
Biogen-Idec: Growing a Customer-Focused Supply Chain

Sitting tensely on the edge of her bed, Abby¹ eyed the long needle attached to the dark blue tip of the syringe. Inside the syringe, a single ml of the drug Avonex was warming from its refrigerated state. She sighed and slowly squirmed out of her jeans. The alcohol-soaked wipe gave her a shiver as she slowly wiped the top of her leg. Time seemed to stop in the darkened bedroom, and she might have sat for minutes or hours had not the voices of her daughters in the hallway jolted her back to the task at hand. Shaking, Abby snatched the syringe and quickly drove it deep into her thigh. She was so concerned about doing it right, that she didn't even notice the prick of the fine needle. As she pushed the plunger of the syringe she felt a slight burning, but it was swiftly forgotten in the relief of removing the empty syringe.

Elated, she turned and picked up the phone from her bed stand, quickly dialing the number she already knew by heart. Gushing with pride, she squealed into the phone, "I did it... I did it ... I did it myself!" Beth, her case manager at Biogen, celebrated with her while quickly accessing her notes from their last conversation. With her case history displayed on the workstation, Beth peppered her with questions: How did it feel? Where did she do it? When was her next visit to her doctor? Had she heard anything more from her insurance provider? As Beth hung up the phone she continued typing the details of her call into Abby's patient record in the Siebel customer relationship management (CRM) system. She hesitated a moment when she reached the date entry next to the word "graduation" on the bottom of the form. Abby had graduated that day and while Beth was happy for her, she felt a small sadness knowing that she would not likely speak with her again. From this point on, Abby would be passed to another case worker who focused on patient follow-up and retention.

Beth's focus was to bring new patients to graduation day. She had first talked to Abby six weeks ago when she was still reeling from her diagnosis. Beth had handled hundreds of such patient calls, but somehow she never got over the tragedy of the disease. Abby was a typical, yet no less tragic, case. An otherwise healthy, 32 year old mother of two, she had begun noticing a funny tingling and loss of muscle

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¹ Patient and case manager names are fictitious. Characters are based on composites of individuals we interviewed, but do not represent any specific person. Any likeness to a specific individual is coincidental.

control in one hand. While out jogging one autumn morning in the woods, she sensed something was different about her gait and half way through her run she tripped on a small twig lying on the trail. At her next routine physical, she mentioned the incident and the numbness to her primary care physician. That led to a series of visits to a specialist, who eventually diagnosed her with early stage Multiple Sclerosis (MS). The morning of the diagnosis, the specialist sat down with her and explained the hand-full of treatment options – all involving regular injections of Interferon-based drugs either subcutaneously or deeper into a muscle. While Abby was not excited about any of the treatments, she knew that if left untreated, the disease could relentlessly progress, ultimately resulting in permanent disability. With the help of her doctor, she tentatively decided on the Avonex treatment because it only required weekly, rather than more frequent, treatments. Avonex was produced by Biogen, a biotech firm based in Cambridge MA. Together with her doctor, she filled out an activation form that was faxed to Biogen and she left the office with purple notebook-size box with booklets and a video on MS and Avonex. She learned that day that Avonex wouldn't cure MS or even treat acute symptoms, but rather it would prevent "flare-ups" and slow the disease's progression, helping patients lead normal lives. However, the treatment was expensive and required that patients give themselves an intra-muscular injection once a week.

With the arrival of the fax at Biogen, a patient record was created in Biogen's Customer Relationship Management (CRM) system and a number of work-processes were initiated including a shipment of information to Abby and a welcome phone call from Beth. Beth and the other case managers at Biogen answered questions about MS and the Avonex, talked patents through the treatment process, and explained service options like having a nurse come to the patient's house to teach the patient and their caretakers how to administer the injection. They also guided the patient through insurance approval and treatment financing. Often it would take a patient weeks to decide upon the treatment and negotiate the insurance maze to gain access to the drug that cost more than \$10,000/ year. Once the financing was in place, the first dose of the drug would be shipped directly from a specialized pharmacy to the patient's home.

Over several phone calls, Beth had listened to Abby's concerns and fears and explained what to expect from the treatment. She sent her additional information about the disease and Avonex along with supplies and a journal to record her reactions to the therapy. She also helped arrange for injection training. She was happy to watch Abby progress: a home nurse had visited and taught her how to administer the injections; the insurance provider had approved the treatment; and the first doses had been shipped via FedEx directly to Abby's home. With each interaction, the CRM system would be updated with Abby's progress and provide Beth with new information for their next interaction. At the end of each phone call,

Beth would stress to Abby that she should call back if she had any questions and Beth would always schedule a future appointment to check in on her. Abby really appreciated the support and came to look forward to Beth's calls.

The last call Beth had made to Abby was five days earlier. The Siebel system had reminded Beth that Abby had received the drug and should be ready to inject. However, Beth found Abby shaken that day. Even though Abby had been through the training and had given herself a practice injection with the help of a nurse, she was still fearful about giving herself the injections. Beth had reminded her that one of Biogen's area business managers (ABMs) could help her find a local clinic that was near her home where she might stop for her weekly treatment. But Abby didn't like the idea of having to interrupt her weekly schedule with a visit to the clinic. She said she would try to do it herself next week....

Now that Abby had given herself the first injection, Beth's job was done. She double-checked the patient record to make sure the information on Abby's doctor was updated. When she was finished, the system would automatically generate a letter to Abby's doctor confirming her first injection. She noted a few personal details shared during the call and then she changed Abby's status to "graduated." She took a deep breath and collected her thoughts. The phone was ringing again, and she needed to focus all of her attention on the next caller.

Moving from Discovery to Patients

Biogen was founded in 1978 by a group of scientists, including Nobel laureates Dr. Walter Gilbert and Dr. Phillip Sharp. The initial business model was focused on developing new compounds that might later be used to create new drugs. Biogen would license the compounds to large pharmaceutical companies who would bring the product to market. In 1980, Biogen licensed its first major breakthrough, beta interferon, to Schering-Plough. That success led to an IPO in 1983. In 1986, Schering-Plough successfully used the Biogen-developed compound to bring Intron® A (interferon alfa-2b) to market for the treatment of hairy cell leukemia.

Ten years later, the research-focused business model was completely upended when Biogen decided to pursue the approval of its own drug, Avonex. With an FDA preliminary approval in 1994, Biogen began a race against time to bring its blockbuster MS drug to consumers. Building a supply chain from scratch would not be easy. There were four key elements to the Avonex supply chain: Bulk manufacturing, formulation, packaging, and final warehousing and distribution. The chain began in a laboratory-like facility where the basic compound was created in bulk. Next, in formulation, the drug was freeze-dried and stored at very low

temperatures. Later, the bulk drug would be packaged into individual doses ready for shipment to patients. The final product had to be stored in refrigerated warehouses that provided specialized distribution services. From the warehouses, the drug would be shipped to pharmacies and then on to the patients.

Jim Mullen (who at the time was VP of Operations), proposed a novel approach to creating a biotech value chain. Instead of licensing its new drug to a pharmaceutical company or developing an entire supply chain, he proposed expanding Biogen's bulk manufacturing capability and outsourcing all other components. Partnering closely with three key suppliers (Ben Venue Laboratories for formulation, Packaging Coordinators for packaging, and Amgen – another biotech firm – for distribution), Biogen achieved a breathtaking feat. Over the months it waited for final FDA approval, Biogen and its partners honed the supply chain. When the FDA gave final approval on May 17, 1996, the supply chain was ready. Within 35 hours Avonex reached the pharmacy shelves – a record within the industry.² Six months later, Avonex became the market leader for MS treatment growing to over \$1.25 billion in sales by 2004.

Jim Mullen went on to become CEO of Biogen in 2000. However, by that time the five-year rocket ship drug that carried Jim to the top of the company had become a bit of a problem. While financially successful, Biogen was essentially a one-product company with Avonex accounting for 82% of its 2000 revenue. Jim set off to remedy that with some sweeping changes. 1) He reorganized the development process to stoke the drug pipeline. 2) He made a \$200M investment in bulk manufacturing, opening a new 250,000-square-foot large-scale manufacturing plant in Research Triangle Park, NC. That plant sported 90,000 liters of bioreactor capacity and was one of the largest biologic manufacturing facilities of its kind in the world (Exhibit 1). 3) He made large investments in developing a customer-centric enterprise, investing over \$20M in a CRM system to support patient interaction in the call center and provide account information to the sales force. That investment included outfitting the sales force with PDA devices that were integrated into the CRM system to enable mobile access. With these large investments, Biogen's supply chain was ready to support much more than a single product. 4) So in 2003, he negotiated a merger with Idec creating the third largest Biotech firm in the world (Biogen-Idec) with projected revenues exceeding \$2 billion in 2004 (see Exhibit 2 for financial results). Idec had two successful cancer drugs for treating B-cell non-Hodgkin's lymphoma. Together in 2004, they had four products on the market (see Exhibit 3 for details on the products) and a pipeline of other promising drugs (see Exhibit 4).

² Bovet, David and Martha, Joseph, "Biogen Unchained," *Harvard Business Review*, May-June 2000, p.3.

Sales and Patient Services

Sales forces were employed by all drug companies, but there were some key differences that highlight the uniqueness of the biotech sales process as compared to a typical pharmaceutical firm. On average, pharmaceutical sales reps got 4-5 minutes of the doctor's time per detail (doctor visit). Often sales reps would arrive at a physician's office without an appointment and simply wait until they could get a few minutes of their time between patients. In cases where the doctor was too busy to see them, the reps might speak with the head nurse or simply leave samples or reading material. Other strategies included bringing snacks or lunch, scheduling lunches out, or hosting small lunch/evening seminars. Typically, the sales reps had several objectives for the short time they had with a doctor: a) discuss results from recent drug trials, b) share information about recent research on a given disease or drug, c) convey general drug information, d) update the doctors on any advances or changes regarding adverse reactions to the drug, and e) provide samples or branded office gifts. In every case, the goal was to move the doctor towards a commitment to prescribe the drug or to reinforce their prescription tendency.

While the general goals were the same for pharmaceutical and biotech sales reps, there were some key differences. The high cost and complexity of many biologic treatments precluded sampling, a common practice of pharmaceutical companies. Also, because biologic treatments were complicated and were usually sold to specialists, the sales reps received more face time with the doctors (as much as 11-12 minutes per detail). This allowed the reps to go into more detail about medical and drug information.

Biogen's approximately 200 sales representatives visited doctors (in their offices or at lunches or dinners). The reps typically had more education and skill than the average pharmaceutical salesperson and were called Area Business Managers (ABMs). The ABMs also hosted seminars for both doctors and patients where they disseminated information about advances in MS and treatment and recent trial results. Due to privacy regulations, ABMs did not regularly interact directly with patients. However, there were several cases where patients could choose to interact with ABMs. For example, ABMs would host information sessions in major cities where they would feature a celebrity who was an Avonex user to discuss their experience - both with the disease and the drug. This created a sense of community for the patients and helped them understand what it meant to live with the disease and how Avonex could affect their lives. Occasionally, a patient would ask to talk to an ABM while visiting their doctor or a patient might ask an ABM to help them find them a convenient clinic where they could receive treatment (in rural area, patients would often have to travel long distances to see their specialist, but could get injections at a more convenient clinic).

In addition to the sales force, Biogen employed highly educated customer service representatives to help patients with many components of their treatment.³ The call center included personnel who fielded inbound calls, case managers, insurance specialists, Medicare specialist, and therapy support coordinators. The customer service center was not used as an outbound sales tool, and ninety-nine percent of all calls were from people who have already seen a doctor and discussed a treatment.

Customer Relationship Management at Biogen - 2001

In 2001, Mullen began plotting an expansion plan for Biogen. With new drugs in the pipeline and possible acquisition targets in sight, he felt he needed to scale the organization to support at least three major drugs by 2005. Mullen was convinced that Biogen had to make a key IT platform investment to support a multiple drug company. Given the company's growing focus around sales and patient support, Customer Relationship Management (CRM) was the natural platform to form a key block of the IT foundation. Moreover, Mullen believed that any other biotech firm that they may acquire would likely have poor customer IT systems. Quickly migrating such acquisitions to a strong platform would speed the integration and unlock more value.

Broadly speaking, CRM focused on strategy and practice of selecting and managing customer relationships in order to maximize long-term profits. Companies in many different industries employed a variety of software products to track sales, provide post-sale support, help determine which customers to target, and extend sales into the customer base. These were typically broken down into categories based on functionality and user base.

- Sales Force Automation tools helped sales people target their pitches. Typically, sales people tracked information about their clients in the software. Also, the software was used to analyze trends and outside information to identify strong customer prospects.
- Customer Service tools comprise such varied products as automatic response systems, call routing and monitoring software, email management, and customer and interaction records. These systems were designed to enable companies to provide effective customer service and to track customer behavior.

³ All customer service representatives at Biogen had college degrees, most in biology or pre-med disciplines. Many representatives eventually left Biogen to attend medical school or nursing programs.

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- Analytical Tools could be used at any point in the customer relationship to target sales or improve products or service.

CRM Capability

During the five year period 1996-2001, Biogen's CRM capability had evolved haphazardly with components managed by multiple systems and processes.⁴ John Vaeth, CRM / Internet Capability Development Manager, noted several key limitations (see Exhibit 4) of the patchwork system including:

- The systems could not support more than one product.
- The European sales force automation tools were rudimentary.
- There were few analytic tools to help gain customer insight.
- There was no way to integrate handheld devices with the sales force automation system.
- The sales support was completely disconnected from the call center activities.

Call Center

The evolving call center capability had become one of Biogen's strengths. Management ascribed much of patient retention to the skills of call center staff. However, Vaeth admitted that the systems could not capture the appropriate data needed to provide seamless customer service, shackling the call center's potential.⁵ He noted several key limitations:

- Different customer service processes were managed by separate systems that were not integrated. For example, an insurance service representative could not see a patient's interactions with case management service representatives or interactions with the patient's doctor.
- Records, such as those of a doctor and patient, could not be linked.
- The call center software was adequate for one product, but would be difficult to scale to additional products. This problem was expected to compound with each added product.
- The European systems were unique to individual countries. They were not linked to each other or the US systems.

European Sales Force Automation

Biogen was selling directly into twelve countries, including the US. Outside of the US, the sales force automation capabilities were limited.

⁴ Accenture, Biogen internal documents, interviews.

⁵ Interview with Chris Dillon and Claire Valle, 3/2/2001; Accenture documents.

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- One executive said that the features needed were as simple as capturing, “[the] purpose of visit, key outcomes, and next steps within one to two minutes.”⁶
 - The inability to capture and access relevant information resulted in ABMs calling on an estimated 30% - 40% of the wrong customers.⁷
 - The scalability of the European sales organization was limited by the technology they were using. As Biogen launched more products, they would have to update the technology.

US Sales Force Automation

The US sales force automation software was homegrown, and while effective in tracking basic contact data, was not linked to other CRM systems. Also, it did not have data mining or sophisticated analytical capabilities to segment and target physicians. As a consequence, little information on physician visits was tracked by the sales force. Culturally, ABMs felt that the information they maintained on each physician they visited was a source of private competitive advantage. As such, many did not actively use the existing sales force automation system, but rather kept their own notes on their physicians.

A \$20M Investment in the Customer

Mullen was convinced that the CRM capabilities had to be stabilized and scaled before they could support three products and \$2 billion in revenue. Additionally, Mullen believed that mobile computing would become a significant competitive weapon in the drug sales process and he felt certain that any new sales solution should include delivery on a personal digital assistant (PDA). He charged Bob Hamm (Senior VP of Commercial Operations) and Pat Purcell (CIO) to form a CRM team to examine the problem and make a recommendation. The team recommended a global Siebel platform to support all customer facing processes. Knowing that a move towards extensive sales tracking would require a major culture change for Biogen’s sales force, they also concluded that mobility would be an important facilitator of the new system adoption. Mobility would also extend the CRM platform directly into the doctor’s office making both information access and data capture more readily available at the point of need. The sales team liked the idea of the flashy technology and thought it would make the process of entering data on each sales visit more palatable. After examining many different devices, the CRM team chose the HP-Compaq IPAQ device.

⁶ Interview with Mark Leuchtenberger, VP International 3/1/01; Accenture documents.

⁷ *Ibid.*

Everyone felt it was important to move quickly and get something implemented within a year. Given Biogen's internal IT capabilities (a staff of 7 people), the team realized that they needed to hire an external consultant that could quickly staff the project with a large team to implement the system using a 'big bang' approach. Accenture was hired to implement the Siebel platform while Everypath was chosen to implement the hand-held application. Kevin White, Director of Commercial IT, commented that "the advantage of using Accenture was their ability to go from 0-60mph in 3 seconds." Accenture could staff the project with team 40-60 consultants throughout the project. Everypath had the key software development skills to implement a Siebel "light" interface on the palm device that could be synchronized with the central data base. The plan was aggressive – a six month development cycle to rollout first in Europe with a US rollout following within three months.

All together, the software, equipment, and consulting services comprised a \$20M project to create the extended CRM platform. For a firm like Biogen that focused most of its internal investments on drug R&D, the project scale was immense – requiring Executive Committee approval. Mullin, who was accustomed to big bets, gained the approval and never looked back. The rollouts occurred on schedule in 2002 with enhancements following throughout 2003.

Benefits of the Extended CRM Platform

Sales Force Automation

Integration with handheld devices allowed ABMs to enter detailed information quickly and easily after meeting with a doctor. Since ABMs often had to spend time waiting to visit the physicians, the ability to enter the data in the doctor's office was important. The PDA was small, easy to carry, and did not require the time a laptop did to boot up. It was expected that this would improve the quantity and quality of information captured.

ABMs felt that the new sales force automation component of the Siebel system helped segment and target doctors along several key metrics. One ABM explained that the old system simply ranked neurologists according to the size of their practices. Now, he could rank neurologists according to size of practice and growth of practice.⁸ Some doctors may have small practices, but were growing rapidly. Visits to these doctors could have a very high impact. Also, the ABMs were now able to view doctors' prescriptions by market share. Some doctors prescribed one drug over another. As the ABM explained, there was no reason to spend a great deal of time calling on a doctor who did not believe that Avonex was an effective drug.

⁸ August 27, 2003 Interview.

The sales force automation tool also helped ABMs by recommending what messages to target to doctors. This included an analysis of the mix of details, mailings, lunches, seminars, etc., that were likely to be most effective with each doctor.⁹ When a doctor prescribed a Biogen drug, the Biogen representatives could see that a new referral had come into the call center and help troubleshoot issues that may occur (like insurance approval). While the ABMs could not view patient information directly, they could see if the graduation process was delayed. Then, they could work with the case managers and doctors to make sure the patient was able to start therapy.

Point of Touch SFA

Enthusiasm for the handheld devices was initially very strong. However, some ABMs preferred using the system on their laptops or preferred to enter the physician visit information in the evening on their home PCs. By 2004, approximately one third of the sales force routinely used the PDAs to enter data.¹⁰ Some complained that it took as much time to enter data on a PDA as it did on a laptop. Others saw it as a great way to capture information while it was freshest in their minds.

Customer Service

Case managers cited many advantages of the new CRM system. First, they appreciated the integration between doctor and patient records. From a central “dashboard,” they could access both doctor and patient information. There was detailed information about all aspects of patient interaction – from insurance approval to adverse effects to basic interactions and updates. This complete view of the customer allowed case managers to address most issues without transferring the patient or leaving the patient on hold while retrieving information.

Measuring the Benefits of CRM

With the system in place for over a year, some still wondered if the \$20M bet on CRM was a good one. While Avonex continued to gain market share, some felt the system was overkill. It was estimated that over 2 million people worldwide had relapsing MS in 2004, with roughly 340,000 in the US alone.¹¹ In 2000, 97,000 patients were taking Avonex.¹² By late 2003, this number had grown to 120,000 patients. Despite fierce competition, Avonex had maintained its position as the number one prescribed drug for MS.

⁹ *Ibid.*

¹⁰ Interview with John Stofko, 8/26/2003.

¹¹ “Just the Facts: 2003-2004,” National Multiple Sclerosis Society, www.nationalmssociety.org

¹² “Biogen Reports Fourth Quarter and 2000 Results,” Press Release, 1/17/2001.

Besides adoption, an important measure for any drug company is persistency. Even for the simplest medications, patents often fail to follow through with the full regime of treatment. Given the nature of Biogen's drugs, patients were even more prone to stop or postpone treatment. Of course, this impacted the efficacy of the drug and had a direct impact on Biogen's financial results. Avonex had historically experienced a never start rate 20% in the early years after introduction. This reflected the percentage of patients who had been prescribed Avonex but never started therapy due to logistics problems, insurance problems, need-phobia etc. With continued investments in the call center capabilities, CRM system, and improved product delivery devices (like prefilled syringes) the drop-off rates had decreased to around 5%.¹³

In the field, the sales force also felt the benefits of CRM. Bob Hamm noted that "before the Seibel system, it could take two weeks to gather all the relevant data needed for a senior manager to have an intelligent conversation with a key physician." For example, was the doctor prescribing Avonex? What else were they prescribing? Who had visited them in the last 6 months? If they were using a competitor's product, what were their objections to Avonex? Had they seen the most recent studies or were they using Biogen's most recent programs? Did they attend the Biogen-sponsored MS seminar at the recent neurological conference? Hamm quipped, "Now all of that information is available within a couple clicks"

Finally, the sales force and call center efficiencies had increased since the CRM rollout and the scalability of the system enabled relatively easy additions of new products. The Biogen Idec merger showed this value with the creation of CRM capability for Idec's oncology business at a fraction of the cost of the original rollout.

¹³ Conversations and Accenture document.

Exhibit 1: New Biologic Manufacturing Facility in North Carolina



Exhibit 2: Biogen Idec financial results for 2003

Consolidated Income Statement (12 months ended Dec. 31, \$ in thousands)			
	12/31/2003	12/31/2002	12/31/2001
Revenues:			
Product	\$ 171,561	\$ 13,711	\$ -
Revenue from unconsolidated joint business	493,049	385,809	251,428
Royalties	12,010	-	-
Corporate partner	2,563	4,702	21,249
Total revenues	679,183	404,222	272,677
Costs and expenses:			
Cost of product revenues	283,813	1,457	-
Cost of royalty revenues	926	-	-
Research and development	233,337	100,868	90,458
Selling, general & administrative	174,596	88,021	51,082
Acquisition of in-process research and development	823,000	-	-
Amortization of acquired intangible assets	33,180	-	-
Total costs and expenses	1,548,852	190,346	141,540
Income (loss) from operations	(869,669)	213,876	131,137
Other income (expense), net	(10,955)	17,646	30,467
Income (loss) before income taxes (benefit)	(880,624)	231,522	161,604
Income taxes (benefit)	(5,527)	83,432	59,945
Net Income (Loss)	\$ (875,097)	\$ 148,090	\$ 101,659

Consolidated Balance Sheet (Period ended Dec 31, \$ in thousands)		
	12/31/03	12/31/02
ASSETS		
Current assets		
Cash and cash equivalents	\$ 314,850	\$ 350,129
Marketable securities available-for-sale	521,109	437,645
Accounts receivable	198,524	4,920
Due from unconsolidated joint business	117,342	100,288
Deferred tax assets	123,945	27,675
Inventory	496,349	33,665
Other current assets	66,545	23,288
Total current assets	1,838,664	977,610
Marketable securities available-for-sale	1,502,327	660,091
Property and equipment, net	1,252,783	264,537
Intangible assets, net	3,638,812	9,280
Goodwill	1,151,066	-
Deferred tax assets	-	85,197
Restricted cash	-	22,500
Investments and other assets	120,293	40,474
Total Assets	9,503,945	2,059,689
LIABILITIES		
Current liabilities		
Accounts payable	63,364	3,886
Deferred revenue	7,155	732
Current taxes payable	94,176	-
Accrued expenses and other	240,130	51,607
Total current liabilities	404,825	56,225
Notes payable	887,270	866,205
Long-term deferred tax liability	1,108,318	-
Other long-term liabilities	50,204	27,569
Commitments and contingencies		
Shareholders' equity		
Convertible preferred stock	166	78
Additional paid-in capital	7,801,170	977,672
Accumulated other comprehensive income	1,054	3,764
Deferred stock-based compensation	(2,141)	--
(Accumulated deficit) retained earnings	(611,921)	263,176
	7,188,328	1,244,690
Less treasury stock, at cost	135,000	135,000
Total shareholders' equity	7,053,328	1,109,690

Exhibit 3: Biogen Idec Products**AVONEX (Interferon beta-1a)**¹⁴

Avonex was launched in 1996 to treat patients with relapsing Multiple Sclerosis (MS). MS is a progressive neurological disease that impairs the transmission of signals along nerve cells. MS is characterized by muscle loss, paralysis and sometimes even death. Patients with recurring MS have irregular “flare ups” of symptoms interspersed with periods completely symptom free. In trials, Avonex had been proven to reduce the accumulation of disability and the frequency of flare ups. Six months after the 1996 launch, Avonex captured the market leading position, and had remained the most popular drug for treating relapsing MS. However, Biogen faced increasing competition from three primary players: Rebif, Betaseron, and Copaxone.

Rebif – was developed by Swiss drug maker Serono, and was marketed in the US through Pfizer. Rebif, like Avonex, was based on the drug Interferon beta-1a. Unlike Avonex, Rebif was administered at a higher dose, through a subcutaneous injection three times a week. Patients using Rebif receive more of the drug, more often than Avonex patients. Rebif was launched in the US in 2002 after trials showed it was more effective than Avonex in preventing relapses after 24 weeks. Biogen claimed that over the long term, Avonex was as effective as Rebif. Subsequent trials show Rebif’s advantage slipping as the time horizon extended.¹⁵ Nevertheless, analysts expected Avonex revenue flatten or drop slightly due primarily to the threat from Rebif. The Rebif treatment cost customers approximately \$17,000/yr.

Betaseron (Interferon beta 1-b) – marketed by Berlex was the first biologic treatment for MS to the market. It is administered in a subcutaneous injection every other day.

Copaxone – marketed by Teva was third to market, between Avonex and Rebif.

¹⁴ Avonex is produced by recombinant DNA technology. Interferon beta-1a is a 166 amino acid glycoprotein with a predicted molecular weight of approximately 22,500 daltons. It is produced by mammalian cells (Chinese Hamster Ovary cells) into which the human interferon beta gene has been introduced. The amino acid sequence of Avonex is identical to that of natural human interferon beta (lifescienceanalytics, inc. “Pipeline Report: Biogen, Inc”).

¹⁵ After 24 weeks, patients on Rebif were twelve percentage points less likely to relapse. After 48 weeks, they were 10 percentage points less likely. After 63 weeks, they are 8 percentage points less likely (Knight-Ridder Tribune Business News, “Swiss Drug Maker Claims Superiority over Cambridge, Mass...”, May 30, 2003).

Amevive (Alefcept)

Amevive was launched in February, 2003 and was the first biologic drug marketed to combat moderate-to-severe plaque psoriasis. Characterized by red, scaly patches of skin, Plaque psoriasis is an autoimmune disorder that causes T-cells to attack the patient's own body. Normally, T-cells are critical to a healthy immune system, but in plaque psoriasis, they cause skin cells to multiply at approximately 10x the normal rate. These cells form raised, scaly plaques on the patient's skin. Psoriasis is not deadly, but it is painful and disfiguring. Amevive combats psoriasis by targeting the T-cells.

Amevive was administered through an intramuscular or intravenous injection once a week for twelve weeks. Unlike Avonex, Amevive could not be self-administered, so patients had to visit a health care professional (usually a dermatologist) once a week. In addition to the weekly injection, patients required weekly T-cell count monitoring as low counts jeopardizes the patient's immune system. After a twelve week cycle, patients often went symptom-free for approximately seven months.¹⁶

From launch through Q2, 2003, Amevive posted sales of \$11 million. This growth was slower than expected. Sales representatives explained that the drug was novel and was difficult to administer. Like Avonex, Amevive was an expensive and complicated drug that required a great deal of commitment from the patient. The patient received weekly injections and T-cell counts at an approximate annual cost of \$8,744.¹⁷ Some dermatologists had been reluctant to prescribe Amevive because they had to order the drug, administer it, and then be reimbursed (causing them to hold inventory). Although this was not prohibitively expensive, this process was new and unfamiliar to dermatologists.

Amevive faced several different forms of competition: systemic agents, topical agents, ultraviolet light therapy, and other biologic treatments.

Systemic agents – While effective, systemic treatments carried severe side effects. The most effective treatment for plaque psoriasis was cyclosporine. However, this treatment could only be used for one year continuously because it dramatically increased the chance of kidney disease. Additionally, the chemotherapy drug Methotrexate was an effective treatment, but it increased the chance of developing liver cirrhosis 20%-25% in three to five years from initiating treatment.¹⁸

¹⁶ June 20, 2003 Biogen announcement that one 12-week course of Amevive provided median duration of response of seven months.

¹⁷ Harp, Dennis, "Biogen, Inc: Amevive to the rescue," Deutsche Bank, 2/12/2003, p. 14.

¹⁸ Harp, Dennis, "Biogen, Inc.: Amevive to the rescue," Deutsche Bank, 2/12/2003, p. 10-11.

Topical agents – Lotions and creams (e.g. vitamin D3 analogues, retinoids, etc) could be effective for short periods of time, but often lost efficacy over time. Also, they were seldom effective against severe forms of the disease.

Ultraviolet light treatment – Ultraviolet treatment was highly effective, but had several complications and side effects. 20-30 treatments were required before the plaque was removed. Additionally, the treatments increased the risk of melanoma five times.¹⁹

Biologic treatments – Several biologic drugs were expected to be approved in the near future. The closest to approval was Raptiva, a Genentech drug with higher efficacy than Amevive in trials. Raptiva was expected to be priced below Amevive.

As with Avonex, Biogen's customer service center helped psoriasis patients through the insurance and education associated with Amevive.

Rituxan (Rituximab)

Rituxan, co-marketed in the US with Genentech, was the first monoclonal antibody approved by the FDA for cancer treatment. Rituxan was co-marketing with Hoffman-LaRoche outside the US, except in Japan.

Rituxan was used to treat various B-cell non-Hodgkins lymphomas. A standard course of treatment consisted of four intravenous infusions given on days one, eight, 15 and 22. The treatment was conducted as an outpatient procedure by medical professionals trained in chemotherapy and biologic treatments. Unlike Rituxan, standard chemotherapy was typically administered in repeating cycles for up to four to eight months. RITUXAN was also approved to be administered as an 8-dose regimen, for re-treatment of patients with B-cell NHL who had previously responded to RITUXAN and for use in patients who have bulky tumors.

Rituxan was typically used for patients who did not respond to traditional chemotherapy and radiation treatments. As such, Rituxan was protected by orphan drug status which was due to expire in November 2004. Rituxan was sold and distributed through Genentech. The agreement with Genentech, however, required a Biogen Idec to develop a dedicated sales force for Rituxan by 2006.

¹⁹ Ibid.

Zevalin (Ibritumomab Tiuxetan)

In February 2002, Zevalin was the first radioimmunotherapy approved by the FDA. Zevalin was used to treat relapsed or refractory low-grade, follicular, or transformed B-cell non-Hodgkin's lymphomas, including patients with Rituxan refractory follicular NHL.

Radiation therapy played an important role in the management of B-cell lymphomas due to the sensitivity of B-cell tumors to radiation. Traditional radiation therapy consisted of an external beam of radiation focused on isolated areas of the body or areas with high tumor burden. The ZEVALIN therapeutic regimen combined a monoclonal antibody with a radioisotope. Following intravenous infusion, the monoclonal antibody recognized and attached to the CD20 antigen. This allowed ZEVALIN to specifically target B-cells, destroying the malignant NHL B-cells and also normal B-cells.²⁰

The course of treatment was complicated. First, a patient received one dose of Rituxan. Then, the Zevalin imaging kit was used to confirm biodistribution of Zevalin. If acceptable biodistribution of Zevalin was demonstrated, another dose of Rituxan was administered. Finally, an infusion of the Zevalin therapeutic kit was administered using yttrium-90.

While complicated, Zevalin was used after patients have failed to respond to traditional treatments and Rituxan. Zevalin was a complementary drug to Rituxan. Zevalin was sold and distributed through a dedicated sales force.

²⁰ Biogen Idec 10-K 3/10/2004.

Exhibit 4: Product Pipeline

Click on column headings and rows to explore the pipeline.

ONCOLOGY

RITUXAN® (rituximab)

Relapsed Indolent B-cell Non-Hodgkin's Lymphoma
Relapsed Chronic Lymphocytic Leukemia
Newly Diagnosed Aggressive Non-Hodgkin's Lymphoma
Newly Diagnosed Indolent Non-Hodgkin's Lymphoma

ZEVALIN® (ibritumomab tiuxetan)

Certain B-cell Non-Hodgkin's Lymphoma

Anti-CD80 mAb

Non-Hodgkin's lymphoma

Anti-CD23 mAb

Chronic Lymphocytic Leukemia

Anti-Lymphotoxin Beta Receptor mAb

Solid Tumors

CH2 Domain Deleted mAb

Solid Tumors

Humanized Anti-CD20 mAb

B-cell Malignancies

IMMUNOLOGY

AVONEX® (Interferon beta-1a)

Multiple Sclerosis-Relapsing Forms
Multiple Sclerosis-Monosymptomatic
Multiple Sclerosis-Secondary Progressive
Chronic Inflammatory Demyelinating Polyneuropathy

AMEVIVE® (alefacept)

Psoriasis

Psoriatic Arthritis

Scleroderma

RITUXAN® (rituximab)

Refractory Rheumatoid Arthritis
Moderate-to-Severe Rheumatoid Arthritis

ANTEGREN® (natalizumab)

Multiple Sclerosis-Relapsing Forms (Monotherapy)
Crohn's disease
Multiple Sclerosis-Relapsing Forms (Combination with AVONEX)

Oral Fumarate

Psoriasis

Multiple Sclerosis-Relapsing Forms

Anti-CD23 mAb

Allergic Asthma & Allergic Rhinitis

Anti-CD154 mAb

Immune Thrombocytopenic Purpura

Lymphotoxin Beta Soluble Receptor

Inflammatory Disorders

VLA-1 mAb

Inflammatory and fibrotic disorders

BAFF-R (BR 3) Soluble Receptor

Inflammatory Disorders

Humanized Anti-CD20 mAb

B-cell Disorders

Anti-alpha_vBeta₆

Inflammatory and fibrotic disorders

OTHER THERAPEUTIC AREAS

ADENTRI™

Congestive heart failure

Clinical Trials
Preclinical
Phase I
Phase II
Phase III
Filing
Approved
Phase IV

Exhibit 5: Benchmark of Biogen's US and European CRM Capabilities in 2001

	Customer Segmentation	One to One Marketing	SFA	Alternative Channels	Call Center	Enterprise Integration	Scalability	Overall CRM Capabilities
Biogen Current								
Biogen Europe								
Biogen US								
Amevive Competitors								
Novartis								
Avonex Competitors								
Teva - Copaxone								
Serono - Rebif								
Berlex - Betaseron								
Other Biotech/ Pharma								
Pfizer (UK)								
Amgen								
AstraZeneca (US)								
Consumer Packaged Goods								
Proctor & Gamble								
Biogen w/ Global CRM Capability								

Source: Accenture and Biogen Resources

