Over the years, research at Lupin comprised the use of alternative processes to make products already under patent, the creation of disease-treating formulations, an improvement in operating efficiencies leading to a cost reduction and putting products at the most appropriate junctures in the marketplace.

In 2001-02, the company graduated its research initiative into a higher league. The company commissioned the Lupin Research Park in Pune to drive the company’s research into the frontiers of modern, medical science and phytomedicine research.

Lupin’s futuristic research centre is provided with integrated research and development laboratories. The centre also comprises dedicated prototypes and pilot plants that facilitate the development of a range of drugs in several therapeutic segments.

Towards the close of 2001-02, the centre was manned by more than 130 scientists.

New Chemical Entities

The company’s decision to enter a specific therapeutic area is based on the following factors: market size, competition as well as a lead on novel and promising mechanisms of action.

Lupin is actively engaged in the synthesis of NCEs in the cardiovascular, anti-infectives, respiratory and dermatological therapeutic areas. The company expects to enter into win-win collaborative relationships to leverage expertise and lower costs.

The synthesis of anti-TB and anti-bacterial products gained momentum. The company entered into collaborative research with leading research institutes and received grants to work on several projects.

In phytomedicine, the company expects to file an Investigational New Drug Application (INDA) for migraine during the current financial year. Lupin identified Psoriasis and Asthma as thrust areas, mainly using plant source.

Therapeutic areas of focus

Anti-psoriasis

Psoriasis, a chronic inflammatory and auto-immune skin disorder, is a US $ 2 billion market and affects up to two per cent of the global population. Traditional medicines are better suited to manage this disease since they are holistic in approach and possess the potential to cure the disease.

Anti-asthma

Asthma is a chronic inflammatory condition, characterised by recurrent attacks of breathing difficulty and airway complication. It is caused by allergens, physical exertion, chemical irritation, emotional stress and genetic factors. Asthma is a serious global problem with a market size of about $ 4.8 billion. About 155 million people across all age-groups are affected by the ailment annually and worldwide.

Anti-migraine

Nearly 20 per cent people worldwide are affected by migraine, translating into a market size of $ 2 billion. Lupin’s herbal research programme is directed towards the development of a safe, potent and effective anti-migraine agent.

Anti-tuberculosis

This $ 1 billion market shows signs of growth. Since no new drug has been introduced to treat TB over the last 30 years, Multi Drug Resistant strains of the disease have emerged. Lupin, the world’s largest producer of anti-TB drugs, possesses the track record to develop and discover drugs that address this resistant strain.

In phytomedicine, the company expects to file an Investigational New Drug Application (INDA) in the herbal category in the current financial year.

Lupin’s objective is to emerge as a preferred outsourcing partner for innovators. Lupin has created a patentable intellectual wealth in platform technologies. Based on these platforms, Lupin has created product-specific drug delivery systems for the advanced markets. In India, the company is creating differentiated drug delivery solutions to generate a value-addition for its existing products.
Over the next decade, as a number of patented drugs lose their protection, there are huge opportunities for substitution. The size of this opportunity has been estimated at approximately $80 billion during 2000-2008.

India is attractively placed to address this market. The country possesses skills in synthetic chemistry / formulation development as well as a low-cost research and manufacturing base. As a frontline Indian pharma company, Lupin is advantageously placed to leverage the opportunity.

Lupin was the first non-US / EC company to enter Europe - particularly UK and France - with injectable Cephalosporins like Cefotaxime and Ceftriaxone. Lupin’s partnership with the American Pharmaceutical Partners, a large US hospital chain, helped drive sales across the USA. Fosinopril and Benazepril were commercialised. ANDAs were filed for Cefotaxime Sodium (three strengths) and Ceftriaxone (four strengths).

**The US value of Lupin’s generic products**

USA is the biggest market globally for generics. Molecules and attractive economic opportunities are mentioned below. (US $ million)

<table>
<thead>
<tr>
<th>Product</th>
<th>US expiry date</th>
<th>Market size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cefalexine Sodium</td>
<td>Expired</td>
<td>48</td>
</tr>
<tr>
<td>Cefadroxime</td>
<td>September 2003</td>
<td>120</td>
</tr>
<tr>
<td>Ceftriaxone Sodium</td>
<td>July 2005</td>
<td>700</td>
</tr>
<tr>
<td>Cefaclor</td>
<td>Expired</td>
<td>120</td>
</tr>
<tr>
<td>Cephalexin</td>
<td>Expired</td>
<td>140</td>
</tr>
<tr>
<td>Lisinopril Dihydrate</td>
<td>Expired</td>
<td>1000</td>
</tr>
<tr>
<td>Cefuroxime Axetil</td>
<td>July 2003</td>
<td>360</td>
</tr>
</tbody>
</table>

Source: IMS and Michael Barber and Associates.

**Cardiovasculars**

Cardiovascular diseases, account for 17 million deaths globally and are recognised as the biggest killers in the developed world. Lupin has developed a number of ACE-inhibitors. The company is developing non-infringing processes for the other members of the Pril family. Lupin is also working on Statins, another range of cardiovascular drugs. The Statins molecule group is emerging as a preferred solution for cardiovascular disorders as clinical evidence suggests that they are the first-line therapy for lipid (lipids generate cholesterol) disorders. The global market size for Statins is estimated at $16.5 bn.

**Anti-TB**

TB and AIDS are mankind’s worst killers, accounting for millions of deaths annually. To prevent the TB bacteria from becoming drug-resistant, the generics research team has developed a new drug in addition to Rifampicin and Ethambutol.

**The USFDA**

Controlled-release drug delivery systems transport the drug to the specific site of the body and ensure a controlled release. Controlled release circumvents the problems of drug concentration, adverse side-effects and frequent administration.

**INDA**

The company established a supply presence in China and SE Asia. The Middle East markets were buoyant. Thanks to strategic alliances, exports of Cephalexin, TADCA, Cefaclor and Ethambutol increased.
developed a cost-leadership position. Lupin’s API exports to non-regulated markets registered a 13.8% growth to Rs. 221.1 crores as against Rs. 194.3 crores in the previous year. Lupin’s reach extended to servicing clients in more than 50 countries and supplying quality material manufactured at its USFDA approved facilities.

The grant of a Chinese international import license (IDL) helped Lupin export larger quantities to China. The company established a supply presence in other SE Asian countries as well. The Middle East markets were buoyant. Thanks to strategic alliances, exports of Cephalexin, Cefadroxil, Cefaclor and Ethambutol increased. Besides, increased international funding strengthened the offtake of Lupin’s products in the anti-TB range.

The API division has launched a multi-pronged programme. It expects to continue to consolidate its market and cost leadership, judiciously expand capacities and create separate teams to drive focus and productivity. Lupin believes that in the foreseeable future, the global API market will comprise specialty and commodity segments. Separate teams are needed: the first to build the vision and the direction for the specialty operations by riding the entire value-chain from product conception to its commercialisation; the second to focus on driving sales in commodity products. Together, these successful specialty teams will strengthen the quality of revenues and margins.

Cephalosporins
Lupin expanded its cephalosporin capacities through a low intensity de-bottlenecking approach and lowered production costs through multiple initiatives. The cephalosporin product range operated at peak capacity. Lupin’s key performing products included 7ADCA family and 7ACCA family and 7ACA family of products.

Anti-TB
Lupin continued to consolidate its global leadership in the anti-TB product range. The company protected its 70 per cent share of the global market in Ethambutol and 40 per cent in Rifampicin and maintained a dominant presence in Pyrazinamide. The company protected its realisations through a prudent mix of products.

Bulk intermediates
Lupin significantly expanded capacities and maintained a global cost leadership. Thanks to its quality, it exported to premium markets like Japan, Europe and USA. Lupin expects to substantially improve its performance in 2002-03.

Formulations
Formulations represent the highest end in the value-chain for Lupin. Lupin’s formulations include remedies in anti-TB, cephalosporins, cardiovasculars, NSAIDs, phytomedicines and other areas. This division turned in revenues of Rs 428.3 cr in 2001-02, representing 45 per cent of the company’s total income.

API
Lupin quadrupled its Pril capacity in 2001-02 and emerged among the top four Pril manufacturers in the world. The company commercially launched Lovastatin and doubled its capacity. Since cardiovascular diseases have a strong affinity with diabetes, Lupin expects to launch products that belong to the latter segment and balance its portfolio.

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7-ACCA
The cephalosporin product range operated at peak capacity. Lupin’s key performing products included Ceftriaxone, Cefotaxime, Cefuroxime Axetil and Cefaclor.

Lupin manufactures a range of active pharmaceutical ingredients like anti-TB, cephalosporins, cardiovasculars (prils and statins), 7 ADCA and 7 ACCA, among others. These are exported to more than 50 countries across the developed and developing markets.

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Lupin’s growth

<table>
<thead>
<tr>
<th>Segment</th>
<th>Industry growth</th>
<th>Lupin</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-TB</td>
<td>5</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>12</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>19</td>
<td>41</td>
<td></td>
</tr>
<tr>
<td>NSAIDs</td>
<td>15</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

A big feature of the growth of India’s formulations industry was the emergence of remedies directed at lifestyle diseases. This segment has grown exponentially due to a change in the living pattern, prompting the incidence of such diseases and an increase in the manufacture of relevant remedies. This is reflected in the following numbers: the gastroenterology segment in India grew by Rs 400 cr, cardiovascular by Rs 1,300 cr and diabetes by Rs 600 cr. To cater to the growth of this segment, Lupin introduced Rabeprazole under the brand name of Rablet in February 2002, an anti-peptic in the therapeutic segment of gastroenterology.

Lupin’s success in this segment came from its demonstrated ability to consolidate its existing businesses and enter value-added therapeutic segments. As a result, Lupin continued to leverage its strengths in anti-TB, cephalosporins and NSAIDs while enhancing its presence in cardio-vascular and gastroenterology.

Lupin’s competitive performance in the therapeutic segment of focus (market-share as a percentage of the total Indian pharma market) is given below:

<table>
<thead>
<tr>
<th>Segment</th>
<th>2000-01</th>
<th>2001-02</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-TB</td>
<td>40.9</td>
<td>44.6</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td>7.3</td>
<td>8.4</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>1.2</td>
<td>1.6</td>
</tr>
<tr>
<td>NSAIDs</td>
<td>1.2</td>
<td>1.5</td>
</tr>
</tbody>
</table>
There was a time when he could barely sing without coughing. Until his doctor introduced him to Lupin...

ANTI-TB
The disease is more relevant now than ever because it accelerates with the incidence of AIDS. Since medication is ineffective if used in isolation, Lupin resorted to patient education and treatment. This holistic approach strengthened Lupin’s presence in the segment: the company possessed the largest number of formulation alternatives (80) in the anti-TB segment. Lupin has accelerated offtake through its ability to generate high value prescriptions from chest and paediatric segments, which are considered as complementary areas. The two principal anti-TB products of the company are AKT 4 and Rcinex; they possess market sizes of Rs 86 cr and Rs 97 cr respectively and are dominant players with more than 40 per cent marketshare in their respective product categories.
The doctor recommends Lupin’s Doxcef to get infected people back on their feet within a day or two.

CEPHALOSPORINS

In a tropical nation like ours, the anti-infection segment occupies a strong presence in the product portfolio of any growing pharmaceutical company. At Lupin, the segment accounted for 24 per cent of the company’s formulation revenues in 2001-02. Lupin introduced two new molecules - Cefpodoxime Proxetil (oral) under the brand name of Doxcef and Cefpirome (injectable) under the brand name of Cef-4 - to combat infections. The corresponding prominent Lupin products were Ceff (API - Cephalexin), Cefantral (API - Cefotaxime) and Cetil (API - Cefuroxime Axetil) with market shares nearing 10 per cent in each of those product segments.

**DOXCEF (CEPHALOSPORINS)**

<table>
<thead>
<tr>
<th>Champion product</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Launch</strong></td>
</tr>
<tr>
<td>Present market size (Cephalosporins)</td>
</tr>
<tr>
<td>Market’s growth rate (Cephalosporins)</td>
</tr>
<tr>
<td>Present turnover</td>
</tr>
<tr>
<td>Lupin’s market share</td>
</tr>
</tbody>
</table>

**Product description**

Doxcef is a brand of Cefpodoxime proxetil. It is a third generation oral Cephalosporin. Doxcef is an anti-bactericidal and works by interfering with the synthesis of the bacterial cell wall. It breaks the cell wall of the bacteria. It is stable in the presence of beta-lactamase enzyme.

**Growth drivers**

Lupin conducted special activities for paediatricians and their patients (children) in the clinics of the doctors. This activity was unique in the Indian context. The company focused on brand building among ENT specialists and physicians.
Thanks to Lupin, the term ‘young at heart’ is of literal and metaphorical relevance to him.

CARDIOVASCULARS
Cardio-vascular diseases are increasing in incidence. According to WHO, India will comprise 100 million or 60 per cent of the world’s heart patients by 2010. The national market for cardiovascular medicines is currently growing at 19 per cent. Lupin is investing in new products to address the growing incidence of such diseases. Lipril and Tonact are its key products, with market sizes of Rs 44 cr and Rs 63 cr respectively.

RAMISTAR

Launch: July 2001
Present market size: Rs 43 Cr
Market’s growth rate: 72 per cent
Present turnover: Rs 1 crore
Rank of product: 4

Product description
Ramistar is a brand of Ramipril, one of the fastest growing anti-hypertensive molecules. This is a part of the cardiovascular segment and reduces blood pressure in the case of hypertension. It also improves the cardiac function after a heart attack. It is the only molecule that has been studied extensively in clinical trials. This has proved its efficacy in cardiac cases for short and long-term benefits.

Product differentiation
Ramistar is available in a complete range of 1.25 mg, 2.5 mg and 5 mg strengths, giving users the flexibility of strength selection. It not only reduces blood pressure, but also protects other organs like the heart, the kidney, the brain and blood vessels from the damaging effects of hypertension.

Growth drivers
The cardiovascular segment is growing rapidly and Ramistar, with its strong attributes, is driving growth. Moreover, Lupin’s aggressive marketing strategies, combined with strong customer response, have also driven growth.
Lupin has enabled thousands of elderly individuals bring a painless twist to their lives.

NSAIDs

India’s senior citizens are prone to body aches, joint pains and arthritic problems, leading to an increase in the demand for NSAIDs (non-steroidal anti-inflammatory drugs). Aided with superior medical infrastructure and a better diagnosis, the pain management market in India continues to grow at 15 per cent. Lupin’s portfolio comprises superior products like Rofecoxib and Celecoxib (in the Cox 2 inhibitor range). The market size of these molecules is approximately US $ 1.8 billion and US $ 1.6 billion respectively. In keeping with this potential, Rofecoxib has already emerged as the largest NSAID molecule in India worth Rs 80 cr.

Rablet (Anti-Ulcerant)

Launch: February 2002
Present market size: Rs 475 cr
Market growth: 18 per cent
Current turnover: Rs 1 cr
Lupin market share: 18 per cent
Rank: 2

Product description
Rablet is a brand of Rabeprazole. Rablet is a ‘Proton Pump Inhibitor’ that lowers the acidity in the stomach. It is commonly used in acid peptic disorders where it blocks the primary site of acid secretion – the H+K+ATPase cells.

Product differentiation
One critical difference with Rablet is the rapid speed with which it provides relief. Rablet provides 10 times faster relief to the patient compared to similar products. In addition, it has strong advantages like cyto-protection and a healing efficacy that differentiates it within the anti-peptic ulcerants market.

Growth drivers
• The large anti-ulcerant market is a key driver.
• Lupin adopted an aggressive marketing strategy to drive growth.
• Lupin actively used the Internet medium to promote product growth.
• The company leveraged its strong relationship with key customers (doctors) to drive offtake.
• The strong performance of the field force helped increase sales.

Champion product
Lupin’s Aptivate has demonstrated that medication without side-effects can bring a harmony into people’s lives.

Lupin’s phytomedicine segment continued to register impressive sales. Softovac and Fibril together hold nearly 10 per cent share of the laxatives market. Aptivate too holds more than 10 per cent share in the appetite-stimulant market.

**CEF-4**

- **Launch**: March 2002
- **Present market size**: Rs. 138 crs
- **Market growth**: 29.4 per cent
- **Current turnover**: Rs. 62 lacs
- **Competing brands**: Cefrom, Forgen, Magnex, Zosyn and Fortum

**Product description**

Cefpirome is a semi-synthetic, wide-spectrum, fourth generation cephalosporin (the highest class of Cephalosporins).

**Advantages**

Cefpirome like other cephalosporins is an anti-bactericidal and kills the bacterial cell by preventing the building of the bacterial cell wall. Cefpirome is effective against numerous clinically significant bacteria. It is stable against the action of most beta-lactamases. The unique feature of Cefpirome is its stability in relation to plasmid-mediated and chromosomally-mediated lactamases. As compared to third generation cephalosporins, it has a lower affinity for beta-lactamase enzymes.

**Product differentiation**

- The stability of Cefpirome against both plasmid-mediated and chromosomally-mediated resistance, which makes it a generation ahead of third generation cephalosporins.
- The promotional strategy addresses the core issue "Bacterial resistance" in the management of nosocomial infections.
- The positioning line of "Beats resistance for unbeatable success" differentiates CEF-4 from that of its competitors.

**Growth drivers**

- The growing incidence of bacterial resistance is the key driver of CEF 4.
- The company has created an awareness using scientific platforms (seminars and scientific community meetings).
- Lupin has a strong presence in major hospitals / nursing homes which have helped actively promote the product.

**the main bacterial defence against the antibiotic attack.**