilant Clinsys (Jubilant Organosys)WellQuest (Nicholas Piramal)SynchronVimta LabsLambada (Intas)SRL RanbaxyReliance Life SciencesAsian Clinical Trials (Suven Life Sciences)MetropolisManipal Acunova|

10. 2. Collaborative Research Projects:

There is only a thin line differentiating contract drug discovery and development services and CRPs. In contract drug discovery and development services, the firm provides discovery services in a number of therapeutic areas, whereas in CRPs the Indian firm’s focus is in selected therapeutic areas. But the firm may have collaborative tie-ups with more than one MNC. In CRPs, the MNC and Indian partner jointly discover drug molecules and develop them. In CRPs, unlike in CRAMS, risk is shared proportionally. The MNC works closely with the Indian partner in the discovery process and the clinical development is the responsibility of the MNC. The Indian company gets upfront payments and milestone and royalty payments depending on the progress and commercialisation of the drug. However, the compound is owned by the MNC.

A few mid-level Indian firms are involved in CRPs. Suven Lifesciences, which started off as a generic company and then moved on to CRAMS and finally reached CRPs, provides the best example. Suven Lifesciences focuses its research on central nervous system (CNS) disorders. Research in CNS disorder like Alzheimer’s disease or depression is very difficult as

quantitative measurements are not possible, unlike in the case of diseases like hypertension. This requires expertise and Suven has brought in Eli Lilly as its collaborator in CNS research. The company now has 13 molecules in various stages of pre-clinical development.

In CRPs, royalty is an essential component of the arrangement, unlike the CRAMS. This would ensure a steady stream of income to Indian firms. As for CRAMS, in CRPs also Indian firms are subordinate allies, who are entitled only to a fraction of the total benefits accruing to the product. Since the Indian firms work jointly with the MNC partners, the chances are better for building up specialised skills as compared to CRAMS. The royalty payments involved often are in double digit percentages and this is a major incentive for Indian firms to enter into CRPs.

10. 3. Out-licensing and In-licensing:

Out-licensing

Discovery and development of new drugs require huge financial resources and expertise. As a result, in most cases, Indian companies have collaborated with MNC partners at the more advanced stages of drug development – clinical development. Out-licensing is the most widely adopted strategy of major Indian firms. They independently develop the molecule up to a certain stage and then license it out to an MNC partner for further development. Indian firms receive upfront and milestone payments and royalty (depending on the terms of the contract), on successful marketing of the drug. In some cases of out-licensing, Indian firms have been entitled to marketing rights and to contract manufacturing opportunities. The

Ranbaxy-Schwarz Pharma deal on RBx 2258 compound provided that Schwarz Pharma would retain exclusive marketing rights in Europe, Japan and the United States, while Ranbaxy would retain the rights for rest of the markets. The deal also provided for Ranbaxy to manufacture and supply finished formulations of the drug to Schwarz Pharma. Out-licensing was considered a win-win strategy because on the one hand it augments the scarcity of resources in finance and research skills of the Indian firms and on the other it gives the MNCs access to promising compounds at considerably lower prices. The out-licensing business was initiated in the country by Dr. Reddy’s and Ranbaxy. They were later joined by others like Glenmark and Torrent.

In-licensing

There are also a few cases of in-licensing of molecules for clinical development, though these are very few in number. Glenmark has an in-licensing deal with San Francisco based Napo Pharmaceuticals for Napo’s proprietary anti-diarrheal molecule Crofelemer. Diarrhoea is the most commonly reported gastrointestinal symptom in HIV infected patients. About 15-30 per cent of HIV/AIDS infected population is affected with diarrhoea. Napo has granted development and commercialisation rights to Glenmark in 140 countries including India (outside US, Europe, China and Japan Napo has granted development and commercialisation rights to Glenmark in 140 countries including India (outside US, Europe, China and Japan).

11. THE KEY ELEMENTS OF CREATING ECOSYSTEMS:

a. Knowledge and learning need to be upgraded through the universities and specialist centres of learning within India. b. Science and Technological

achievement should be recognized and rewarded by the sanction of grants and the future funding should be linked to scientific achievement. c. Indian scientists working abroad are now inclined to return to India or network with laboratories in India. This trend should be effectively leveraged. d. By involving the universities.

12. CONCLUSION:

As far as concern R&D in Indian pharmaceutical companies so they are not doing enough well and they are not self dependant if Indian pharmaceutical companies wants to become a developed R&D from a developing R&D so they must consider the following three aspects; i. Cost

ii. Efforts and,

iii. Risk.

REFERENCES:

i. The Process of New Drug Discovery and Development, Second Edition, Charles G. Smith and James T. O'Donnell, 2006, p. 422, published by Informa Healthcare. ii. " Food & Drug Administration, Generic Drugs: Questions and Answers". Food and Drug Administration, January 12, 2010. iii. Abhinav Agrawal, Kamal Dua, Vaibhav Garg, U. V. S. Sara and Akash Taneja, 27-Challenges and Opportunities for The Indian Pharma Industry, Health Administrator vol. xx number 1&2 : 109-113 iv. Kettler, white and jordin.

v. KPMG 2005 AND Lintin and Nicholas 2007.

vi. Abrol, et al 2011planning commission of India 2006.

vii. Goddamn the Pusher Man, Reason, April 2010

viii. DSIR-IIFT and Prowess.

THANK YOU SO MUCH