UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

ASTRAZENECA AB, et al., Plaintiffs, -v- APOTEX CORPORATION, et al., Defendants.	01 Civ. 9351 (DLC) OPINION & ORDER

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DENISE COTE, District Judge:

This is the last of several patent infringement actions consolidated before this Court concerning generic production of omeprazole, commonly known by its brand name, Prilosec®. Plaintiffs' Astrazeneca AB, Aktiebolaget Hassle, KBI-E Inc., KBI Inc., and Astrazeneca LP (collectively, "Astra") patent on the omeprazole molecule expired in 2001, but several patents covering the formulation of the drug, including the patents at issue in this case, did not expire until 2007. Beginning in 1997, anticipating the expiration of the molecule patent, eight generic drug manufacturers, including defendants Apotex Corp., Apotex, Inc., and TorPharm, Inc. (collectively, "Apotex"), filed Abbreviated New Drug Applications ("ANDAs") with the FDA, seeking permission to manufacture and sell omeprazole. Infringement litigation ensued.

Apotex, Canada's largest generic pharmaceutical company, began selling its generic omeprazole in November 2003, during the pendency of the litigation, and continued selling until 2007, when it was found to infringe Astra's patents. The only

remaining issue is the measure of damages to which Astra is entitled for over three years of infringing sales. The parties have agreed that these damages are to be based on a reasonable royalty for the use made of the patents, which this Court must set by imagining a successful hypothetical licensing negotiation between Astra and Apotex in November 2003, on the eve of Apotex's launch.

PROCEDURAL HISTORY

Fact and expert discovery in this action concluded on August 16, 2013. The parties' Joint Pretrial Order, proposed findings of fact and conclusions of law, and pretrial memoranda were submitted on September 13. At the time the trial was scheduled, the parties agreed that a bench trial would resolve Astra's outstanding damages claim. With the parties' consent, the trial was conducted in accordance with the Court's customary practices for non-jury proceedings, which includes taking direct testimony from witnesses under a party's control through affidavits submitted with the pretrial order. The parties also served with the Joint Pretrial Order copies of all exhibits and deposition testimony that they intended to offer as evidence in chief at trial.

At trial, Astra called two fact witnesses and five experts. Astra's fact witnesses were Kenneth E. Graham, Sr. ("Graham"), an Astra employee for 21 years who held the title of Brand Leader for Nexium®, among others; and Mark Uhle ("Uhle"), CFO for AstraZeneca Pharmaceuticals LP. Astra's expert witnesses were Dr. Martyn Davies ("Davies"), Professor of Biomedical Surface Chemistry at the University of Nottingham in the United Kingdom; Dr. David T. Lin ("Lin"), formerly a Team Leader in the FDA's Division of Reproductive and Urologic Drug Products; Robert Navarro ("Navarro"), Clinical Professor in the Department of Pharmaceutical Outcomes & Policy at the University of Florida College of Pharmacy; Dr. Gordon Rausser ("Rausser"), Robert Gordon Sproul Distinguished Professor at the University of California, Berkeley; and Dr. Christine S. Meyer ("Meyer"), Vice President at National Economic Research Associates, Inc. Affidavits submitted by Astra constituted the direct testimony of its fact and expert witnesses. Each of these witnesses appeared at trial and was cross-examined.

Astra also offered excerpts from the depositions of Dr. Bernard Sherman ("Sherman"), Chairman and CEO of Apotex, Inc.; Beth Hamilton ("Hamilton"), National Sales Director for Apotex Corp.; Gordon Fahner ("Fahner"), Vice President of Business

Operations and Finance at Apotex, Inc.; and Tammy McIntire ("McIntire"), president of Apotex Corp. Apotex offered counter-designations as to Sherman, Hamilton, Fahner, and McIntire.

During the presentation of its defense, Apotex presented affidavits constituting the direct testimony of two fact witnesses and five experts. Apotex's fact witnesses were Dr. David Beach ("Beach"), formerly president of TorPharm, a division of Apotex Pharmaceuticals and Bernice Tao ("Tao"), formerly Director of Global Regulatory Operations at Apotex, Inc. Apotex's expert witnesses were Dr. Stephen W. Schondelmeyer ("Schondelmeyer"), Professor of Pharmaceutical Management and Economics at the University of Minnesota; Roy Weinstein ("Weinstein"), Managing Director at Micronomics; Dr. Jeffrey Leitzinger ("Leitzinger"), Managing Director at Econ One Research, Inc.; Gordon R. Johnston ("Johnston"), formerly Deputy Director of the FDA's Office of Generic Drugs; and Dr. Cory Berkland ("Berkland"), Professor of Pharmaceutical Chemistry and of Petroleum Engineering at the University of Kansas. Affidavits submitted by Apotex constituted the direct testimony of its fact and expert witnesses. Each of these witnesses appeared at trial and was cross-examined.

Apotex also offered excerpts from the depositions of Lisa Schoenberg ("Schoenberg"), Vice President of Sales and Marketing for AstraZeneca Pharmaceuticals LP; and Jeanette Tremayne ("Tremayne"), Director of Alliance Management Finance for Merck Sharpe & Dohme, the parent of defendant KBI Inc. Astra offered counter designations as to both Schoenberg and Tremayne.

The nonjury trial was held in this action from November 4 to 19, 2013. This Opinion presents the Court's findings of fact and conclusions of law. The findings of fact appear principally in the following Background section, but also appear in the remaining sections of the Opinion. This Opinion concludes that Astra is entitled to a reasonable royalty for Apotex's infringement of the Patents in the amount of 50% of Apotex's profits on its infringing sales or $76,021,994.50, plus pre-judgment interest.

BACKGROUND

The evidence at trial has emphasized several key areas of dispute between the parties that would have been crucial in a November 2003 licensing negotiation. First, Apotex's evaluation of the value of a license to sell omeprazole would have been largely shaped by the condition of the market in November 2003

for the class of drugs in which omeprazole belonged. This class was called proton pump inhibitors or PPIs. PPIs address problems associated with gastric distress related to the production of gastric acid. Entry into the PPI market, the evidence has shown, remained an extremely valuable opportunity in November 2003, despite the presence of several branded PPIs, three other generic manufacturers of omeprazole, an over-the-counter PPI branded as Prilosec OTC®, and the increasing importance of Astra's next generation branded PPI, Nexium®. Second, Apotex would have been acutely aware, as it approached the negotiating table in November 2003, of the difficulties it faced if it attempted to develop a new, non-infringing alternative formulation. While one other generic manufacturer had already shown that it was indeed possible to commercialize omeprazole without infringing Astra's formulation patents, Apotex did not have a non-infringing formulation ready in November 2003 and would have had little confidence that it could develop one without substantial delay. Since earlier generic products have a significant advantage over later entrants, Apotex would have been keenly motivated to avoid that delay of entry.

Astra too would have had a core set of concerns as it approached a hypothetical negotiation. While its patent on the omeprazole molecule had expired and it was in the midst of executing a strategy to promote Nexium®, Astra still earned substantial profits on sales of Prilosec®. Moreover, the price of generic omeprazole had not been substantially eroded by the entry of three generic omeprazole products in the months leading up to November 2003, and Astra would have been concerned that Apotex, with a license in hand, would have cut prices to gain market share, further eating into Astra's profits on Prilosec®. Of perhaps even more concern to Astra was the impact the Apotex sales might have had on the growth of Nexium®. Astra offered aggressive rebates on Nexium® to ensure that its cost to Third Party Payers ("TPPs"), such as pharmacy benefit managers ("PBMs"), did not rise relative to its principal competitors, which included not only the other branded PPIs but also generic omeprazole. It believed that without a competitive price, Nexium® would fall out of favor with the various entities that help determine how commonly various drugs are dispensed, and at what cost to consumers. Astra also did not have a practice of licensing its branded products to generic manufacturers, and would have wanted to maximize its profit on any license it

granted to Apotex. These would have been the key motivations and concerns of the parties as they approached a November 2003 negotiation, and they have been the key areas of dispute at trial.

I. Omeprazole

Omeprazole is in a class of drugs called proton pump inhibitors or PPIs. PPIs, which are indicated for many gastrointestinal conditions, work by reducing the production of gastric acid. Omeprazole proved to be a difficult drug to formulate, chiefly because it degrades in acidic environments like the stomach and yet is most effective when it passes through the stomach and is absorbed in the small intestine. In re Omeprazole Patent Litig., 222 F. Supp. 2d 423, 434-35 (S.D.N.Y. 2002) ("Omeprazole I"). Astra's scientists also found that omeprazole had stability issues, and had difficulty developing a formulation with an adequate shelf-life. Id.

Astra ultimately solved these problems with a formulation that combined three key elements: (1) a core combining the active pharmaceutical ingredient with an Alkaline Reacting Compound or "ARC", which provided the necessary stability; (2) an outer, enteric coating that protected the drug from the acidic environment of the stomach but degraded in the intestine,

and (3) a water soluble inert subcoating to separate the core from the enteric coating. Id. at 393. These elements are combined in small spheres, which are inserted into capsules of 10, 20, and 40 milligram strength.

In 1987, Astra applied for patents on this formulation, and received the patents-in-suit (the "Patents"). Both the '505 and '230 patents claim these three elements. The '505 patent includes the formulation and the omeprazole compound; the other patent covers a class of benzimidazole compounds, including omeprazole, and their salts, rather than just omeprazole itself. Id. at 445.

When Astra received FDA approval to sell omeprazole in the United States in 1989 it was the first PPI on the market. Astra considered omeprazole, sold under the brand name Prilosec®,[1] the "new global standard in the short and long term treatment of acid related diseases," and doctors similarly regarded it as the gold standard among PPIs until Astra's next PPI, Nexium®, entered the market in 2003. Prilosec® was a blockbuster drug, with extraordinary sales success. As of 2001, Prilosec® was the "most-prescribed anti-secretory product in the U.S. and in the

[1] For a brief time, Prilosec® was first sold under the brand name Losec®.

world, and . . . the largest prescription pharmaceutical product ever in terms of sales."

II. The First Wave Litigation

Anticipating the expiration of Astra's patent on the omeprazole molecule, which occurred on October 5, 2001, generic drug companies began filing ANDAs for omeprazole in 1998. These were accompanied by "Paragraph IV" certifications challenging the validity of the '505 and '230 patents and/or asserting non-infringement. Between May 1998 and April 2001, Astra filed lawsuits against eight generic drug companies, and the lawsuits were assigned to the Honorable Barbara S. Jones of this district.[2] Judge Jones divided the defendants into two groups. The First Wave defendants were Andrx Pharmaceuticals, Inc. ("Andrx"); Genpharm Inc. ("Genpharm"); Kremers Urban Development Co. and Schwarz Pharma, Inc. (collectively, "KUDCo"); and

[2] Judge Jones resigned from the bench in January 2013 and the patent litigation that remained before her relating to the '505 and '230 patents was assigned to this Court. At a conference on February 6 and in an Order of February 8, a schedule was set to bring the remaining litigation to a conclusion. Since that conference, the two other cases, Astra Aktiebolag v. Andrx Pharmaceuticals, Inc., No. 99 Civ. 9887 (DLC), and Aai Pharma, Inc. v. Kremers Urban Development Co., No. 02 Civ. 9628 (DLC), have been resolved, both on the eve of trial. Thus, this Opinion will resolve before the District Court the last of this suite of cases.

Cheminor Drugs, Ltd., Reddy-Cheminor, Inc., and Schein Pharmaceutical, Inc. (collectively, "Cheminor"). The Second Wave defendants were Impax Laboratories, Inc. ("Impax"); Mylan Laboratories Inc., Mylan Pharmaceuticals Inc., Esteve Quimica, S.A., and Laboratorios Dr. Esteve, S.A. (collectively, "Mylan"); Lek Pharmaceuticals d.d. and Lek Services, Inc. (collectively, "Lek"), and Apotex.

On October 16, 2002, Judge Jones issued an Opinion finding that the Patents were not invalid and that three of the First Wave Defendants -- all except KUDCo -- infringed the Patents. Of particular importance to Apotex, Judge Jones held that the Andrx product infringed the Patents based on the presence in the Andrx product of an inert subcoating that formed in situ rather than being applied. Omeprazole I, 222 F. Supp. 2d at 528. More specifically, Judge Jones concluded based on testimony by Astra's expert that Andrx's formulation led to the creation, in situ and thanks to a chemical reaction, of a microscopically thin salt layer between the core and the enteric coating, and that this layer was a "subcoating" within the meaning of the Patents, since it was inert, water-soluble, and formed an isolating barrier between the core and the enteric coating. Id.

at 538-41.[3] Later, during the Second Wave litigation, Judge Jones would conclude that Apotex's product also infringed the Patents due in part to the in situ formation of a subcoating underneath the enteric coating.

III. The PPI market in 2003

A. Generic launches

Three generics launched between the issuance of Judge Jones's First Wave Opinion in October 2002 and Apotex's launch in November 2003: KUDCo, Mylan, and Lek. KUDCo, whose formulation had been found to be non-infringing, id. at 433, launched its omeprazole product in December 2002. KUDCo was the first generic on the market, and enjoyed a 180 day period of exclusivity in that role.[4] Despite this advantage, however,

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[3] When it affirmed Judge Jones's Second Wave Opinion in 2008, the Federal Circuit described the function of the inert subcoating in Astra's formulation of omeprazole. While the enteric coating protects omeprazole from gastric acid in the stomach, the court noted, it contains acidic compounds that can cause the omeprazole in the drug core to decompose while the drug is stored. In re Omeprazole Patent Litig., 536 F.3d 1361, 1365 (Fed. Cir. 2008) ("Omeprazole V"). To increase storage stability, the ARC is added to the drug core, but the ARC can compromise the enteric coating. This problem was solved with the addition of an inert subcoating that rapidly disintegrates in water, increasing storage stability while also preventing omeprazole from degrading in the stomach. Id.

[4] KUDCo had not been the first to file an ANDA. It purchased its right to sell during the exclusivity period from its competitors

KUDCo did not have the manufacturing capacity to supply the full needs of the market immediately.[5] For this and the reasons that commonly apply to generics selling during the exclusivity period, KUDCo kept the price of its omeprazole product high.[6]

Lek and Mylan, on the other hand, were in the same position as Apotex. They were Second Wave defendants and the court had not yet ruled on Astra's infringement claims against them. Nevertheless, Lek and Mylan made the decision to launch their products in August 2003, knowing they were "at risk" of later being held to infringe. Facing the uncertainty of potential liability to Astra, they did not cut prices aggressively.[7] As both Dr. Rausser and Dr. Schondelmeyer explained at trial, the

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Andrx and Genpharm, which held the right jointly.

[5] In a December 9, 2002 press release, KUDCo reported that it had the capacity to supply about 50% of the omeprazole market. On April 1, 2003, KUDCo reported that it was able to supply about 70% of the market and that it was divesting of certain products to "accelerate redirection of manufacturing resources to . . . omeprazole."

[6] As an internal Astra email in January 2003 noted, "almost all managed care plans are unimpressed with the price point of KUDCo's generic. This has caused some to wait to make changes to their formulary until additional generics become available and price point drops."

[7] In her Second Wave Opinion, Judge Jones eventually concluded that Mylan and Lek did not infringe the Patents, while Apotex did. In re Omeprazole Patent Litig., 490 F. Supp. 2d 381, 390 (S.D.N.Y. 2007) ("Omeprazole III").

uncertainty about infringement that accompanies an at-risk launch makes an at-risk generic drug manufacturer hesitant to cut prices.

The parties vigorously dispute the degree to which these three prior launches impacted the market. Astra suggests that all three kept their prices high relative to Prilosec® and that Apotex, if it had obtained a license from Astra, would have transformed the generic market by launching at a significantly lower price. Apotex argues that prices for generic omeprazole were already beginning to erode, and that the competition among the three generics would have continued to erode prices even without the entry of a licensed fourth product.

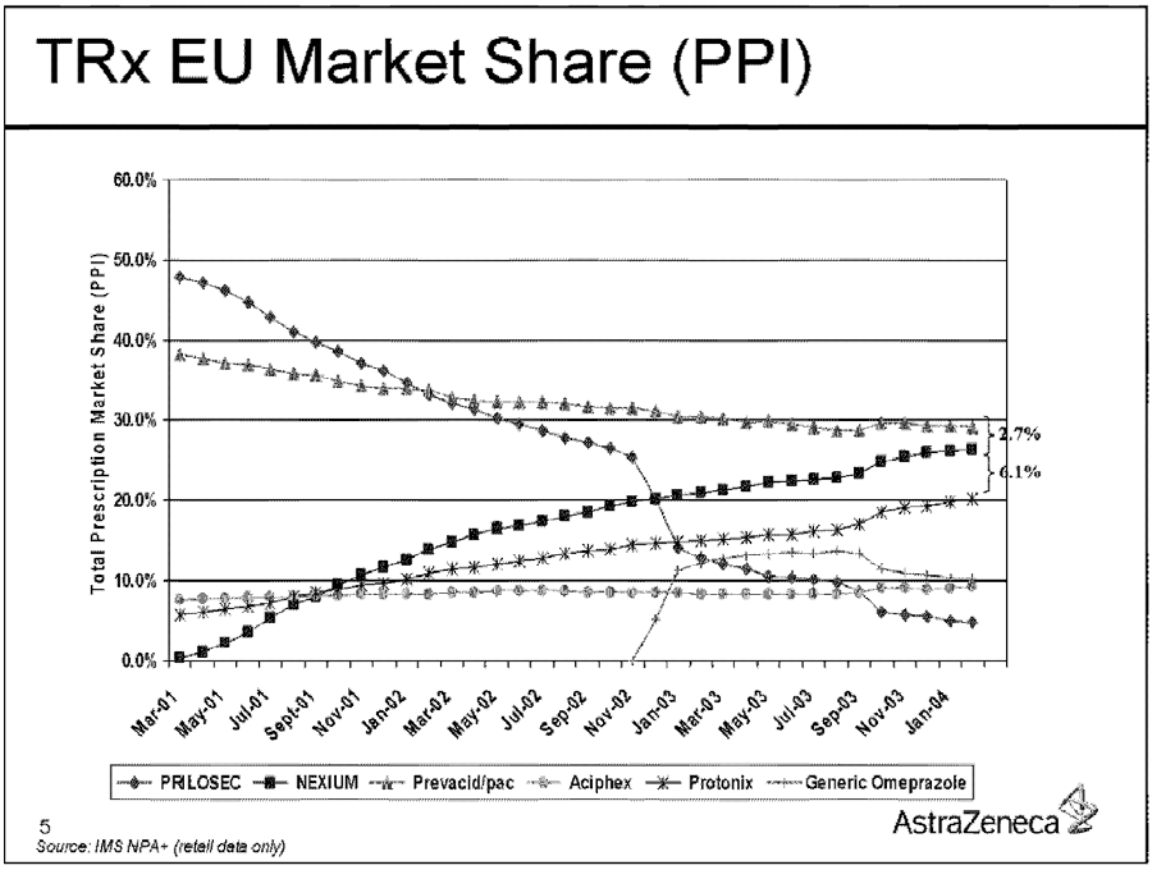
The record suggests that both are right to a degree. The prices of generic omeprazole had declined, but not significantly. An Astra review of the market in October 2003 noted that with Mylan and Lek having launched and KUDCo no longer "restrained" by problems with its production capacity, "price pressures" were increasing and "Managed Care formularies are in a state of flux." The report went on to conclude, however, that thus far, the "high price of generics has limited therapeutic substitution." Similarly, an Astra email dated October 29, 2003 noted that "price competition in the generic

market has increased and both Mylan and KUDCo are offering steeper discounts," but then observed that "this has not caused a change in [managed care] behavior."

The entry of generic competition for Prilosec®, however, had a profound impact on the sale of Prilosec®. The market share of Prilosec®, as measured by the total number of prescriptions written, had been steadily declining since at least 2001, when Nexium® was introduced. It dropped precipitously, however, in late 2002 as KUDCo's generic omeprazole product came on the market, before settling back into a steady decline in 2003.

The following graph from Astra's quarterly performance review in April 2004 illustrates the shifting market shares of Prilosec®, branded PPIs and generic omeprazole from March 2001 through early 2004. While Prilosec® begins with the highest market share in the prescription PPI market, it has the lowest by the end of the period. Conversely, Nexium® steadily gains market share, ending the period as the product with the second largest share, trailing Prevacid®, a branded PPI competitor. Generic omeprazole, which entered the market in late 2002,

quickly took market share from Prilosec®, rising to nearly 15% market share for a period of time.[8]



Taken as a whole, the evidence regarding the omeprazole market as of November 2003 indicates that generic drug prices remained relatively and uncharacteristically high. This was due to the fact that only one generic drug company was operating freely and without the threat of litigation hanging over it. A

[8] "TRx EU" stands for "total prescriptions -- extended units" and includes the mail-order market.

fourth generic, entering the market with a license in hand, would therefore have had a golden opportunity to take significant market share away from both other generic manufacturers and perhaps even branded PPIs by launching at a lower price.

B. Astra's Nexium® strategy

Anticipating the expiration of its patent on the omeprazole molecule and an inevitable decline in its sales of Prilosec®, Astra had long been planning the introduction of a new branded drug that it hoped would take Prilosec®'s place as the gold standard in the PPI market. This drug became Nexium®, which launched in March 2001, about six months before the expiration of the omeprazole molecule patent.

In 1998, Astra summarized its strategy as the following. Predicting that Prilosec® could lose up to 80% of its sales volume within six months of the introduction of generic omeprazole, it hoped to extend the period of market exclusivity for Prilosec® through the strategic use of patents and to transfer the maximum amount of Prilosec® business to a new patent-protected product that would be introduced before the patent protection for omeprazole expired. It wanted that new

product to be differentiated from Prilosec® as a superior drug. That new product was Nexium®.

Astra identified several challenges in implementing this strategy. They included the need to prove that Nexium® was clinically superior to omeprazole and the need to convert the Prilosec® business to Nexium® before the entrance of generic competitors for the Prilosec® business.

Astra achieved the first of these goals. Astra was ultimately able to emphasize Nexium's clinical advantages over omeprazole as part of a campaign to encourage physicians and patients to see Nexium® as the most effective PPI on the market. The FDA-approved label for Nexium® indicated it for "treatment of Gastroesophageal Reflux Disease (GERD)," including healing erosive esophagitis (for which it was indicated for one or possibly two courses of short-term treatment of 4 to 8 weeks), maintenance of healing of erosive esophagitis, and treatment of symptoms associated with GERD, including heartburn. The label reports that Nexium® 40mg is more effective and faster at achieving sustained symptom resolution for patients with erosive esophagitis than omeprazole 20mg.

At its launch, Astra announced that

> Nexium™ 40mg demonstrates higher healing rates in erosive esophgitis than Prilosec® 20mg (the approved

> dose for this indication). In three studies, Nexium™ 40mg consistently demonstrated higher healing rates than Prilosec® 20mg and two of these studies were statistically significant. Healing rates achieved for Nexium™ 20mg were between those achieved with Nexium™ 40mg and Prilosec® 20mg.

In the 1990s, Astra developed another tactic as well to help encourage the transfer of Prilosec® patients to Nexium®. Astra planned to help Nexium® gain PPI market share by introducing an over the counter version of omeprazole called Prilosec OTC®.

In 2001, Astra predicted that PBMs would quickly implement a maximum allowable cost (or "MAC") after two to three generic omeprazole products had entered the market. A MAC limits the amount that a pharmacy will be reimbursed for a drug; it is tied to the price of a low-priced generic version of the drug, as further described below. Astra expected a MAC to be implemented even sooner where the branded drug is a blockbuster, as was true in the case of Prilosec®. As a result, Astra anticipated that any patients who remained loyal to Prilosec® would incur substantial out-of-pocket costs in meeting the co-pays imposed by their insurance plan. Astra expected approximately half of the PBMs to adopt mandatory generic substitution with the advent of a single generic, and for most PBMs to do so as soon as the second or third entrant appeared. Thus, as of July 2001, Astra

expected the "full effects of genericization of omeprazole to have occurred in the fall of 2003." This expectation was based on research suggesting that approximately 40% of HMO enrollees would be impacted by mandatory generic substitution during KUDCo's exclusivity period, while 100% would be impacted after the expiration of KUDCo's exclusivity period, starting seven months after patent expiration.[9] Based on this expectation, Astra timed the introduction of Prilosec OTC® for the Fall of 2003.

Astra believed before the launch of Prilosec OTC® that the over-the-counter ("OTC") and prescription markets were fundamentally different. In an internal analysis dated July 9, 2003, Astra examined the launch of Claritin as an over-the-counter product and concluded that the OTC and prescription markets were "distinct," in part because physicians tend not to push OTC products, and OTC products tend not to appear on the drug formularies of insurance providers. Nevertheless, Astra believed that Prilosec OTC® could help promote Nexium®, because Prilosec OTC® would be viewed as similar to prescription

[9] The document reporting these findings refers to Andrx's exclusivity period, because Andrx and Genpharm had not yet sold their exclusivity to KUDCo.

omeprazole. In other words, Astra believed that patients who failed on Prilosec OTC® would proceed straight to Nexium®, because it was "the only PPI proven better than Prilosec." Astra thus thought that it could "position OTC as a reason to discourage prescribing of omeprazole and encourage prescribing of the superior brand, Nexium®."

The parties hotly debated at trial the degree to which the appearance of Prilosec OTC® actually affected the prescription PPI market. The evidence shows that the advent of Prilosec OTC® caused a substantial drop in the market share of generic omeprazole and a further drop in the market share of Prilosec®.[10] Indeed, Prilosec's net sales dropped from roughly $67 million in September 2003 to roughly $28 million in October 2003 and $17 million in November 2003. On the other hand, the presence of Prilosec OTC® in the marketplace did not have any effect on omeprazole pricing, because the systems through which prescription and OTC drugs are paid for are largely separate, as will be explained in more detail below. As of November 2003,

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[10] Consistent with its strategy of transferring Prilosec® business to Nexium, when it launched Nexium Astra stopped marketing Prilosec® to doctors and consumers and stopped giving free samples. Astra continued, however, to support the wholesale price of Prilosec® through a rebate program in an effort to keep it on insurance company formularies.

Astra's overall plan regarding the transfer of the Prilosec® business to Nexium® appeared to be working. Nexium's percentage of the prescription PPI market continued to grow after the introduction of Prilosec OTC®.

C. Third Party Payers

Despite Astra's strategy of promoting Nexium® as clinically superior to other PPIs on the market, it nevertheless faced significant price pressure as it promoted the new drug. This was in part due to the nature of prescription drug pricing and the ways in which various entities other than the manufacturer and the patient influence which drugs are sold, and at what prices.

Some background is useful in understanding the complex process by which drug prices are set. In the decades following the popularization of health insurance after the Second World War, insurers had little role in the dispensing of prescription drugs. During this period, a doctor would prescribe a drug to a patient, the patient would take the prescription to a pharmacy, the pharmacy would fill the prescription as written, and the patient would then submit the bill to her insurer, which would pay the bill, often minus a 20% patient portion or co-pay. This

system gave little room for insurers to affect the cost of drugs.

By the early 1990s, this had changed, as managed care organizations began to aggressively manage prescription drug costs. Managing such costs has two central components. First, the organizations seek to control or at least influence the choice of drugs made by doctors, patients and even pharmacies, and second, using that control as leverage, they extract discounts for prescription drugs from drug manufacturers.

One methodology that third party payers or TPPs have adopted for managing their reimbursement of prescription drug costs is the creation of a "formulary," or list of covered drugs. During the time at issue in this litigation, formularies often placed drugs into three tiers. Tier I was generally reserved for generic drugs and required the patient to pay nothing or the smallest co-pay. Tier II usually contained the preferred branded drug and required a higher co-pay by the patient. Tier III usually included non-preferred branded drugs and required the highest co-pay. "Closed" formularies excluded certain drugs altogether.

Managed care health plans and PBMs[11] often use formularies to encourage doctors and pharmacists to provide a patient with a generic in place of the brand name drug or to prefer one branded drug over another. Health plans and PBMs can exert influence over physicians by contractually requiring them to adhere to the formulary policies, by educating them about the drugs on the formulary, or by requiring pharmacists in a network to call physicians to ask them to alter prescriptions that are inconsistent with formulary policies. Health plans and PBMs may also have contractual arrangements with network pharmacies that reimburse them only for the less expensive generic on the formulary even if the pharmacy dispenses a branded drug.

When there is widespread acceptance of a generic drug and confidence in its supply, health plans and PBMs may impose a MAC or maximum allowable cost. When a MAC is imposed, the pharmacy will only receive reimbursement for a drug at the MAC price, regardless of the pharmacy's actual acquisition cost for the

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[11] PBMs provide administrative and management services to deliver a prescription drug benefit. They may be part of a managed care organization or a separate firm. By 1999, the top seven PBMs estimated that they covered 234 million "lives". As of 2006, roughly two-thirds of outpatient prescriptions were covered by commercial third party prescription programs, with the remainder being covered by public programs such as Medicaid and Medicare, and a smaller fraction covered by patients paying cash.

product. A market is considered “genericized” at that point; prices often fall by about 80% and the sales volume of the branded drug collapses. The MAC price may be chosen from the federal Medicare program’s price for the drug or some other data source. Similar pressure is placed on a patient’s choice of a drug therapy when the patient is required to pay a higher co-pay when she obtains a non-preferred drug. When negotiating prices with a pharmaceutical manufacturer, a health plan or PBM can threaten to exclude a drug it considers overpriced from a closed formulary or to move the drug to a less preferred position on a formulary in order to secure a discount.

As a general matter, the more costly a drug is to a third party payer, the more likely the payer is to develop a strategy to reduce costs. If it does take steps that disadvantage the drug, those steps may lead to a reduction in the sales of the more costly drug compared to lower cost drugs in the same class of pharmaceuticals. As a result, branded drugs often have an incentive to offer rebates to TPPs, either to ensure placement on Tier II of a formulary or to ensure that they are not excluded from a formulary altogether. These rebates can vary from 3% to 25% or more off the drug’s WAC or wholesale

acquisition cost.[12] If the branded drug offers favorable rebates, it may be cheaper from the TPP's perspective than a generic equivalent, in which case the TPP is less likely to take adverse action against the branded drug.

There are other ways a TPP can disadvantage a branded drug, beyond simply changing its formulary status. A "step therapy" or "step edit" requirement mandates that patients first try a certain preferred drug, like generic omeprazole, before doctors can prescribe a disfavored, more expensive drug, like Nexium®. If step therapy is imposed, the doctor must determine that the patient is not responding adequately to the preferred drug before the patient can move on to the disfavored drug. Another tactic, known as a "prior authorization requirement," mandates that doctors receive authorization from the TPP before they prescribe the disfavored drug to a particular patient.

Generic versions of drug products are typically cheaper for most third party payers, and TPPs generally attempt to drive a culture of generic substitution across a formulary. Even if a generic is not cheaper than a branded drug for a third party payer, it may be more profitable for pharmacies to dispense the

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[12] The WAC is a publicly available list price for drugs published by the industry.

generic version. Since TPPs cannot require pharmacies to dispense a generic from a particular manufacturer, pharmacies decide which manufacturer's generic will be dispensed. Pharmacists customarily stock a single generic product. Pharmacies are thus able to negotiate significant discounts off the published average wholesale price or AWP,[13] and in some cases these may be as steep as an 80% discount.

These financial realities have a significant impact on the pharmaceutical market. Generic drugs are filling a growing share of outpatient prescriptions. They rose from roughly 30% of the prescriptions filled in 1990 to over 70% in 2010. Astra's own files provide an example of how formulary policies can drive sales. In 2001, Astra tried to understand how the entry of generics had led to the rapid erosion of the sales of another branded drug -- Prozac®. This study emphasized the role of pharmacists in driving the "aggressive conversion" to the generic drug. The research identified the most influential factor as the restrictions placed by managed care institutions

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[13] The AWP during the relevant time period was typically 20 to 25% higher than the WAC for the same drug. A pharmacy was usually reimbursed for branded drugs at a contracted percentage discount from the AWP, such as 15%, and given a small dispensing fee, such as $1.50. The amount of the co-pay would also be subtracted from the reimbursement since the pharmacy would collect the co-pay directly from the patient.

on pharmacy practices, either by requiring a higher co-pay for the brand, refusing to include the brand on their formularies, or imposing step-therapy.[14]

D. Price Comparison of Nexium® and Omeprazole: December 2002 to November 2003

This system by which TPPs influenced drug prices had a significant effect on the drugs at issue here. Most importantly for Astra, the emergence of generic omeprazole placed increasing pressure on Astra to pay larger rebates to maintain a favorable formulary position for Nexium®. These rebates kept the effective price of Nexium® comparable to that of omeprazole. Indeed, there is evidence that the effective cost of Nexium® therapy was, perhaps remarkably since Nexium® was the most recently patented PPI, lower than the cost of omeprazole therapy during the period from December 2002 through November 2003, at least from the perspective of certain major TPPs. This was due to several factors, which included the relatively small difference between the wholesale prices of the Nexium® and

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[14] The other key findings related to the high volume of branded Prozac® (which made it a logical target for cost containment), the perceived expensiveness of the branded drug, the greater profit margin available to pharmacists from dispensing the generic, and the unprecedented media attention given to the launch of the generic drug.

omeprazole products, the manufacturer rebates Astra provided for Nexium®, and the fewer number of pills necessary for a successful course of treatment when Nexium® is prescribed. Each of these factors merits some further discussion.

The difference or spread between the wholesale price of Nexium® and generic omeprazole in the interval between December 2002 (when the first generic as introduced) and November 2003 (when the hypothetical negotiation occurred) appears to have been roughly a dollar or less. The spread between the wholesale acquisition cost or WAC, which is the price wholesalers pay to pharmaceutical manufacturers like Astra, for these two products ranged during that time frame from $0.66 to $1.05.

Similarly, the spread during this time frame of the average wholesale price or AWP of these two products was relatively small. This is not surprising since during that time the AWP was typically equal to 120% or 125% of the WAC.

Neither the WAC nor the AWP, however, necessarily provides a complete measure of the relative prices between Nexium® and generic omeprazole, since Astra paid significant discounts and rebates to TPPs that had a significant impact on the actual prices they paid. Nexium® rebate data for 13 major third party payers shows an average rebate of 14% of their gross sales in

the fourth quarter of 2002, rising to 17% in the fourth quarter of 2003.[15]

Another feature of any price comparison is the need to consider the cost of a successful course of treatment. One tool that is commonly used for such a comparison is the Daily Average Consumption or DACON. On average, as of November 2003, omeprazole patients consumed 0.12 pills more per day than patients using Nexium®. At this rate, if a third party payer's cost per pill of Nexium® were 13.9% higher than for omeprazole, the true cost of treatment would be equal for the two drugs.

A study by Astra's expert Dr. Rausser of pharmacy log data from sixteen pharmacies in California and fourteen in Massachusetts for all prescription PPI purchases demonstrated that the effective cost of Nexium® therapy for those TPPs to whom Astra offered rebates was often less than omeprazole therapy during the period between December 2002 and November

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[15] This analysis does not include rebates generic omeprazole manufacturers may have been giving to mail order pharmacies. The data available to Dr. Rausser, who conducted this analysis, on these rebates included only the "deepest available rebates," which did not allow him to determine what effect they might have on average prices of omeprazole. Furthermore, the mail order market accounted for only 13% of all U.S. drug sales in 2003 and only 8.5% of Nexium sales from January to October 2003.

2003.[16] When DACON and rebate data were factored in, the median third party payment for Nexium® was lower than that for omeprazole in 78% of the cases in California,[17] and 89% in Massachusetts.[18] Combining the data from the two states, there were 149 instances in which matching sales appeared in the same month for the same third party payer, which allows a direct comparison of that TPP's cost of Nexium® with omeprazole. In 125 of those instances, or 84%, the median effective third party payment for Nexium® was lower than that for omeprazole. For twelve out of the thirteen third party payers, Nexium® was less

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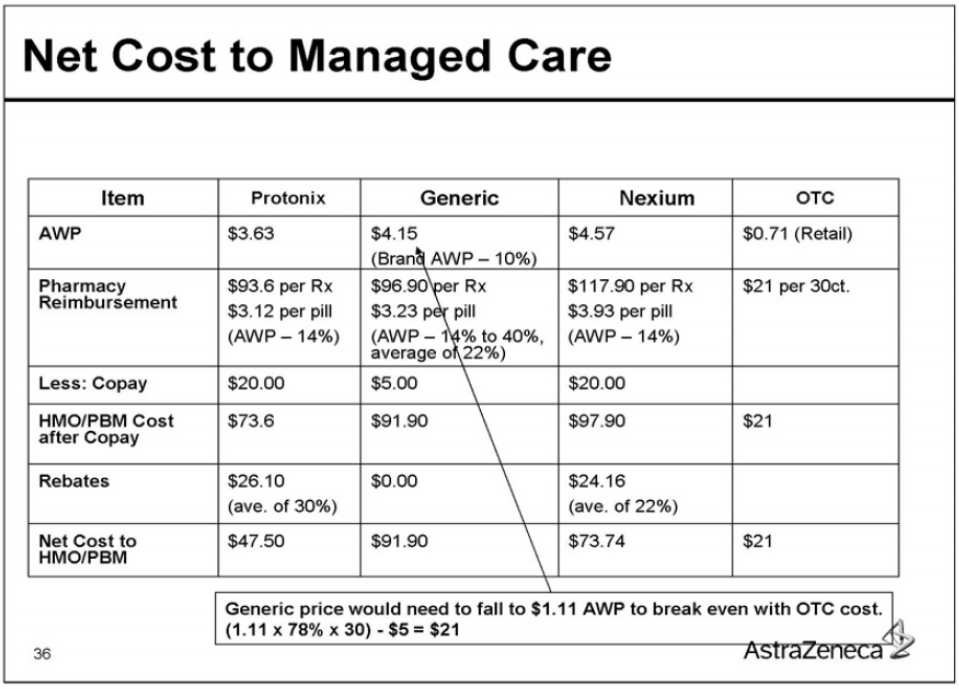
[16] Dr. Rausser drew these conclusions from a study of pharmacy logs obtained by subpoenas issued during state court litigation in California and Massachusetts in which Astra was responding to class action claims that consumers and others had been misled into believing that Nexium was superior to Prilosec® and were injured by having to pay an unjustified price premium for Nexium. At that time, Dr. Rausser used the data to support his opinion that a large portion of the proposed class suffered no economic harm because Nexium was a less expensive therapy.

[17] The 78% figure reflects 61 out of 78 cases, that is, data for the nine third party payers to the California pharmacies for each month in a twelve month period between December 2002 and November 2003 for which there was sufficient data.

[18] The 89% figure reflects 63 out of 71 cases, that is, data for the nine third party payers to the Massachusetts pharmacies for each month in a twelve month period between December 2002 and November 2003 for which there was sufficient data.

expensive than omeprazole in at least half of the months for which there was sufficient data to make a comparison.

While Astra would not have had access to the pharmacy log data Dr. Rausser used in November 2003, his study corroborates Astra's own contemporaneous internal analysis. A July 9, 2003 Astra analysis indicates that the net cost to a TPP of a 30 day Nexium® prescription was over $18 less than the net cost of a generic omeprazole prescription, i.e., $73.74 versus $91.90. Astra attributes this differential to the closeness in the list prices of the products and the co-pay differentials and rebates provided by Astra. The following table from Astra's report presents this data.



Net Cost to Managed Care

Item	Protonix	Generic	Nexium	OTC
AWP	$3.63	$4.15 (Brand AWP – 10%)	$4.57	$0.71 (Retail)
Pharmacy Reimbursement	$93.6 per Rx $3.12 per pill (AWP – 14%)	$96.90 per Rx $3.23 per pill (AWP – 14% to 40%, average of 22%)	$117.90 per Rx $3.93 per pill (AWP – 14%)	$21 per 30ct.
Less: Copay	$20.00	$5.00	$20.00	
HMO/PBM Cost after Copay	$73.6	$91.90	$97.90	$21
Rebates	$26.10 (ave. of 30%)	$0.00	$24.16 (ave. of 22%)	
Net Cost to HMO/PBM	$47.50	$91.90	$73.74	$21

Generic price would need to fall to $1.11 AWP to break even with OTC cost.
(1.11 x 78% x 30) - $5 = $21

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AstraZeneca

Apotex has challenged the reliability of the California and Massachusetts data drawn from Dr. Rausser's study of data from thirty pharmacies. Most of the thirty pharmacies which supplied the data were parts of large chains or a mass merchandiser: Wal-Mart, Longs and CVS in California; Wal-Mart, CVS and Target in Massachusetts. The logs typically include the date of the transaction, the name and dosage of the drug, the number of pills sold, any co-pay paid for insured transactions, and the name of and the amount paid by any third party payer. Dr. Rausser calculated the third party payment per pill by dividing the dollar amount of the recorded third party payment by the quantity of pills sold.

Dr. Rausser next identified the twenty largest third party payers responsible for the largest share of Nexium® sales and was able to obtain rebate data for thirteen of the twenty. These thirteen TPPs were significant participants in the market.[19] They represented 82% of the insured omeprazole

[19] Six of these thirteen represented 67% of the pharmacy benefit manager or PBM market share in 2003. Six others were large national PBMs or health plans, such as CIGNA and United Healthcare. The thirteenth was a large regional health plan.

transactions, and over 95% of the Nexium® rebates paid by Astra.[20]

Apotex complains that the data is not drawn from a statistically reliable sample. It comes from only two states,[21] comes from only large volume buyers of Nexium®, and then only those to which Astra paid rebates, and omits the mail order segment of the market. The data also has gaps, including a lack of data from months for which no data existed for both drugs. With these and other similar arguments, Apotex argues that Dr. Rauser's conclusion -- that for many major third party payers during the period from December 2002 through November 2003 the cost of generic omeprazole therapy was greater than the cost of Nexium® therapy -- is “invalid”.

While Apotex has correctly pointed out that there are limitations in the pharmacy log data, and that there is a need

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[20] Dr. Rausser’s analysis compared the price of 20 mg omeprazole with 40 mg Nexium, which he explained was proper because the price of Nexium to both TPPs and patients was the same for both 20 and 40 mg doses. Dr. Rausser observed that there was much more data in the pharmacy logs for 40 mg Nexium than for 20, while the opposite was true for omeprazole.

[21] Mr. Weinstein notes that the prices of omeprazole differ significantly between the two states, underscoring the unreliability of using data from just two states to make generalizations about a regional or nationwide market.

to be careful in drawing lessons from it, it has not shown that the data is unreliable or, to use its phrase, invalid. In part because it is so costly and time-consuming to procure and analyze, it is unusual to have access to this rich vein of information about third party payer and pharmacy pricing of the relevant drugs during the relevant time period. Astra has succeeded in showing that this pharmacy data, particularly when combined with other trial evidence, supports a conclusion that for many TPPs during the period in which the hypothetical negotiation was occurring, the cost of Nexium® therapy remained quite close to that of treatment with generic omeprazole.

It must be remembered, however, that the proximity in price to generic omeprazole was only one component in Astra's overarching strategy for promoting Nexium® and maintaining its favorable formulary position. Astra continued to position Nexium® as a clinically-superior, next generation drug relative to all of the other PPIs on the market, including the other branded PPIs. In a mid-2003 Nexium® Strategic Plan document, Astra described its pricing strategy for Nexium® as follows.

> The pricing strategy for Nexium has been one of premium price due to its clinical differentiation and heritage within the PPI class. The product has been strategically priced at a discount to Prevacid and branded Prilosec to help add incentive for conversion from other PPIs once the clinical rationale for

> utilizing the product has been established. Nexium continues to rank third in listed WAC price with Aciphex, generic omeprazole and Protonix rounding out the class. [Astra] has continued to take nominal price increases to keep in step with the competition. Unlike Protonix, Aciphex and at times Prevacid, [Astra] has not chosen to deep discount the product to Managed Care.

Indeed, from the point of view of the consumer, Nexium® was more expensive than generic omeprazole in 2003, reflecting its higher co-payment requirements. A majority of consumers paid $10 or less for generic omeprazole and $20 or more for Nexium®. This reflects the fact generic omeprazole had a preferred formulary position. Nevertheless, Astra's official rebate policies support Dr. Rausser's overarching hypothesis that Nexium® rebates were to some degree responsive to the price of generic omeprazole. Following the entry of generic omeprazole, Astra increased its rebates on Nexium® and included the generic product in calculations of market share for rebates that were determined on that basis.

E. Status of Market in November 2003

As of the date of the hypothetical negotiation of a license for Apotex to sell generic omeprazole using the formulation covered by the Patents, the PPI market was a huge, lucrative, and competitive market. As Dr. Sherman, Apotex's CEO, noted in a memo to Dr. Beach, Prilosec® was the "largest selling drug in

the U.S., with U.S. annual sales approaching $2 billion." In planning for the expiration of the omeprazole molecule patent in 2001, Astra itself noted that "Prilosec® is the most attractive market for generics ever." In projections dated June 18, 2003, Apotex estimated that the prescription omeprazole market would be worth a total of roughly $2.6 billion over the course the year, and $1.4 billion in 2004. Because the other branded PPIs had launched much later than Prilosec®, generic omeprazole was the only generic PPI on the market and would be for years.

As of November 2003, Astra had two branded PPI products, Prilosec® and Nexium®, introduced in 1989 and 2001, respectively. Three other branded PPIs were also successful market participants and generic omeprazole had been on the market for about a year. Most recently, Prilosec OTC® had entered the scene.

As of November 2003, pharmacies would have felt free to dispense generic omeprazole instead of Prilosec® when filling Prilosec® prescriptions, since generic omeprazole was an AB-rated substitute for Prilosec®.[22] Prilosec®'s share of the

[22] AB-rated drugs are FDA-approved bioequivalents of the branded drug; they have been judged by the FDA to be therapeutically equivalent. The FDA rated the generic omeprazole manufactured by KUDCo, Mylan and Lek as AB-rated for Prilosec® even though by

market had dropped precipitously with the advent of generic omeprazole, but Astra continued to support Prilosec® sales through a rebate program and Prilosec® continued to provide a significant stream of income to Astra. In 2003, Astra sold $1.3 billion worth of Prilosec® with $437 million in net sales adjustments (which includes rebates), leading to $865 million in net sales. In that same year, Astra sold $3.2 billion worth of Nexium®, with $770 million in net sales adjustments and $2.5 billion in net sales.

Although three generic pharmaceutical manufacturers had begun selling omeprazole, generic prices remained high. No MAC had been imposed by a health plan or PBM, a phenomenon which would have led to a crash in omeprazole prices.[23] This led Astra to conclude that it had not yet seen significant price erosion and had not yet felt the full effects of cheap generic omeprazole. It was of course unclear how much longer these three generics would maintain their high prices. Nonetheless,

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2007 it had been determined that none of these formulations relied upon the patented technology.

[23] There was no evidence at trial that a MAC was ever imposed for omeprazole, reflecting perhaps that the litigation over many of the generic omeprazole products took many years to resolve. Decision makers are wary of imposing steep price constraints when there may be a sudden deficit in supply.

Astra had every reason to expect that the launch of a fourth generic, particularly for a licensed product, would swiftly accelerate the decline in omeprazole prices and lead to the destruction of the remaining Prilosec® market.

The launch of Prilosec OTC® in September 2003 was having a significant impact on the overall PPI market as well. As will be discussed in more detail below, Astra calculated internally that Prilosec OTC® had taken roughly 30% of the generic omeprazole market. Indeed, Astra documents show that the total number of omeprazole prescriptions, which declined sharply just after Prilosec OTC®'s launch, did not begin to recover until the Fall of 2004, around the time Teva -- the fifth generic pharmaceutical manufacturer to enter the market -- launched its generic omeprazole.

An Astra "Prilosec OTC Update" dated October 21, 2003 reported that TPPs were beginning to take action against omeprazole in light of Prilosec OTC®. These actions included, in certain cases, discontinuing reimbursements of prescribed omeprazole, sending OTC coupons to PPI users, and moving PPIs to the third tier of formularies. While the principal impact of Prilosec OTC® was on Prilosec® itself and generic omeprazole, it also had an impact on the entire PPI market. An outside report

later commissioned by Astra calculated that Prilosec OTC® resulted in a 3% decline in Nexium® sales. The Astra document cited earlier in this paragraph anticipated that Prilosec OTC®, combined with multiple generics, would affect Nexium® by reducing gross sales by $55 million in 2003 and $398 million in 2004.

Finally, as of November 2003, Astra remained committed to an expensive rebate program to support Nexium® prices, in the hope that this price support would preserve Nexium's favorable formulary status and avoid implementation of step therapy or other adverse actions. Since formulary decisions are made in the context of an entire class of drugs, the prices, supply and therapeutic profile of each drug in the class are in play. Astra's rebate strategy was therefore aimed directly or indirectly at all of its PPI competitors and the interrelated and evolving positions of those competitors regarding supply, price, and any other competitive advantage. But, since the only new competitor in the prescription PPI market in 2003 was generic omeprazole, a principal consideration in Astra's adjustment of its rebate strategy was the impact that the entry of generic omeprazole was having on drug formulary practices and pharmacies.

Thus, as of November 2003, any new entrant that altered that competitive landscape in a material way would impose upon Astra the burden of increasing its effort to compete for favorable formulary treatment. Astra's primary tools in that effort would have been its hefty rebate program and its ongoing effort at drug differentiation.

IV. Atra's Licensing Practices as of November 2003

There is no evidence that Astra would have initiated or encouraged licensing discussions with Apotex. Astra had been defending the Patents for more than five years, and would continue to do so for another ten years. It had no active program for licensing any of its patented prescription drugs to generic pharmaceutical companies or history of doing so.

Astra traditionally markets its brand name prescription drug products to doctors and third party payers by explaining that it is the sole source of the product. Its general policy is not to license others to use its inventions to sell products that will be sold in direct competition with its patented products. While Astra's patent for omeprazole had expired in 2001, its formulation patents for Prilosec® did not expire until 2007.

In any hypothetical negotiation of a license to a generic manufacturer, Astra would have considered the opportunity in terms of its expected net present value. In other words, in making such judgments it discounts future cash flows to what they would be worth presently, taking into account the probability of receiving the future cash flows. Astra would also consider the anticipated cannibalization of the revenues from the branded product and other Astra products. If the expected net present value of a license is above zero, Astra's financial team recognizes that it is up to management to determine whether that value is sufficient in light of the potential impacts of the license, the expected return on investment and other financial metrics, as well as the license's overall alignment with corporate strategy.

A. Licenses for other PPIs

Apotex has emphasized, however, that Astra did enter licensing agreements that encompassed the Patents, and that it did license a compound that used the valuable Prilosec® trademark and that competed directly with Prilosec®. Thus, while Astra never licensed the Patents to a company selling generic prescription omeprazole products, between 1994 and 1998, Astra had entered into four agreements that involved the

Patents. The most significant of these for the purposes of these proceedings -- the license for Prilosec OTC® -- will be discussed last.

In 1994, Astra entered into an agreement with Takeda Chemical Industries, Ltd. ("Takeda"), the maker of the PPI Prevacid®, that included the licensing of the '230 patent. The agreement resolved legal proceedings in a number of countries in which the two companies had accused each other of infringing the other's PPI patents and provided cross-licenses to those patents. Takeda was required to pay Astra a small royalty for its U.S. sales -- 2.5% -- which was cut to 1% after the expiration of the patent on the omeprazole molecule. The agreement did not permit Takeda to sell omeprazole.

In 1996, Astra entered into an agreement with Byk Gulden Lomberg Chemische Fabrik GmbH ("Byk"), which had developed the PPI Protonix®. The agreement resolved infringement actions Astra had brought against Byk in several countries, as well as proceedings Byk had brought seeking to invalidate Astra patents. The agreement granted Byk a royalty-free worldwide license under certain patents, including the patents-in-suit, to make, use, and sell Protonix®. Byk agreed to drop all proceedings in which

the validity of an Astra patent was called into question. The agreement did not permit Byk to sell omeprazole.

In 1996, Astra also entered into an agreement with Eisai Co. Ltd. ("Eisai"), which had developed the PPI Aciphex®. Under the agreement, both parties agreed to drop challenges to each others' patents and exchanged cross-licenses allowing the use of their patents (including, in Astra's case, the patents-in-suit) in connection with the manufacture and sale of their respective PPIs. Eisai agreed to pay Astra a royalty of .1% on its U.S. net sales of Aciphex®. Eisai was not, however, permitted to use the Patents to make or sell omeprazole.

B. Prilosec OTC®

Prilosec OTC® was launched in September 2003, two months before the hypothetical negotiation, pursuant to a six year old licensing agreement between Astra and Procter & Gamble ("P&G"). The parties hotly contest whether the licensing terms for this product provide an appropriate benchmark for the hypothetical license between Astra and Apotex.

The product Prilosec OTC® arose from a November 20, 1997 agreement between Astra and P&G, an agreement that was amended in August of 1999. Their agreement established a framework for the cooperative development, Astra's supply, and P&G's marketing

of Prilosec OTC®. Under the agreement, P&G paid Astra a base royalty of 7% of net sales for the first twenty years, to be increased based on sales volume to a royalty rate as high as 40% in the first three years after launch and 20% thereafter. Astra expected these sales targets to be met and they were, meaning that P&G indeed paid Astra 40% on a portion of its net sales on Prilosec OTC® for three years. For example, in October 2003, Astra reported that P&G had not changed its expectations for the first year sales, which stood at between $200 to $400 million.

P&G also paid up-front milestone payments of $56 million and invested hundreds of millions of dollars to develop and market the product, although Astra was also required to shoulder certain development costs. In addition, Astra allowed its highly valuable trademarked Prilosec® brand name to be used for Prilosec OTC®, and P&G was required to use its "best efforts" to market and sell Prilosec OTC®. Astra was also required to supply the drug to P&G essentially at cost. At trial, Uhle explained that the royalty payments made by P&G ended up amounting to a blended rate of approximately 20% of its net sales over the course of the first three years Prilosec OTC® was on the market, or 23% of net sales if the upfront milestone payments are included.

As its name suggests, Prilosec OTC® does not require a prescription. In contrast to the active ingredient in Prilosec®, omeprazole, the active ingredient in Prilosec OTC® is omeprazole magnesium. Prilosec OTC® is indicated for 14 days of treatment of heartburn, which is an approved indication not shared by the other PPIs discussed here. Nexium® and Prilosec® were both indicated for four to eight weeks' treatment of GERD. Prilosec OTC® is only available in a 20mg formulation, while Prilosec® is available in 10, 20 and 40mg formulations and Nexium® in 20 and 40mg formulations.

The broader strategic underpinnings of Prilosec OTC® from Astra's perspective and the eventual fate of Prilosec OTC® and its effects on the PPI market are of crucial importance to the parties for two reasons. First, Astra's expectations about Prilosec OTC® help determine how comparable its license with P&G was to the license at issue in this case. In other words, if Astra expected Prilosec OTC® to directly compete with prescription Prilosec®, or with Nexium®, then the terms of its license are more helpful in analyzing a license with Apotex. Second, Astra's strategy for Prilosec OTC® says a lot about how it evaluated the prescription omeprazole market in the mid to late 1990s and how it expected that market to fare over the

coming years. Thus, even independent of the precise royalty rate Astra negotiated with P&G, Astra's plans for Prilosec OTC® help shed light on what it would have viewed as the risks of granting a license to Apotex.

As already noted, within the pharmaceutical industry the OTC and prescription markets are usually viewed as distinct consumer markets. The industry assumes that physicians tend "not to push" OTC products, and it was rare in 2003 for health plans and PBMs to provide insurance reimbursement for OTC products.[24] Prilosec OTC® was priced at $0.71 per pill, which made it a more expensive treatment option for most consumers than generic omeprazole, which was often available to insured patients at a co-pay of $10 or less for a month's prescription.[25]

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[24] Navarro only learned of one plan that provided coverage of Prilosec OTC® as of late 2003. Moreover, the pharmacy log data analyzed by Dr. Rausser for the period between the launch of Prilosec OTC® and November 11, 2003 shows 3,975 PPI purchases of Nexium reimbursed by a third party payer but none covering Prilosec OTC®.

[25] Apotex argues that the course of treatment price comparison should factor in the cost to a patient of the doctor's visit that would be necessary to obtain the prescription for generic omeprazole. For any individual, however, there may be a host of factors that lead to a doctor's visit and among all patients there is a large range in the cost of making such a visit. There is no simple mathematical formula that can be applied here, and Apotex has not provided one.

As a consequence, Astra initially thought that Prilosec OTC® would target "self-treaters" who pay cash for their medicine and that it would compete against other OTC heartburn products called histamine antagonists.

Nevertheless, Astra felt that Prilosec OTC® could help it promote Nexium®. More specifically, Astra's plan was to "position OTC omeprazole as a reason to discourage prescribing of omeprazole and encourage prescribing of the superior brand, NEXIUM."[26] "If Prilosec is available OTC," Astra observed in a 2002 Product Strategic Plan for Prilosec®, after a person has used Prilosec OTC® and failed to get the relief she needs, "physicians will want to write Nexium more because it is the only PPI proven better than Prilosec." As of 2002, of course, Prilosec® was still providing "significant revenue" to Astra and was viewed as "the launch platform for Nexium."

Astra therefore expected Prilosec OTC® to cause significant erosion of the prescription omeprazole market, and it positioned the product accordingly. Prilosec OTC® was marketed to both

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[26] An internal "long-term vision statement for the gastrointestinal area at Astra" drafted in October 1998 indicated that Prilosec® could lose up to 80% of its sales volume within the first three to six months of generic introduction. The document went on to analyze Astra's strategy of converting from Prilosec® to Prilosec OTC® and Nexium.

consumers and physicians as an equivalent to omeprazole. Indeed, Prilosec OTC®'s label explained that 20.6mg of Prilosec OTC® was "equivalent to" 20mg of omeprazole. As Graham explained at trial, these efforts were part of Astra's broader strategy of cannibalizing Prilosec® to promote Nexium®.

In October 2003, about a month after launch, Astra estimated that Prilosec OTC® had captured 30% of the omeprazole prescription market, including both generic omeprazole and Prilosec®. Nexium® and Protonix® had gained market share in the prescription PPI market as a result, and generics had increased their price competition with each other. There had been little or no change, however, in the treatment of PPIs on formularies and by PBMs generally. Astra viewed these developments as "more or less as expected."

These market dynamics help place the Prilosec OTC® license in proper perspective. Astra's strategy, conceived in the 1990s, at a time when it thought that the omeprazole market would be "genericized" during 2003 and that Prilosec® would be having great difficulty remaining competitive with generic omeprazole, was to introduce Prilosec OTC® as a potent competitor to generic prescription omeprazole and as a driver of Nexium® sales. For reasons already discussed, however, the

price of generic omeprazole had remained unexpectedly and unusually high, and Prilosec® had retained a footing in the market. Astra was not surprised, therefore, in the Fall of 2003 to see Prilosec OTC® take market share from both Prilosec® and prescription omeprazole. Like the entry of generic omeprazole, the entry of Prilosec OTC® further eroded Prilosec®'s volume. Astra remained optimistic because it regarded Nexium® as the future of its business in the PPI market, and Prilosec OTC® was expected to help encourage the growth of Nexium®, not hinder it.

This is the environment in which Astra would have been negotiating a license with Aptoex. The advent of a licensed generic omeprazole would have been a very different phenomenon than the introduction of Prilosec OTC®. While Prilosec OTC® had not caused any substantial change in TPP behavior, Astra would have expected a licensed generic omeprazole to use price to take market share from its three generic predecessors. Any material decrease in the price of generic omeprazole would cause all TPPs to reconsider their strategies for the PPI market and would likely place pressure on Nexium®, causing Astra to increase its rebate program in a way that Prilosec OTC® did not.

V. Apotex's Alternative Formulations

Another key factor in any November 2003 licensing negotiation would have been the amount of potential revenue Apotex stood to lose by walking away from the negotiating table. Because Apotex did not have a non-infringing alternative formulation ready for a November 2003 launch, any decision to forgo a license would have necessitated a return to the drawing board, delay, and uncertainty. Just how much of its profits over three and a half years of sales Apotex would have sacrificed by attempting to develop an alternative formulation is thus a key issue.

As it prepared to enter the market in 2003, Apotex developed a series of projections of the market share it expected to gain and the profits it expected to earn. In June 2003, Apotex projected its market share as 5% at launch, 15% in 2004, and 25% from 2005 to 2007, for a total of roughly $581 million in sales over its first five years on the market. In November 2003, Apotex prepared another set of projections covering the period through the end of its fiscal year, June 2004. Apotex forecast that it would capture 7% of the generic market over that time, leading to roughly $27 million in profits at a 92.5% profit margin.

Apotex argues that it could have avoided infringement by changing its omeprazole product in three ways. It could have made certain changes to its pellet formulation that would have rendered it non-infringing, copied other non-infringing generic formulations, or developed a microtablet formulation.

The parties debate how feasible any of these approaches are and how long it would have taken Apotex to successfully manufacture alternative formulations and receive FDA approval for them. Before engaging in detail with their arguments in this regard, it is worth noting that Apotex began working on a formulation of omeprazole as early as 1996, and by 2003, seven years later, had developed only an infringing product. Second, in defending this action, including in particular this damages phase of the litigation, Apotex has not chosen to demonstrate the ease with which it could have developed a non-infringing, bioequivalent, and stable version of omeprazole by actually manufacturing and testing such a formulation. If, as it argues, the development of a non-infringing formulation would have been a relatively easy and swiftly accomplished task, its failure of proof in this regard is telling. Finally, it is notable that although Genpharm, Andrx, and Cheminor were found to infringe the Patents in the First Wave Opinion in October 2002, not one

of them developed and launched a non-infringing alternative formulation in 2003, or indeed at any time before the expiration of the Patents in 2007.

Both Astra and Apotex agree that Apotex would have had to await FDA approval before marketing the revised product. The parties also agree that changes to the pellet formulation would have required Apotex to submit a PAS or Prior Approval Supplement. See 21 C.F.R. § 314.70(b) (requiring supplemental submission and prior approval for "major changes," including "changes in the qualitative or quantitative formulation of the drug product, including inactive ingredients"). Dr. Lin also suggested that the creation of a microtablet might have required submission of an entirely new ANDA rather than a PAS.

Apotex would have assumed in the Fall of 2003 that it would take as much as a year to receive FDA approval of a PAS and as much as two years to receive approval of an ANDA. PASs were and are reviewed on a "first in, first out" basis, as are ANDAs. Moreover, PASs and ANDAs are assigned to the same set of reviewers. There is no publicly-available data concerning the median time for review of PASs in the 2003 time period, but using the data on approval of ANDAs, Dr. Lin estimates that Apotex "could potentially have faced" a delay of seventeen

months before approval of a PAS. Johnston opines, quite optimistically, that the "reasonable expectation" for the approval time for a well-documented PAS in the 2003 to 2004 timeframe was about six months.

One of Apotex's employees, Tao, testified that between December 2002 and November 2003, Apotex submitted "at least" seven PASs to the FDA, but Apotex has only provided documents showing how long it took for two of them to receive approval. Those two took 7.5 and 10.5 months to receive FDA approval.[27] Tao testified that during 2003 Apotex projected internally that the approval of a PAS would take roughly eight months. Apotex agrees with Astra that the median time from submission of an original ANDA to approval was seventeen months in 2003.

Astra has shown that Apotex would have had no reasonable confidence in the Fall of 2003 that it could find a non-infringing formulation for omeprazole that would obtain FDA

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[27] These two PASs involved metformin, a drug used in the treatment of diabetes. As a result, they would have been assigned to a different team than a PAS for omeprazole. One of the supplements was submitted on March 31, 2003 and approved on February 18, 2004, about 10.5 months later. In the interim, Apotex received two deficiency notices, the second of which it received about nine months after the initial submission. The second supplement was filed on March 15, 2004. It was approved on November 4, 2004, which is approximately 7.5 months later.

approval, much less one that could be developed, tested, and approved without years of effort. In essence, the evidence at trial showed that each of its proposed alternatives would have entailed significant delay and uncertainty, and would have cost Apotex a substantial portion if not all of its profits. Of course, even if it had found a viable, non-infringing formulation, before filing its submission with the FDA, Apotex would need to complete the testing necessary to create a PAS and ANDA. The necessary stability tests for FDA approval required three months of data.

A. Changes to Apotex's formulation

Apotex contends that it could have avoided infringement of the Patents by making one of three changes to its pellet formulation. First, it could have avoided the use of an ARC, one of the claimed elements of Astra's patented formulation, by removing the magnesium hydroxide from its product core. Second, it could have prevented the in situ formation of an inert subcoat by changing the binder it used in the core. Third, it could have prevented the formation of the subcoat by changing the coating it applied. It is unlikely, however, that Apotex would have believed in November 2003 that any of these changes would have been successful or easy for it to pursue.

First, as to the ARC, Apotex argues that the magnesium hydroxide constitutes only 2% of the core of the Apotex product and could have been easily replaced by simply adding more of the inert filler, i.e., the mannitol, which would have saved time in the manufacture of the core. Magnesium hydroxide, however, protects omeprazole from degrading in an acidic environment, such as the highly acidic aqueous environment in the human stomach. The combination of omeprazole and this particular ARC in the core of the product, therefore, helps to stabilize the compound.

In its development process, Apotex considered formulations with no ARC in the product but chose not to pursue that course. It also evaluated several different alkaline compounds over the course of at least a year before selecting magnesium hydroxide as the best candidate. The Apotex formulation of its at risk generic omeprazole, therefore, like the Astra formulation, uses magnesium hydroxide as an excipient.

Similarly, several other pharmaceutical companies have used an ARC in the composition of the core to protect the drug's active ingredient from degradation due to acidic conditions. Without protecting the active ingredient from such degradation, a manufacturer also risked discoloration of the product, which

could interfere with acceptance in the marketplace. Moreover, Apotex's decision not to remove the ARC of magnesium hydroxide from its product following the opinion rendered in the First Wave litigation is further evidence that it believed the ARC to be a necessary component of its product. Astra has shown, therefore, that Apotex would have had no reasonable expectation that removing the ARC from its formulation would have been either an easy or necessarily successful avenue to producing a non-infringing product that could be approved and marketed. Apotex argues that other non-infringing formulations were able to avoid the use of an ARC in the core of their products. For the reasons discussed below, none of those would have presented an available alternative.

Apotex suggests that it could have avoided the formation of an in situ subcoating by altering its formulation in two principal ways. It could have changed the binder in the pellet cores from Povidone ("PVP") to hydroxypropyl cellulose ("HPC") or changed the polymer in the enteric coating from methylacrylic acid copolymer Type C to hydroxypropyl methycellulose phthalate.

Astra's expert Dr. Davies explained the numerous technical difficulties and uncertainties associated with these changes. For instance, while Apotex suggests that it could have changed

its binder from PVP to HPC, the latter is much less hard and more friable than the former, which could necessitate other changes to the manufacturing process. Changing the binder is also capable of changing the resulting drug's dissolution profile. Changing the enteric coating too is capable of affecting dissolution and stability, and the new coating Apotex proposes would have required the use of an organic solvent, something that Apotex had regarded as "highly undersirable" and a "last resort."

B. Copying other formulations

Apotex next argues that it could have copied the formulations of other, non-infringing generic omeprazole manufacturers. As an initial matter, it is worth remembering that in November 2003, only KUDCo had been held to be non-infringing. The KUDCo formulation did not contain an ARC in its core and therefore did not infringe. Omeprazole I, 222 F. Supp. 2d at 551. KUDCo also, however, has patents on its formulation, and Apotex has not explained how it could copy that formulation without infringing those patents.

Lek and Mylan were, like Apotex, Second Wave defendants, and so had launched at risk in 2003. There would have been no reason for Apotex to have regarded their formulations as non-

infringing in November of that year, or to have taken steps to copy them. Apotex suggests that because it is assumed to have known in November 2003 that it infringed the Patents under the hypothetical negotiation framework, it should also be assumed to have known that Mylan and Lek did not infringe. Apotex has not cited any law in support of this view. The hypothetical negotiation framework does not treat the parties as having knowledge of all events between the negotiation and the finding of infringement simply because it requires them to assume that the Patents are valid and infringed.

At any rate, even assuming that Apotex would have wanted to copy the formulations of Mylan and Lek, there is no indication that it could have done so. The Mylan/Esteve formulation uses different excipients and a significantly different manufacturing process for its product. It also holds patents on its formulation. Because of the very different approach taken by Mylan/Esteve, the adoption of this route would have required Apotex to engage in very substantial research and development, at considerable time and expense.

Lek was able to avoid the use of an ARC by excluding the use of water in its formulation. Apotex used water in both the granulation and coating steps for its generic omeprazole. The

conversion to a profoundly different manufacturing process would have entailed a significant and expensive investment and a lengthy delay in development and testing. Moreover, like KUDCo and Mylan, Lek holds patents related to its formulation.

C. Microtablet formulation

Apotex argues that it could have pursued a third route to a non-infringing product: the creation of a microtablet. But, Astra has shown that Apotex would have had absolutely no confidence that it could succeed following this path either. It had tried mightily and without success for almost two years to make an omeprazole microtablet and had abandoned those efforts as futile.

Aware that Astra's patent on omeprazole was due to expire in April 2001, Apotex began as early as 1996 to attempt to create an omeprazole product. Apotex first tried to formulate omeprazole core pellets, but quickly placed that project on hold to pursue the development of mini-tablets for placement in hard gelatin capsules.

Dr. Sherman, CEO of Apotex, wrote to Dr. Beach, head of Torpharm, on August 1, 1997, to highlight the potential value of omeprazole to the company and emphasize the need for haste in developing a formulation. Dr. Sherman recited that omeprazole

is “the largest selling drug in the U.S., with U.S. annual sales approaching $2 billion.” He listed the patents-at-issue, noting that the omeprazole patent expired in 2001, but that the formulation patents did not expire until 2007. As he observed, those patents covered the use of an alkaline agent in the core and a subcoat under the enteric coat to improve stability. With the approach that Dr. Sherman recommended, he was confident that Apotex “will not infringe.” Dr. Sherman wanted to make tablets, four of which would fit in a capsule. He noted that, in contrast, “the pellets are difficult to make. . . . As omeprazole is unstable at neutral or acid pH, an alkaline compound has to be included to avoid degradation in processing. This makes it difficult to avoid the formulation patents.”

Over the course of the next roughly seventeen months, Dr. Sherman sent numerous memos to Dr. Beach listing the problems with the microtablet formulation and urging speed in developing solutions. In a memo dated July 24, 1998, Dr. Sherman explained that a portion of the tablets were not disintegrating, and that the explanations might be either too much coating or not enough coating. Finally, on December 18, 1998, Dr. Sherman instructed Dr. Beach to abandon the microtablet formulation, noting the persistent problems with stability and bioequivalence.

As this history demonstrates, Apotex tried mightily, with the specific goal of avoiding infringement of the '505 and '230 patents, to develop a microtablet formulation. After seventeen months, it concluded that it had failed. There is no evidence to suggest that Apotex would have believed that this effort would be any easier or more successful in November 2003.

These anticipated delays would have translated into lost profits for Apotex as it scrambled to enter the market as quickly as possible. Using Apotex's projections of how rapidly it would be able to gain a certain share of the generic omeprazole market, Dr. Meyer calculated the percentage of its profits Apotex would have sacrificed with each year of delay. Starting with Apotex's June 2003 projections of the market share it expected to capture, Dr. Meyer determined that a one year delay would have cost Apotex 31.6% of its profits, a two year delay would have cost 59.2% of its profits, and a three year delay would have cost 84.5% of its profits. The likelihood that Apotex would have faced at least a two year delay if it attempted to develop a non-infringing formulation thus does much to shed light on the value to Apotex of a license.

VI. The Book of Wisdom: Post-entry Information

A. Nexium®

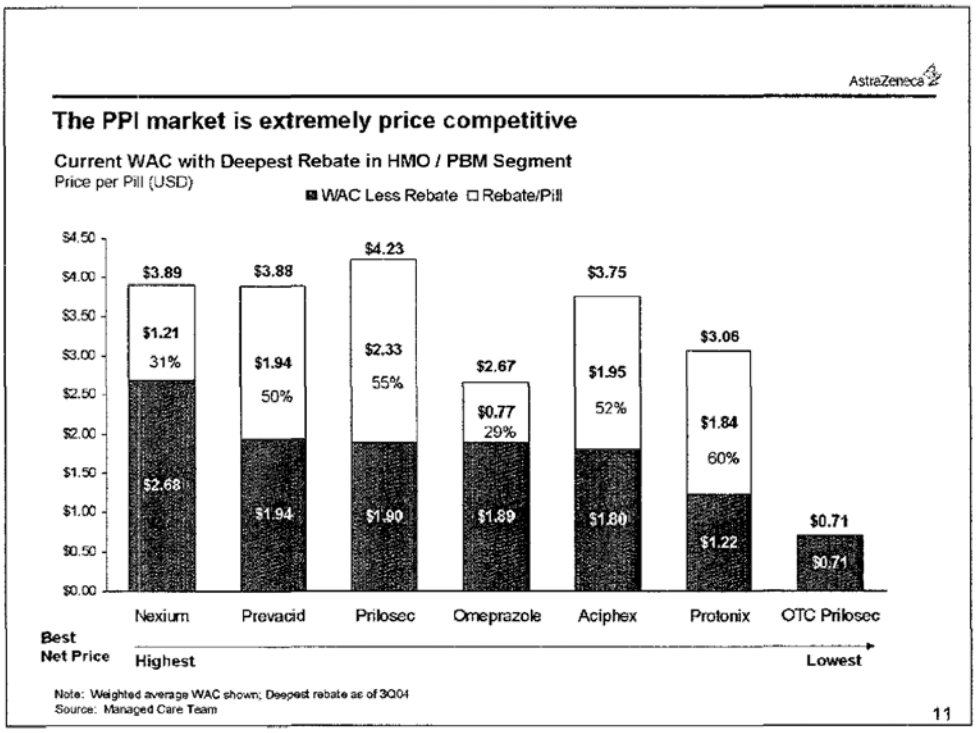
When Apotex entered the generic omeprazole market in November 2003, it launched its product "at risk" of a later finding of infringement and without the freedom to shape a pricing strategy that a license would have given it. Despite that distinction, it is helpful to look at the impact of Apotex's launch on Astra's Nexium® strategy. Data from various sources show that Astra offered increasing rebates on Nexium® in the years after November 2003. Astra's internal manufacturer rebate data shows the average manufacturer rebate rates for the 13 TPPs selected by Dr. Rausser steadily increasing from 2004 to 2006. Astra's financial data also shows increasing rebate expenses as a percentage of gross sales.

Nevertheless, the decreasing price of generic omeprazole was only one factor among several influencing Nexium's market share and Astra's need to offer rebates to maintain its position. Indeed, isolating exactly why Astra offered increasing rebates on Nexium® is not possible. Internal documents suggest that Astra may have been motivated by pricing pressures from generic omeprazole, other branded PPIs, and even Prilosec OTC®.

An April 2004 Astra strategy document analyzed Nexium's "access relative to the competition" and listed as the competition only Protonix® and Prevacid®. The same document described the "changes in the PPI market for managed care" as including multiple generics, but also noted that branded competitors were pricing more aggressively and that Protonix® was "on the rise."

In August 2004, Astra conducted a workshop regarding its strategy with Nexium®. As of that time, PPIs were the second largest drug class as measured by sales in the United States. Although the sales of Prilosec OTC® had been generally "flat" since its launch, Astra noted that PPI market growth had "stopped" at the time of Prilosec OTC®'s launch. As of that time, Prevacid®, Nexium® and Protonix® each had a market share of between 29 to 24%, in that descending order. In contrast, the omeprazole share of the prescription PPI market was less than 10% and Prilosec® was less than 3%. Astra also noted that the PPI class was "extremely price competitive," and prepared a chart showing the "WAC less rebate" for the various drugs in the market. This chart showed that Nexium® had the highest price ($2.68), with Prevacid® ($1.94), Prilosec® ($1.90), omeprazole

($1.89), and Aciphex® ($1.80) roughly even. Protonix® ($1.22) and Prilosec OTC® ($0.71) were substantially cheaper.[28]



Astra's August 2004 strategy document also showed that there was a strong negative trend in formulary coverage without restrictions for all brand name PPIs, including Nexium®, starting in the fall of 2002. Nonetheless, Nexium® was on the formulary at the large PBMs, who control most of the "covered

[28] By January 2005, Astra calculated that the WAC with the deepest rebate included in the per pill price resulted in a pill of Nexium® costing $2.65, omeprazole $1.17, and Prilosec OTC® $0.71.

lives" in the market. Indeed, the national PBMs generated over half of Nexium's total volume. In planning for the future, Astra noted that the resolution of the generic litigation could change the landscape.

An Astra document prepared in September 2004 noted that while Nexium® continued to "experience wide access and reimbursement on MC formularies," the "PPI class remains very competitive and the introduction of Prilosec OTC® and generic omeprazole have increased the competitive pressure." The document went on to examine Nexium's formulary status for twelve national TPPs that together with mail order represented more than 82% of the market. For these major accounts, Astra noted, "Nexium's formulary status has remained largely unchanged throughout the launch of generic omeprazole and Prilosec OTC®." The document later analyzed "managed market trends" and noted that many TPPs were encouraging patients to use Prilosec OTC® "as first line therapy in a means to reduce branded PPI Rx costs." The document also noted that while "NEXIUM is in similar position to other branded PPIs in terms of restricted access," "the formulary position for NEXIUM in key accounts has not changed! 40% of covered lives have UNRESTRICTED access to NEXIUM." (Emphasis in original.)

One report commissioned by Astra and prepared in October 2004 evaluated how much volume Nexium® had gained from various competitors. It reported that Nexium® had gained 3% of its volume from Prilosec® and 0% from omeprazole while it lost 2.8% of its volume to Prilosec OTC®.

In a January 2005 Nexium® performance review, Astra noted that Nexium® had enjoyed excellent growth in market share over the course of 2004 and that rebate rates had been "lower than expected." Again there was no mention of generic omeprazole being a factor in Nexium's rebate strategy, or of Apotex in particular.

In sum, the post November 2003 evidence supports the idea that Astra offered increasing rebates on Nexium® to compete in the PPI market, and that the price of generic omeprazole was one factor among several influencing Nexium's competitive position. It is therefore reasonable to suggest that Astra's Nexium® strategy would have made it disinclined to grant Apotex a license, with which Apotex might have cut prices much more drastically.

B. Prilosec OTC®

A series of reports commissioned by Astra and prepared by a consulting firm called Ipsos analyzed the performance and impact

of Prilosec OTC® in the months and years following its launch. Ipsos's "Prilosec OTC® Year 1 Review," prepared in October 2004, generally characterized Prilosec OTC® as behaving like a prescription product and noted that it would therefore "continue to threaten Rx somewhat more than OTC brands." A chart contained in the report shows that omeprazole lost 16% of its volume to Prilosec OTC®, Prilosec® lost 12%, and Nexium® lost 3%. Ipsos prepared another report, entitled "Prilosec OTC 20-Month Review," in June 2005. Again Ipsos noted that Prilosec OTC® was behaving like an Rx product, and again it observed large losses in volume by Prilosec® (14%) and omeprazole (7%) to Prilosec OTC®. Nexium® was reported to have lost 1% to Prilosec OTC®.

Astra's internal analysis confirmed that Prilosec OTC® had a significant impact on the total volume of omeprazole prescriptions. A chart prepared by Astra shows the total number of omeprazole prescriptions falling from roughly 130,000 to 70,000 in the months following OTC's launch. Astra's internal documents show that it also believed that Prilosec OTC® had taken volume from Nexium®. In its 4th quarter 2004 performance review for Nexium®, dated January 11, 2005, Astra noted that

while Nexium® continued to grow in volume, Prilosec OTC® had slowed its growth by about 4%.

These figures were seen despite the fact that the out of pocket cost to consumers of Prilosec OTC® was higher than the cost of omeprazole and Prilosec®. This was due largely to Prilosec OTC®'s lack of coverage by TPPs. Dr. Rausser calculated that in the interval between November 12, 2003, and the end of 2004, there were 673 instances in which a third party payer contributed to the cost of Prilosec OTC®, which represented only 2.5% of PPI purchases. In 2004, only 6% of plan sponsors covered Prilosec OTC®. A series of reports produced by Takeda contained similar numbers. They indicated that 4% of plan sponsors covered Prilosec OTC® in 2004, 6% covered it in 2005, and 9% covered it in 2006.

C. Apotex's Sales

Although Apotex launched its product at a lower WAC price than Mylan, Lek, and KUDCo, it did not cut prices aggressively, launching at a WAC price of $2.65 compared with Lek's $2.69. Nevertheless, omeprazole was one of Apotex's largest selling products in the United States.[29] For the twelve months ending

[29] Dr. Sherman explained that "for some reason the competitors decided not to lower prices to keep us out, so we [Apotex] were

March 31, 2007, omeprazole generated the second largest amount of net revenue for Apotex of all of its products sold in the United States.

During that same period, omeprazole capsules produced the highest gross margin for the company. Apotex initially surpassed its projection that it would earn a 92% margin on omeprazole, earning margins of 96.2% and 95.8% in November and December 2003, respectively. Eventually, however, Apotex's profit margins declined: in 2004 it earned a margin of 88.5% and in 2005 it earned a margin of 68.3%. Overall, Dr. Meyer calculated that Apotex sold $201,791,249 worth of omeprazole in the U.S. from November 2003 to October 2007, for a total profit of $152,043,989, or a 75.3% margin.

The effect of Apotex's entry on generic omeprazole prices was hotly disputed at trial. A chart prepared from the pharmacy log data collected by Dr. Rausser shows a downward trend in prices beginning roughly a month before Apotex's entry, and continuing at essentially the same rate after Apotex's launch. In the period from Apotex's launch until 2006, the price of omeprazole dropped from $3 to $2.50. Dr. Rausser testified that

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able to take a larger market share than we expected with less price reduction than we expected."

this data showed a more serious downward adjustment in prices after Apotex's launch, but the evidence at trial generally showed that it was not possible to isolate Apotex's contribution to omeprazole's price decline after November 2003. Of course, this price data does little to shed light on how Apotex would have priced its omeprazole had it been a licensed entrant.

D. Settlements

There are two additional sets of negotiations that occurred after November 2003 that the parties have discussed as potential benchmarks for the reasonable royalty between Astra and Apotex. One is the 2005 settlement offer made by Andrx; the other is the 2010 settlement with Teva.

1. Andrx offer

On May 11, 2005, Andrx sought a license to sell its generic omeprazole from July 1 until the expiration of the relevant patents in 2007. Andrx and Astra had been engaged in ANDA litigation since May of 1998, and as of May 2005 Andrx had already been found to infringe and had seen this finding upheld on appeal before the Federal Circuit. All that remained in the litigation was the determination of damages, which Astra sought for Andrx's commercial manufacture of omeprazole in the period

before October 2002, when Judge Jones held that Andrx was infringing the Patents.

Andrx sought the end of all litigation surrounding the Patents. In exchange, it would purchase a license from Astra for 70% of its profits from the sale of the 40mg strength omeprazole. As an alternative, Andrx offered to license the 10, 20, and 40mg strengths, in which case it would pay 70% of its profits on the 40mg strength, but only 50% of its profits on the 10 and 20mg strengths. At that time, Andrx was the exclusive first-filer for the 40mg dosage, and therefore would have been able, after it had obtained all of the necessary approvals, to launch its product as the first and exclusive authorized generic version of Prilosec® at that dosage for 180 days. In exchange, Andrx proposed that Astra dismiss its outstanding claim for damages in connection with Andrx's infringement, as well as any claim for fees and costs in connection with the litigation. An undated draft license agreement, which Andrx provided to Astra, included a minimum royalty payment for the first 180 days of $25 million.

Apotex points out that the negotiations concerned not just the Patents but also two other patents: the '281 and '905 patents. Apotex also observes that Andrx did not offer to

license only the 10 and 20mg strengths, and suggests that without the ability to sell the 40mg strength, the value of a license to only the 10mg and 20mg omeprazole would have been lower than even the 50% rate in Andrx's proposal. On the other hand, Andrx's letter was only an opening offer, and it is reasonable to assume that it would have been willing to agree to a higher royalty had Astra been interested in negotiating. The record contains, however, no evidence of any interest on the part of Astra in Andrx's proposal. Uhle, who testified regarding Astra's licensing practices, said that he had not heard about the Andrx offer until he was made aware of it in preparing for this litigation. At any rate, the offer was not accepted.

2. Teva settlement

In January 2010, Astra reached a settlement with Teva and Impax to resolve Astra's pending claims against them for infringement of the Patents, including claims for damages based on Teva/Impax's at-risk launch of their generic omeprazole in September 2004.

Teva and Impax had entered into a Strategic Alliance Agreement in 2001. Impax manufactured the omeprazole capsules and Teva marketed them. Pursuant to their agreement, Teva paid

Impax the cost of manufacture plus 35% of its defined profit from the sale of omeprazole for the first 18 months after launch, 40% for the next six months, and 50% thereafter. Apotex emphasizes that this royalty agreement was reached as a component of a strategic alliance between Teva and Impax. Among other things, Teva provided a loan for construction of a new facility and purchased Impax stock.

Teva was one of the Second Wave defendants, and Judge Jones found in May 2007, less than three years after its at-risk launch, that Teva's omeprazole capsules infringed the Patents. 490 F. Supp. 2d at 499. That decision was affirmed in June 2008. In re Omeprazole Patent Litig., 281 Fed. Appx. 974 (Fed. Cir. 2008) ("Omeprazole IV").

Acknowledging the validity of Astra's patents, Teva/Impax settled Astra's outstanding damages claim for a lump-sum payment of less than $10 million. The parties here dispute how best to translate this lump-sum payment into a royalty rate that could be used as a benchmark in this litigation. Astra's expert Dr. Meyer calculated various royalty rates implied by the total amount of the settlement. First, Dr. Meyer calculated the amount as a percentage of Teva's net sales, based on both publicly available sales transaction data, and on confidential

reports Teva and Impax used to report such figures to each other. More importantly for this case, Dr. Meyer also calculated how the settlement amount would translate into a percentage of profits, this time using only the Teva/Impax reports. This analysis showed that the settlement represented 54% of Teva's profits on its infringing sales.[30]

E. Infringement Litigation

On October 6, 2003, the FDA granted final approval of the 10 and 20 milligram strengths of Apotex's product, and tentative approval of the 40 milligram product. Omeprazole III, 490 F.Supp.2d at 471. On November 12, 2003, Apotex started to sell its 10 and 20 milligram doses in the United States. Id.

On May 31, 2007, Judge Jones found that Apotex's 10, 20 and 40 milligram ANDA omeprazole products infringed claims 1, 5, 6 and 10 of the '505 patent and claims 1, 6, 7 and 13 of the '230 patent. Id. at 486. She also held that its filing of the ANDAs constituted acts of infringement, and that its manufacture, sale and offering for sale of FDA-approved 10 and 20 milligram generic omeprazole directly infringed the Patents. Id.

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[30] Dr. Meyer also calculated a percentage based on the combined profits of both Teva and Impax, but explained that this figure is less relevant, because Teva was responsible for making the lump sum payment to Astra.

On June 14, Judge Jones also concluded that a period of pediatric exclusivity applied to the Patents and therefore ruled that the effective date of approval for Apotex's and other generic products "shall be no earlier than October 20, 2007". In re Omeprazole Patent Litig., No. 01 Civ. 9351 (BSJ) (S.D.N.Y. June 14, 2007) (Judgment). On June 28, the FDA revoked its final approval of Apotex's ANDA until at least October 20, 2007. In response, Apotex sued the FDA, seeking to enjoin its revocation of Apotex's approval. Apotex Inc. v. U.S. Food and Drug Admin., 508 F. Supp. 2d 78, 80 (D.D.C. 2007). On September 17, 2007, the District Court in that district denied the motion for injunctive relief and for a stay pending appeal. Id. at 89.

In rendering its decision on the Apotex application for an injunction, the court held that once a court issues a ruling establishing pediatric exclusivity, "the FDA had no authority to issue final approval" of an ANDA prior to the expiration of the patents. Id. at 84. The court noted that a decision denying Astra the pediatric exclusivity period would "deprive it of the statutorily-awarded benefit of its financial investment" in conducting pediatric studies on the drug. Id. at 88. "[A]bsent an exclusivity period, not only would [Apotex] be able to distribute its product, but other generic Prilosec manufacturers

& marketers would similarly be able to flood the market. The erosion of Astra's statutory right is a significant harm." Id. Thus, Apotex did not regain approval from the FDA to resume marketing its product until October 22, 2007.

In 2008, the Federal Circuit affirmed Judge Jones's decisions in two separate opinions. In the first, the Federal Circuit affirmed Judge Jones's findings of non-infringement as to Mylan. In re Omeprazole Patent Litig., 281 Fed. Appx. 974 (Fed. Cir. 2008). In the second opinion, the Federal Circuit affirmed Judge Jones's findings of infringement as to Apotex and Teva/Impax. In re Omeprazole Patent Litig., 536 F.3d 1361 (Fed. Cir. 2008). Its decision included a finding that the district court had jurisdiction to provide relief under Section 271(e)(4)(A) to reset the effective date of the ANDA to reflect Astra's six-month pediatric exclusivity period despite the expiration of the patents. Id. at 1381.

DISCUSSION

The Drug Price Competition and Patent Term Restoration Act of 1984, Pub. L. No. 98-417, 98 Stat. 1585, commonly known as the Hatch-Waxman Act, allows a generic manufacturer of an already approved brand-name drug to obtain expedited approval to

market that drug by filing an Abbreviated New Drug Application, or "ANDA." See F.T.C. v. Actavis, Inc., 133 S. Ct. 2223, 2228 (2013). The filing of an ANDA pursuant to 35 U.S.C. § 355(j)(2)(A)(vii)(IV)("Paragraph IV certification") qualifies as an act of infringement, and allows the generic manufacturer and the brand-name patentee to litigate issues of infringement before the generic is approved. Actavis, 133 S. Ct. at 2228. Indeed, the FDA is generally forbidden from approving the generic manufacturer's ANDA until either 30 months have elapsed or a court has found that the underlying patent is invalid or will not be infringed. 21 U.S.C. § 355(j)(5)(B)(iii); Caraco Pharmaceutical Labs., Ltd. v. Novo Nordisk A/S, 132 S. Ct. 1670, 1677 (2012).

A generic that is the first to file an ANDA under this subdivision enjoys a period of 180 days of exclusivity from the first commercial marketing of its drug, a period that represents "the vast majority of potential profits for a generic drug manufacturer." Actavis, 133 S. Ct. at 2229 (citation omitted). The Hatch-Waxman Act provides that, for an infringement action based on the filing of an ANDA, "damages or other monetary relief may be awarded . . . only if there has been commercial manufacture, use, offer to sell, or sale within the United

States or importation into the United States of an approved drug." 35 U.S.C. § 271(e)(4)(C). The Patent Act generally provides that "upon finding for the claimant the court shall award the claimant damages adequate to compensate for the infringement, but in no event less than a reasonable royalty for the use made of the invention by the infringer." 35 U.S.C. § 284.

When the damages sought are based on a "reasonable royalty," that royalty is derived "from a hypothetical negotiation between the patentee and the infringer when the infringement began." ResQNet.com, Inc. v. Lansa, Inc., 594 F.3d 860, 868 (Fed. Cir. 2010). The aim of the hypothetical negotiation is to determine what royalty payment scheme willing parties would have executed if infringement had not occurred. Lucent Techs., Inc. v. Gateway, Inc., 580 F.3d 1301, 1325 (Fed. Cir. 2009). The royalty is to be determined by considering the fifteen so-called Georgia-Pacific factors. Dow Chemical Co. v. Mee Industries, Inc., 341 F.3d 1370, 1382 (Fed. Cir. 2003) (citing Georgia-Pacific Corp. v. United States Plywood Corp., 318 F. Supp. 1116, 1120 (S.D.N.Y. 1970)).

Before moving to an analysis of the Georgia-Pacific factors as applied by the parties' experts and a determination of the

reasonable royalty that applies here, three legal arguments made by Apotex will be addressed. First, Apotex suggests that the royalty should be based on the value of the infringing aspect of its formulation, that is, the inert subcoating that formed in situ between the active core of its pellets and the pellet's enteric coating, rather than the value of the omeprazole capsules that were sold to consumers. Second, Apotex argues that it would be improper for the royalty to include the six-month "pediatric exclusivity period" that ran from April 30 to October 20, 2007. Third, Apotex argues that certain of the plaintiff companies lack standing.

I. The Isolated Value of the Subcoating

Apotex argues that Astra's royalty calculations are flawed because they are based on the value of the omeprazole capsules as a finished product rather than on the isolated value of the inert subcoating that was found to infringe Astra's Patents. Apotex suggests that the value of this subcoating was "minimal."

Where a product, typically an electronic product, is composed of many different components, royalties for infringement are awarded "based not on the entire product, but instead on the smallest salable patent-practicing unit." LaserDynamics, Inc. v. Quanta Computer, Inc., 694 F.3d 51, 67

(Fed. Cir. 2012) (citation omitted). Under a narrow exception known as the "entire market value" rule, however, a patentee may assess damages based on the market value of the entire product "where the patented feature creates the basis for customer demand or substantially creates the value of the component parts." Uniloc USA, Inc. v. Microsoft Corp., 632 F.3d 1292, 1318 (Fed. Cir. 2011) (citation omitted). In these circumstances, a patentee must either "separate or apportion the defendant's profits and the patentee's damages between the patented feature and the unpatented features" or establish that "the entire value of the whole machine, as a marketable article, is properly and legally attributable to the patented feature." Id. (citing Garretson v. Clark, 111 U.S. 120, 121 (1884)). Animating the entire market value rule are two goals: "determining the correct . . . value of the patented invention, when it is but one part or feature among many, and ascertaining what the parties would have agreed to in the context of a patent license negotiation." Lucent, 580 F.3d at 1337.

It is clear that the royalty in this case is properly calculated based on the value of Apotex's omeprazole capsule and not, as Apotex suggests, the "negligible" value of the subcoating itself. As an initial matter, there is little reason

to import these rules for multi-component products like machines into the generic pharmaceutical context. Notably, Apotex has cited no precedent for doing so, and has submitted no evidence suggesting that the infringing subcoating is itself a "salable patent-practicing unit," LaserDynamics, 694 F.3d at 67, of its omeprazole product. It would therefore be improper to attempt to isolate its value as distinct from the value of the marketable capsules in determining a reasonable royalty.

Even under the entire market value rule, while the subcoating did not of course create customer demand for omeprazole, it did "substantially create[] the value," Uniloc, 632 F.3d at 1318, of the drug as it was formulated by Apotex. While Apotex argues that the coating "had no noticeable benefit," this contention is belied by factual findings in the court's prior opinions. More specifically, several features of omeprazole made it notoriously difficult to formulate.

Omeprazole is most effective when absorbed by the small intestine and yet is highly susceptible to degradation in the acidic environment of the stomach, meaning that scientists had to develop a formulation that would allow the drug to pass through the stomach and be absorbed by the small intestine, all the while ensuring adequate shelf life in a drug that is

sensitive to heat, moisture, organic solvents, and light. Omeprazole I, 222 F. Supp. 2d at 433-37. After years of effort, Astra scientists determined that a water soluble subcoat helped solve many of these problems and allowed them to formulate a commercially viable drug. Id. at 437. The court's factual account thus demonstrates that the subcoat was a crucial aspect of the process embodied in the '505 patent, and that Astra's prior formulations, which lacked a subcoat, were not commercially viable. Id.

II. The Pediatric Exclusivity Period

Apotex next argues that it would be legally improper for the reasonable royalty to include payments made for the six month "pediatric exclusivity" period that followed the expiration of the patents-in-suit. Under the Food and Drug Administration Modernization Act of 1997, Pub. L. No. 105-115, 111 Stat. 2296, the FDA may request, "after consultation with . . . the holder of an approved application for a drug," that a patent holder perform pediatric studies of a drug. 21 U.S.C. § 355a. If those studies are performed, the period during which the FDA is barred from approving an ANDA filed by another drug manufacturer is extended by six months. 21 U.S.C. § 355a(b)-(c).

The effect of this "pediatric exclusivity period" on litigation under the Hatch-Waxman Act is somewhat complicated. When a generic drug manufacturer files an ANDA with a Paragraph IV certification, the patent holder may file suit to litigate issues of validity and infringement. 21 U.S.C. § 355(j)(5)(B)(iii). If the patent holder proves infringement, the district court must set the ANDA's effective date no earlier than the date the patent expires. 35 U.S.C. § 271(e)(4)(A). What this means in practice is that if the court finds that the generic's ANDA infringes the patent before the FDA approves the ANDA, then the FDA may not approve the ANDA (and the generic may not sell its drug) until after the patent expires. In re Omeprazole Patent Litig., 536 F.3d 1361, 1367 (Fed. Cir. 2008). If the FDA has already approved the ANDA, however, the court's order results in a retroactive change in the ANDA's effective date. Id. at 1367-68.

As noted above, the six month pediatric exclusivity period extends the time during which the FDA is barred from approving an ANDA. 21 U.S.C. § 355a(b)(1)(B)(ii). Accordingly, although the Patents expired on April 30, 2007, the court in this case set the effective date for the Apotex ANDA six months later, at October 20, 2007. The FDA then revoked its earlier approval of

Apotex's ANDA, and re-approved it on October 22, 2007. The court's rulings in this respect were affirmed by the Federal Circuit, which squarely rejected the argument that "the district court may not grant relief relating to the period of market exclusivity after a patent has expired." Omeprazole V, 536 F.3d at 1368.

Apotex does not appear to dispute that the effect of this statutory scheme is to bar the sale of a generic until after the expiration of the six-month pediatric exclusivity period. See Janssen Pharmaceutica, N.V. v. Apotex, Inc., 540 F.3d 1353, 1362 n.7 (Fed. Cir. 2008). Naturally, then, a license acquired in 2003 would have had to include both the right to sell omeprazole during the original term of the Patents and during Astra's pediatric exclusivity period.

Apotex nonetheless argues that it would be impermissible to include royalty payments for the pediatric exclusivity period in any damages calculation, because a patent holder may not collect royalty payments beyond a patent's expiration date. Apotex takes this premise from Brulotte v. Thys, 379 U.S. 29 (1964), in which the Court held that "a patentee's use of a royalty agreement that projects beyond the expiration date of the patent is unlawful per se." Id. at 32. But Brulotte, which predated

the legislation concerning the pediatric exclusivity period, has been roundly criticized for years, and does not actually support such a sweeping generalization. Brulotte's reasoning was grounded in a fear that the legislative scheme governing patents would be corrupted if a patent holder could use a license "to project its monopoly beyond the patent period," thereby subjecting "the free market visualized for the post-expiration period . . . to monopoly influences that have no proper place there." Id. at 32-33.[31]

This concern is simply not present here, since Astra is not attempting to extend Apotex's royalty payments beyond the statutory exclusivity period. Charging Apotex for sales made during the pediatric exclusivity period does not impair "the free market visualized for the post-expiration period," id. at 32, since by creating the pediatric exclusivity period Congress obviously determined that there should be no "free market" during those six months.

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[31] This reasoning has been condemned as "lack[ing] economic or logical sense." Zila, Inc. v. Tinnell, 502 F.3d 1014, 1019 n.4 (9th Cir. 2007) (citation omitted); see also Scheiber v. Dolby Labs., Inc., 293 F.3d 1014, 1017 (7th Cir. 2002) (describing Brulotte's reasoning as "not true," because "charging royalties beyond the term of the patent does not lengthen the patentee's monopoly; it merely alters the timing of royalty payments").

Apotex argues that the pediatric exclusivity period is not technically an extension of the patent term, meaning that royalty payments made during this period are impermissible under Brulotte. This problem is adequately addressed by Astra's expert, who distinguished between "royalty" payments made during the patent term and "waiver" payments made in exchange for Astra's waiver of the pediatric exclusivity period. Apotex's assertion that these labels are merely semantic rings hollow, since its own argument relies on drawing an essentially artificial distinction between an extension of the patent term and the statute's grant of "market exclusivity," both of which have the same effect in terms of Apotex's ability to sell its infringing product.

Apotex also suggests in the alternative that the royalty rate should be lower during the pediatric exclusivity period, since even without a license it would have been able to manufacture (but not sell) omeprazole during this time. Dr. Meyer explained at trial that the ability to manufacture alone would not have affected Apotex's willingness to pay for a license for the ability to sell, and without a license during the pediatric exclusivity period its profits would have suffered. Apotex offers no compelling reason why it would have

been less eager to obtain a license to sell the infringing formulation during the pediatric exclusivity period than during the period before the expiration of the patents. Indeed, any six month interruption in its ability to sell its generic product would be expected to have far reaching consequences. It is thus entirely proper for the damages calculation in this case to include payments made for Apotex's right to sell omeprazole during the pediatric exclusivity period.

III. Standing

Article III, Section 2 of the United States Constitution limits the jurisdiction of the federal courts to actual cases and controversies. See Sprint Comm. Co., L.P., v. APCC Servs., Inc., 554 U.S. 269, 273 (2008). One component of this limitation is the requirement that a plaintiff suing in federal court have standing to sue. Lance v. Coffman, 549 U.S. 437, 439 (2007). To establish standing, a plaintiff must allege "personal injury fairly traceable to the defendant's allegedly unlawful conduct and likely to be redressed by the requested relief." Hein v. Freedom From Religion Foundation, Inc., 551 U.S. 587, 598 (2007) (citation omitted). "Since the patent statutes give rise to the right to sue others for patent infringement, they also define the nature and source of the

infringement claim and determine the party that is entitled to judicial relief." Morrow v. Microsoft Corp., 499 F.3d 1332, 1339 (Fed. Cir. 2007).

The Patent Act entitles a "patentee" to bring a "civil action for infringement of his patent." 35 U.S.C. § 281. A "patentee" can be both the person to whom the patent was issued and "successors in title to the patentee." 35 U.S.C. § 100(d). The Federal Circuit has described

> three general categories of plaintiffs encountered when analyzing the constitutional standing issue in patent infringement suits: those that can sue in their own name alone; those that can sue as long as the patent owner is joined in the suit; and those that cannot even participate as a party to an infringement suit.

Morrow, 499 F.3d at 1339. The first category, plaintiffs who can sue in their own name alone, includes both the patentee itself and any entity to whom the patentee has transferred "all substantial rights to the patent." Id. at 1340 (citation omitted). The second category, plaintiffs who can sue as long as the patent owner is joined in the suit, includes those who "hold exclusionary rights and interests created by the patent statutes, but not all substantial rights to the patent." Id. Among this group are "exclusive licensees," who hold "exclusionary rights" by virtue of the fact that they may

"prevent others from practicing the invention." Id. Finally, those who lack exclusionary rights do not meet the injury in fact requirement and therefore lack constitutional standing. Id.; see also Sicom Sys. Ltd. v. Agilent Techs. Inc., 427 F.3d 971, 976 (Fed. Cir. 2005) ("A nonexclusive license confers no constitutional standing on the licensee to bring suit or even to join a suit with the patentee because a nonexclusive licensee suffers no legal injury from infringement.").

The Federal Circuit has explained that to qualify as an exclusive licensee for standing purposes, "a party must have received, not only the right to practice the invention within a given territory, but also the patentee's express or implied promise that others shall be excluded from practicing the invention within that territory as well." Spine Solutions, Inc. v. Medtronic Sofamor Danek USA, Inc., 620 F.3d 1305, 1317 (Fed. Cir. 2010) (citation omitted). Notably, an exclusive licensee need not be the only party with the ability to license the patent. WiAV Solutions LLC v. Motorola, Inc., 631 F.3d 1257, 1266 (Fed. Cir. 2010). Rather, "a licensee is an exclusive licensee of a patent if it holds any of the exclusionary rights that accompany a patent." Id. The exclusive licensee's standing, however, is "coterminous" with the exclusionary rights

it has been granted, meaning that it "may have standing to sue some parties and not others." Id. In sum, "if an exclusive licensee has the right to exclude others from practicing a patent, and a party accused of infringement does not possess, and is incapable of obtaining, a license of those rights from any other party, the exclusive licensee's exclusionary right is violated." Id. at 1266-67.

At the outset, Astra makes two arguments as to why the issue of standing should not even be addressed at this time. First, Astra argues that Apotex should have raised any objection to Astra's standing sooner and suggests that by failing to do so Apotex has waived the issue. It is well settled, however, that "standing is jurisdictional and not subject to waiver." Spine Solutions, 620 F.3d at 1319 (citation omitted).

Second, Astra argues that its standing has been established as "law of the case." While no court in this litigation has previously mentioned the issue of standing, Astra argues that because standing is jurisdictional, this court and the Federal Circuit must have concluded implicitly that all the plaintiffs had standing, and that that conclusion should not be revisited now. The law of the case doctrine, however, "is a discretionary rule of practice and generally does not limit a court's power to

reconsider an issue." Liona Corp. v. PCH Assocs., 949 F.2d 585, 592 (2d Cir. 1991). In light of the court's "independent obligation to examine [its] own jurisdiction," United States v. Hays, 515 U.S. 737, 742 (1995), it would be unwise to avoid the question of standing by means of the law of the case doctrine where no court in this litigation has explicitly addressed the issue. See Wyoming v. Oklahoma, 502 U.S. 437, 462 (1992) (Scalia, J., dissenting) ("[L]aw of the case principles . . . have never to my knowledge been applied to jurisdictional issues raised (or reraised) before final judgment."). The Court therefore turns to the standing of the five plaintiffs.

Of those five plaintiffs, Apotex contends that four lack standing. Apotex concedes that Hassle owns the patents-in-suit and therefore has standing. AstraZeneca AB, a Swedish company, owns Hassle in its entirety. AstraZeneca LP is a U.S. company that is majority owned by AstraZeneca AB. KBI and KBI-E are U.S. entities that Astra describes as "affiliated" with AstraZeneca AB, but that are not owned by any of the other plaintiffs.[32]

[32] In its pretrial briefing, Astra indicates that it previously offered to withdraw the claims of KBI and AstraZeneca LP, and now makes no argument in its briefing as to why those two entities have standing.

The relationships between these various parties vis-à-vis the Patents are shaped by a series of agreements. AstraZeneca AB, the sole owner of Hassle, entered into an agreement with Hassle in 1985 called the Commission Company Agreement. The Commission Company Agreement, a one-page document, gives AstraZeneca AB the right to control the business of Hassle, but does not mention the patents or intellectual property in particular. The conduct of AstraZeneca AB over the years indicates that the parties to the Commission Company Agreement understood that AstraZeneca AB's power to control Hassle included the power to control the use of the Patents. At various times, AstraZeneca AB has granted licenses to the patents-in-suit to other companies without Hassle's involvement, while Hassle has never granted a license to another party without AstraZeneca AB's involvement. Furthermore, Hassle has allowed AstraZeneca AB to join it as a plaintiff in numerous litigations, including the First and Second Waves of this litigation.

In 1998, the various plaintiff entities entered into a series of agreements the parties refer to as the "Project Nobel" agreements, which restructured the ownership and operations of Astra Merck Inc., a now-defunct joint venture between

AstraZeneca AB and Merck. In one of these agreements, the "Amended and Restated License and Option Agreement" (the "Option Agreement"), AstraZeneca AB granted to KBI "an exclusive license . . . to make, have made, use and sell" omeprazole products. The Option Agreement also gave KBI various rights regarding infringement litigation, including the right to initiate an action for infringement, either jointly with AstraZeneca AB or on its own, and the right to participate in decisions regarding settlement. KBI then assigned its rights under the Option Agreement to KBI-E, via the "Assignment and Assumption of Amended and Restated License and Option Agreement" (the "Assignment"). In the "Limited Sublicense Agreement," KBI-E then sublicensed back to KBI the non-exclusive right to make omeprazole products, for the limited purpose of supplying those products to AstraZeneca LP under another agreement called the "Supply Agreement." KBI-E sold the exclusive right to distribute omeprazole and other products to AstraZeneca LP for a one-time fee.

AstraZeneca AB has standing as an exclusive licensee of the patents-in-suit. Although the Commission Company Agreement between it and Hassle did not mention the Patents explicitly, or indeed any other patent, an exclusive license may be granted

implicitly. See Spine Solutions, 620 F.3d at 1317.[33] By obtaining complete control of Hassle, AstraZeneca AB gained control over the Patents, as demonstrated by the parties' behavior in the years following the execution of the Commission Company Agreement. For instance, AstraZeneca AB granted several licenses to the patents-in-suit before the Project Nobel agreements were executed without the participation of Hassle, while Hassle never granted licenses without the involvement of AstraZeneca AB. AstraZeneca AB also participated in litigation to enforce the Patents. This behavior indicates that the Commission Company Agreement implicitly gave AstraZeneca AB the right to exclude others from practicing the patents-in-suit and that AstraZeneca AB was therefore an implied exclusive licensee. See Rite-Hite Corp. v. Kelley Co., Inc., 56 F.3d 1538, 1552 (Fed. Cir. 1995) (en banc); cf. WiAV Solutions, 631 F.3d at 1266 ("[I]f the patentee allows others to practice the patent in the licensee's territory, then the licensee is not an implied

[33] Apotex argues, citing Abraxis Bioscience, Inc. v. Navinta LLC, 625 F.3d 1359 (Fed. Cir. 2010), that AstraZeneca AB lacks standing because "[c]ommon corporate structure does not overcome the requirement that even between a parent and a subsidiary, an appropriate written assignment is necessary to transfer legal title from one to the other." Id. at 1366. AstraZeneca AB's standing, however, is as an exclusive licensee, not an assignee.

exclusive licensee." (citation omitted)). AstraZeneca AB thus has standing to sue as long as the patent owner, Hassle, is joined in the suit. Morrow, 499 F.3d at 1339.

The standing of KBI and KBI-E is more clear-cut. As noted above, the Option Agreement transferred AstraZeneca AB's rights in the patents to KBI, which then assigned those rights to KBI-E. KBI-E was thus left with an "exclusive license . . . to make, have made, use and sell" omeprazole products, as well as the right to engage in litigation if its exclusive rights were infringed. KBI-E was thus an exclusive licensee, and therefore has standing to join Hassle as a plaintiff in this suit. KBI, on the other hand, did not retain its exclusive rights. While KBI-E transferred back to KBI the non-exclusive right to manufacture omeprazole in the Limited Sublicense Agreement, the non-exclusive nature of the right KBI received deprives it of standing. KBI-E thus has standing, while KBI does not.

Apotex makes two arguments as to why KBI-E lacks standing, neither of which has merit. First, Apotex argues that because AstraZeneca AB did not receive its rights to the Patents in writing, it could not have transferred those rights to KBI. As explained above, however, an exclusive license need not been in writing, and indeed AstraZeneca AB's transfer to KBI supports

its own status as an exclusive licensee. After all, without an exclusive license it would not have been able to give KBI its own exclusive license. Second, Apotex argues that the agreements between KBI and KBI-E left neither with an exclusive license. This argument is belied by the agreements themselves, which indicate that KBI assigned its exclusive license to KBI-E, which then transferred back to KBI only a non-exclusive right to manufacture, retaining for itself the exclusive rights it received under the Assignment.

AstraZeneca LP, on the other hand, bought from KBI-E the "sole and exclusive right to promote, distribute, market and sell" omeprazole products. This transaction made AstraZeneca LP an exclusive licensee with regard to the distribution of omeprazole, while KBI-E retained an exclusive license to manufacture omeprazole (which it sublicensed to KBI on a non-exclusive basis for the sole purpose of supplying AstraZeneca LP). AstraZeneca LP therefore gained the right to exclude others from distribution of omeprazole and has standing to sue Apotex insofar as Apotex distributed its infringing product. Weinar v. Rollform Inc., 744 F.2d 797, 806-07 (Fed. Cir. 1984) (holder of "exclusive right to sell as sole distributor in the United States" had standing as an exclusive licensee); see also

WiAV Solutions, 631 F.3d at 1266 ("[A]n exclusive licensee lacks standing to sue a party who has the ability to obtain such a license from another party with the right to grant it.").

In arguing that AstraZeneca LP lacks standing, Apotex relies on Rite-Hite Corp. v. Kelley Co., 56 F.3d at 1553, but that case did not abrogate the holding of Weinar that "a licensee with the exclusive right to sell in the entire United States . . . shared the property rights represented by a patent" and therefore had standing. Id. (citation omitted). Rather, the court in Rite-Hite concluded that the plaintiffs whose standing was being challenged were at best "non-exclusive licensees by implication." Id. Because the rights granted in the Distribution Agreement were explicitly declared to be "sole and exclusive," AstraZeneca LP has standing. Of the five plaintiffs, therefore, four have standing to bring the claims in this litigation. Only KBI lacks standing.

One final observation on the question of standing is appropriate. Apotex argues, more broadly, that its standing arguments will impact the calculation of a reasonable royalty in this case by affecting the interests that can be considered in the hypothetical negotiation. In other words, Apotex suggests that if AstraZeneca LP (which earned the bulk of the profits

from sales of Prilosec) lacks standing, then the profits it earned should not factor into the reasonable royalty determination. This argument misunderstands the nature of reasonable royalty damages.

In a hypothetical negotiation, a patent owner can be expected to account for the profits its affiliates and licensees earn on its patents. See Union Carbide Chemicals & Plastics Tech. Corp. v. Shell Oil Co., 425 F.3d 1366, 1378 (Fed. Cir. 2005), overruled on other grounds, 576 F.3d 1348 (Fed. Cir. 2009) ("[T]he holding company would not enter any negotiation without considering the competitive position of its corporate parent."). Therefore, even if Apotex is correct that AstraZeneca LP lacks standing, the reasonable royalty analysis would still account for its economic position.

IV. The Reasonable Royalty

The reasonable royalty inquiry begins with the Georgia-Pacific factors. Dow Chemical, 341 F.3d at 1382. These are:

> (1) royalties the patentee has received for licensing the patent to others;
> (2) rates paid by the licensee for the use of comparable patents;
> (3) the nature and scope of the license (exclusive or non-exclusive, restricted or nonrestricted by territory or product type);
> (4) any established policies or marketing programs by the licensor to maintain its patent monopoly by not licensing to others to use the invention or granting

> licenses under special conditions to maintain the monopoly;
> (5) the commercial relationship between the licensor and licensee, such as whether they are competitors;
> (6) the effect of selling the patented specialty in promoting sales of other products of the licensee;
> (7) the duration of the patent license term;
> (8) the established profitability of the product made under the patent, including its commercial success and current popularity;
> (9) the utility and advantages of the patent property over the old modes or devices;
> (10) the nature of the patented invention and benefits to those who have used the invention;
> (11) the extent to which the infringer has used the invention and the value of that use;
> (12) the portion of profit or of the selling price that may be customary in that particular business to allow for the use of the invention or analogous inventions;
> (13) the portion of the realizable profit that should be credited to the invention as opposed to its non-patented elements;
> (14) the opinion testimony of qualified experts;
> (15) the results of a hypothetical negotiation between the licensor and licensee.

Whitserve, LLC v. Computer Packages, Inc., 694 F.3d 10, 27 n.11 (Fed. Cir. 2012).

In this case, it is useful to approach this analysis by analyzing the basic negotiating positions of each party rather than examining each of the Georgia-Pacific factors separately. Such an analysis necessarily takes into account almost all the Georgia-Pacific factors. Two of the factors have already been addressed above: the duration of the patent term (factor 7) will extend through the pediatric exclusivity period; the entire

capsule as opposed to non-patented elements (factor 13) is the appropriate measure for assessing realizable profit. Two remaining factors, factors 2 and 14, will be addressed at the end of the discussion below.

A. Apotex's position

Apotex's negotiating position would have been shaped by one basic concern. Because Apotex expected to (and did) make substantial profits from its sales of omeprazole, it would have been willing to pay a large share of those profits for the right to use the patents in 2003. In deciding how large a share of its profits it would pay, however, Apotex would have carefully evaluated the cost and delay associated with developing and obtaining approval for the sale of an alternative formulation that did not infringe the Patents.

1. Apotex's profits

Apotex expected to, and did, earn substantial profits from selling omeprazole between November 2003 and October 2007, the time period covered by the hypothetical license. While it experienced a gross margin ranging from 31% to 48% for most of the generic products it sold in the United States, it estimated that its gross margin on generic omeprazole would easily double that. It also predicted that it would quickly gain a sizeable

foothold in the generic market and therefore enjoy massive sales. Those expectations were reasonable, and Apotex achieved sales and growth roughly consistent with them.

During any negotiation for a license, of course, Apotex would have been relying on even rosier expectations. With a license from Astra, its patent litigation would end and Apotex would not have to act with the caution in pricing its generic product that is customary for "at risk" entrants into the generic market. It would have been able to maximize its profit even if that meant deep discounting. Only one of the three predecessor generic manufacturers in the PPI market -- KUDCo -- would have been able to compete with that same freedom in decision-making.

And, Apotex would have looked ahead to several years of extraordinary profits. Omeprazole was the only PPI that would have a generic version during the period covered by the Patents. Apotex also would have expected to enjoy increased sales of its other generic products as a result of its launch of omeprazole -- the only generic PPI molecule in one of the most widely-used class of drugs in the United States.[34] As Apotex explained in

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[34] The sixth Georgia-Pacific factor is "the effect of selling the patented specialty in promoting sales of other products of the

opposing Astra's requested injunction in 2007, sales of omeprazole help Apotex sell other products, since "customers tend to expand upon their current base of sales from current suppliers." In other litigation, an Apotex witness explained that "the presence of a blockbuster in the product line is perhaps the single most effective way to increase sales across all product lines." Astra does not advance any definite figure for the increased sales Apotex would have expected its other products to enjoy thanks to omeprazole, and Astra does not include this consideration in the profit calculations that support its reasonable royalty figure. Nevertheless, this effect does lend support for the idea that Apotex would have been willing to pay a substantial royalty for the right to sell omeprazole.

2. Apotex's ability to avoid infringement

In the hypothetical negotiation, Apotex would have understood that its formulation infringed the Patents. As of that time, Apotex would not have had any confidence that it could create a non-infringing product, much less do so on a

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licensee." Whitserve, 694 F.3d at 27 n.11.

timetable that would permit it to become a strong player in the generic PPI market.

Time was not on Apotex's side. KUDCo had entered the market about a year earlier, and two other generic manufacturers had launched their products three months earlier. Thus, Apotex was already faced with the hurdle of being the fourth generic in a market in which every additional generic manufacturer would face stiffer competition. Generally, pharmacies only have one generic version of a drug on hand. Each generic version of a drug is competing with every other generic to win that placement. A late entrant thus has the burden of displacing established commercial relationships to get that business.

In postponing entry into this lucrative market while engaged in an effort to develop a non-infringing product, Apotex risked losing even the fourth pole position. Other non-infringing generic omeprazole products might enter in the interim, or other generic products might enter at risk. With extended delay, therefore, Apotex risked being effectively closed out of the market even if it succeeded in finding a non-infringing formulation.

During the negotiation, Apotex would have been quite pessimistic about its chances of developing a non-infringing

formulation. It had spent close to two years trying to develop microtablets to place in a capsule because it thought that that would be a clear path toward a non-infringing product. Apotex abandoned that path because it could not produce a stable bioequivalent formulation. It had tried to work at an intense pace to be the first ANDA filer in this extraordinarily lucrative market, and it missed that mark by three years. Genpharm filed in December 1997; Apotex filed the eighth ANDA in December 2000.

And Apotex knew not just from its own experience, but also from the experience of others that finding a non-infringing formulation was tough. Three of the four defendants in the First Wave litigation were found to be infringers, one of them because its product, like Apotex's product, had an inert subcoating that formed in situ. Thus, even a product that was not designed to have a subcoating ran the risk of infringement if a subcoating formed in situ through the chemical reactions of the ingredients.

As discussed in detail above, Apotex suggests that it could have avoided infringement by making any one of three changes to its formulation: modifying its pellets, copying a competitor's non-infringing formulation, or using a microtablet formulation.

Apotex has not shown that these approaches were available to it or would result in a non-infringing product. See Spectralytics Inc. v. Cordis Corp., 649 F.3d 1336, 1346 (Fed. Cir. 2011).

As for Apotex's proposals for tinkering with the ingredients in its pellets, it is pure speculation whether any of its various proposals would create a stable, bioequivalent product that was non-infringing. Apotex has never asked one of its many experts to try to create the revised formulation, much less to create and test it. See SynQor, Inc. v. Artesyn Techs., Inc., 709 F.3d 1365, 1382 (Fed. Cir. 2013) (where an alleged substitute is not on the market, "the accused infringer has the burden to overcome the inference that the substitute was not 'available'") (citation omitted).

There is a reason that Apotex chose the ingredients that it did for its pellets following six years of research and testing. Those ingredients created a successful product. This is no easy task given the challenges of working with the omeprazole molecule and delivering it sufficiently intact to the part of the body in which it is most effective.

By the end of the trial, Apotex had largely abandoned its argument that it could have altered the infringing formulation

successfully.[35] In any event, during the trial it described three potential changes to its formulation. The first was to remove magnesium hydroxide from the core. But as Dr. Sherman admitted, that ingredient helped stabilize the core and had been the best stabilizer that Apotex could find after testing alternatives. The next was to avoid the formation of a subcoating by replacing the binding agent PVP with HPC. HPC is an inferior binder, however, and Apotex did not show that its use would eliminate the formation of a subcoat in situ. Finally, Apotex suggests that it could have explored a change to the enteric coating of the pellet. But, again, it has not shown that its proposed change would not result in the formation of an in situ subcoating, and its proposal is that the coating it has acknowledged to be superior -- Eudragit L30D –- be replaced by an inferior product that would require a solvent other than water to be used in the manufacturing process. For several good reasons, Apotex had already rejected, however, the use of organic solvents in the manufacturing process.

Even if one of these proposals could have resulted in the creation of an alternative, non-infringing formation that would

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[35] In its summation, Apotex only discussed one of the three proposed modifications to the pellets.

receive FDA approval as a stable, bioequivalent form of omeprazole, of course that creation, testing, and approval would have taken time. First, Apotex would have expected that it would take it at least a year to identify a successful new, non-infringing formulation. After all, after six years of work it had been unable to arrive at such a solution. Interestingly, despite determinations in October 2002 that the generic omeprazole formulations of three manufacturers infringed the Patents, there is no evidence that those manufacturers -- Genpharm, Andrx, and Cheminor -- ever looked for or found a non-infringing alternative. The three month stability tests and the FDA approval process for any new Apotex product would easily consume another year, assuming again that all went smoothly. At its most optimistic, Apotex would thus have expected a delay of at least two years before it would be able to begin selling an approved product. Apotex would not have been sanguine about its ability to tinker with its formulation of the pellets as an alternative route to entering the generic market; as Dr. Meyer showed, a two-year delay in entering the market would have cost Apotex 59.2% of its profits.

Apotex also argues that it could have copied the formulations of other generic manufacturers, but the only

generic formulation which a court had found was non-infringing as of November 2003 was the KUDCo formulation. That was not available to Apotex to copy, as it was protected by KUDCo patents.[36] Rite-Hite, 56 F.3d at 1548 (product protected by patent is not "available").

Finally, Apotex has argued that it could have revived its work on the omeprazole tablet and used that clearly non-infringing formulation to enter the market. But, as explained above, despite its best efforts Apotex was unable to solve the problems associated with its tablet, and it has provided no reason to believe that it would have been any more successful in that work in 2003 or 2004 than it had been in the 1990s.

Apotex argues that analyzing its negotiating position by reference to the cost and delay associated with developing a non-infringing alternative formulation is improper. Doing so, Apotex says, leads to a royalty rate that is unfairly based on the "hold-up" value of patents rather than their actual economic advantage over alternative, non-infringing approaches. Apotex here relies on a 2011 FTC Report, which notes that "[a]

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[36] Apotex suggests that it could have copied the Lek and Mylan formulations since they were also non-infringing. But as of November 2003, Apotex did not know those two formulations would be found in 2007 to be non-infringing formulations. In any event, they were also protected by patents.

reasonable royalty damages award that is based on high switching costs, rather than the ex ante value of the patented technology compared to alternatives, overcompensates the patentee." Federal Trade Comm'n, The Evolving IP Marketplace: Aligning Patent Notice and Remedies with Competition 190 (2011), available at http://www.ftc.gov/os/2011/03/110307 patentreport.pdf. Apotex therefore suggests that in the "hypothetical world" in which the negotiation occurs it should be assumed that Apotex would have begun developing a non-infringing alternative formulation in 2000, when it filed its ANDA. Apotex's argument contradicts settled law.

The hypothetical negotiation approach to determining a reasonable royalty posits that a negotiation occurred at a particular time, which in this case has been stipulated to be November 2003. As the Federal Circuit explains, "[t]he hypothetical negotiation requires the court to envision the terms of a license agreement reached as the result of a supposed meeting between the patentee and the infringer at the time the infringement began." Rite-Hite, 56 F.3d at 1554 (emphasis supplied). This framework is incompatible with Apotex's suggestion that it should be assumed to have been pursuing non-infringing alternatives as early as 2000.

Hanson v. Alpine Valley Ski Resort, Inc., 718 F.2d 1075 (Fed. Cir. 1983), is on point. In that case, the court rejected the argument that a royalty was unreasonable because it exceeded the cost of a non-infringing alternative. Id. at 1081. In doing so, the court observed that

> Alpine could have avoided infringement, and paying royalties therefor, by purchasing non infringing machines . . . . It chose, however, to purchase and use [the] infringing machines. Having followed that course, it cannot invalidate an otherwise reasonable royalty on the claim that by hindsight it would have been better off if it had purchased the non-infringing . . . machines.

Id. at 1081-82.

The hypothetical negotiation is hypothetical in the sense that the negotiation itself is imaginary, not in that it allows the parties to construct an entirely imaginary world that ignores the facts as they existed at the date of infringement. Those facts show that Apotex did not have a non-infringing alternative formulation ready and waiting. That this was the situation in which Apotex found itself in November 2003 is one of the most salient features of the negotiating dynamic in this case and may not now be ignored.

The cases on which Apotex relies, SK Hynix Inc. v. Rambus Inc., No. C-00-20905 (RMW), 2013 WL 1915865, at *19-20 (N.D. Cal. May 8, 2013), and Microsoft Corp. v. Motorola, Inc., No. 10

Civ. 1823 (JLR), slip op. (W.D. Wash. April 25, 2013), are not to the contrary. Those cases deal with the special situation in which a technical standard is set for an industry that puts one patent holder "in a position to 'hold up' industry participants from implementing the standard." Qualcomm Inc. v. Broadcom Corp., 548 F.3d 1004, 1010 (Fed. Cir. 2008). In such a situation, the organizations setting the technical standards often "require participants to disclose and/or give up [intellectual property rights] covering a standard." Id. Patent holders in such situations also typically agree to license their patents on a "reasonable and non-discriminatory" basis, a standard that courts will enforce by, for instance, allowing other parties to practice a patent as long as they are willing to pay a reasonable and non-discriminatory royalty. Microsoft Corp. v. Motorola, Inc., 696 F.3d 872, 876-77 (9th Cir. 2012) (citation omitted). These considerations are simply inapplicable here, as the Patents do not cover a standard technology.

While the Georgia-Pacific factors do include a consideration of "the utility and advantages of the patent property over the old modes or devices," Whitserve, 694 F.3d at 27 n.11, they do not set the economic utility of the patent

property in the abstract as an upper limit on the royalty figure. Furthermore, taking into account the costs and risks Apotex would incur by switching formulations in November 2003 does take into account the patented technology's advantages over non-infringing alternatives.

Notably, Apotex began its efforts to formulate omeprazole by working on a micro-tablet formulation that would not have infringed the patents-in-suit. As Dr. Beach testified, and as numerous internal Apotex documents show, Apotex switched to the infringing pellet formulation after its microtablet formulation encountered repeated obstacles and delays. In short, Apotex's microtablet formulation was a failure. This history demonstrates that the patented formulation did have "utility and advantages" for Apotex. Consideration of this Georgia-Pacific factor does not require ignoring the time and money Apotex invested in the patented formulation, or the time and money it would have spent in any effort to develop an alternative.

B. Astra's position

In contrast to Apotex's eagerness to obtain a license from Astra, Astra would have had no desire in November 2003, or indeed at any time, to issue a license to Apotex. Rather, it would have believed that any license granted to a generic

omeprazole supplier would be likely to alter the dynamic in the prescription PPI market in a way that would damage Astra financially. Since it is necessary, however, to assume that both parties were willing to enter into a license, Astra has shown through overwhelming evidence that it was in the driver's seat in the negotiations and would have required Apotex to pay a hefty portion of its profits for a license.

To begin with, Astra had no program to license its Patents in connection with generic prescription omeprazole, and had no interest in doing so. Astra's position in a hypothetical licensing negotiation with Apotex would have been shaped by two primary concerns: first, ensuring that the license would adequately compensate it for any economic harm it would suffer as a result of Apotex's entry into the market, and second, maximizing the licensing fee it could expect to receive from Apotex, based on its understanding of how much Apotex would be willing to pay.

Astra would have believed in November 2003 that the entry of a licensed generic omeprazole might lead to the complete conversion of the prescription omeprazole market to generic products through the imposition of MACs. If this happened, it would have had a significant impact on two Astra products,

Prilosec® and Nexium®. Prilosec® would probably have lost any remaining positions on formularies and Nexium® would have been confronted with fiercer competition for formulary placement and other favorable treatment.

If Apotex had entered the market with a license, then there would have been two generic omeprazole manufacturers who could engage in price competition without any constraint imposed by litigation risk: KUDCo and Apotex. The Lek and Mylan products had been launched at risk in August, and their competition with each other and with KUDCo had brought down the price of generic omeprazole, but by a relatively modest amount given the historic experience of price declines when generic products can compete without restriction with each other. With a license, Apotex would have been expected to change that market dynamic. Moreover, the Lek and Mylan products had a three month head start on Apotex in the market. While Apotex would have wanted to keep its price as high as possible, it would confront the classic interaction of supply and demand. Would its profits increase with a substantially lower price because it would capture enough market share to offset the price decline?

Astra would therefore have had to consider with care Apotex's pricing strategy. Astra's fears in this regard would

have been well founded. According to a study of IMS retail sales data from 1999 to 2004 performed by the FDA's Center for Drug Evaluation and Research, a second unconstrained entrant typically brings a current generic price down from 94% of the brand's price to 52% of the brand's price. After four generic entrants, the generic price is often 39% of the brand's original price. As it turned out, when Apotex entered the market without a license it priced its product to obtain roughly a 30% market share by 2005.

When the price of a generic product is low enough and there is assured supply, it is customary for insurers to impose a MAC. If this severe limitation on the reimbursement of omeprazole products had been put in place, then Astra would have had to consider the tsunami that would engulf the entire prescription PPI market.

In such a situation, Astra would probably have been faced with something like the following two choices for Prilosec®. It could either turn Prilosec® into a generic (an unpalatable option for a company like Astra) and compete with other generic products, or it could sell Prilosec® as a very low-priced branded product to those few consumers who were willing to pay

cash. After all, once a MAC is imposed, it would be unrealistic to expect Prilosec® to remain on any formulary.

With the elimination of Prilosec® from the market, Astra would have lost access to one of its strategies for transitioning patients to Nexium®. Moreover, with the imposition of a MAC for omeprazole, Astra could expect that the competition among branded PPIs would become ever fiercer. They would be jockeying with greater intensity to be the one preferred branded PPI on Tier II, and to avoid imposition of step therapy and other adverse actions. To succeed, they would have to make a substantially increased commitment to their rebate program so that they remained as attractive as possible to TPPs. With a MAC imposed, Nexium® would have lost any chance, even through a generous rebate program, to remain price competitive with the generic PPI.

While Astra would have had to consider whether a MAC would be imposed on generic omeprazole as a result of Apotex's entry into the market with a license, it would also have considered less dramatic impacts from that entry. Under any scenario, however, Astra would have reasonably expected that Apotex's licensed entry would make it substantially more difficult to support Prilosec®'s position on drug formularies and that the

reduced prices for generics would have increased the demands on Astra to provide rebate support for Nexium®.

Thus, Astra would have tried to calculate whether the expected income stream from an Apotex license would offset lost sales from Prilosec® and the increase in financial support required to keep Nexium®'s market share stable or to improve it. While Prilosec®'s market share had plummeted by late 2003, it still had roughly 5% of the PPI market and generated net sales of $865 million in 2003 and $361 million in 2004. Astra's rebate program for Nexium® consumed roughly 17% of its gross sales by the end of 2003 and 28% of its gross sales by the end of 2004. These are the financial parameters in which Astra was operating.

In this context, it is reasonable to conclude that Astra would not have licensed Apotex for anything less than 50% of Apotex's profits. Apotex earned profits on omeprazole of $152,043,989 between November 2003 and October 2007. Using a 50% royalty, this results in a fee of $76,021,994.50.

While there are no perfect benchmarks for this licensing fee, a 50% licensing fee fits comfortably within the range of negotiations that occurred in connection with the patents-in-

suit. These negotiations included actual licenses and offers to settle or settlements of litigation.

Astra received a step royalty ascending from 7% to 40%, with a blended royalty rate of 20% to 23%, from P&G for the sale of Prilosec OTC®. Unlike Apotex's omeprazole, this is a product that Astra expected to benefit its product line. From the 1990s, Astra had envisioned Prilosec OTC® as a product that would take sales away from generic omeprazole and encourage consumers to try Nexium® if Prilosec OTC® proved unsuccessful. Moreover, while Astra provided the product at cost to P&G, this required no great investment, and P&G bore the entire burden of using its best efforts to market the product. Thus, Astra received a handsome royalty for a product that was an essential part of its long term PPI strategy. While Apotex has emphasized that the base royalty of 7%, P&G and Astra expected that the sales for the first three years would surpass the threshold that triggered the 40% rate, and those expectations were met.

Andrx offered in 2005 to pay Astra 70% of its profits to enter the market in that year as the sixth generic. The 70% figure was for the sale of 40mg generic omeprazole, a product not yet sold on the market. It offered Astra 50% of its profits on 10mg and 20mg generic omeprazole with a $25 million minimum

royalty for the 180 days following its first commercial sale. Even though these royalties were offered to settle litigation, including the claim that Andrx had infringed the Patents through prior manufacture of commercial quantities of omeprazole, they serve as a marker of the value of licensing rights.

And of course, the settlement agreement between Teva and Astra in 2010 resulted in a payment to Astra of the equivalent of 54% of Teva's profits from its infringing sales. Moreover, back in 2003, when Teva exercised its option to add omeprazole to its strategic alliance agreement with Impax, it agreed to pay Impax on a sliding scale from 35% to 50% of its profits after the two year mark.

Each of these markers provides some support for the choice of 50% at the reasonable licensing fee for Apotex. In contrast, Apotex has not shown that any of the cross-licensing agreements or other settlements that did not involve the sale of omeprazole provide a relevant marker. Its contention that Astra would have agreed to a licensing fee no greater than 7% must be dismissed out of hand.

In addition to those already addressed, Apotex makes essentially four arguments why the 50% licensing fee is too high. It contends it would have been unwilling to pay that

much; that any license would have been non-exclusive and therefore of limited value; that greater weight must be given to the impact of Prilosec OTC® on Astra's other products; and that its forecasts from before its launch did not accurately reflect the costs attributable to omeprazole and therefore provided an artificially high profit margin.

In summation, Apotex asserted bluntly that generic drug manufacturers simply do not pay licensing fees of 50% of profits. It was unable to point to any evidentiary support for that contention, and in fact the record contains evidence that is directly contrary. Apotex's products at the time typically achieved a gross margin of 31 to 48%, or an average across all products of 40%. Apotex projected a gross margin of over 92% from its sale of unlicensed omeprazole. Based on those estimates, a 50% royalty would have left it with an anticipated gross margin of 46%, close to the top of this range. And, as the rough benchmarks described above show, generic drug manufacturers are willing indeed to pay fees in the range of 50% of their profits or higher.

As for Apotex's argument that its license would not have been exclusive and therefore would have been worth far less than 50% of its profits, this is again belied by the various other

benchmark licenses discussed at trial. Notably, Andrx offered to buy a license from Astra for 70% of its profits on 40mg omeprazole, for which it would have been the exclusive generic supplier, and 50% of its profits on the 10 and 20mg doses, for which it would have been the sixth generic supplier. Teva, which was never an exclusive supplier of omeprazole, settled its claims with Astra for what amounts to 54% of its profits. And, without any license (let alone an exclusive one), Apotex anticipated achieving gross margins of 92%.

Apotex emphasized at trial that Astra introduced one of the major PPI competitors when it introduced Prilosec OTC®, and that that launch occurred in September 2003, just months before the hypothetical negotiation. Apotex is quite right that Prilosec OTC® had a major impact on the PPI market. While it had very minimal effect on Nexium®, it dealt a blow to omeprazole's market share from which took about a year to recover. But, Apotex failed to show at trial that this impact on sales to consumers actually had any significant impact whatsoever on formulary position or the price competition within the prescription PPI market. After all, Prilosec® did not have to compete for placement on the shelves behind the pharmacy counter; it was sold in the drugstore aisles and competed with

other OTC products for shelf space there. Very few formularies included Prilosec OTC® in 2003 and this remained true for a long time thereafter. As a consequence, generic prescription omeprazole and branded prescription PPIs were competing with each other and not with Prilosec OTC® through rebates and product differentiation to avoid adverse actions by formularies and for favorable formulary placement. The existence of Prilosec OTC® in the marketplace simply would not have altered in any fundamental way the calculus between the parties as they negotiated a license. Their basic concern would have been how the entry Apotex's licensed generic product would alter the field of play in the prescription market, and specifically, the policies of TPPs.

Apotex's final argument, that its projections in the months leading up to its launch did not contain meaningful cost estimates and therefore overstated the profit margin it expected to earn, is similarly unavailing. At the outset, there is no evidence in the record to support the theory that the cost estimates in these internal projections were not intended to be accurate. Apotex is of course correct that its actual profit margin fell short of its projections; while it projected a 92% profit margin, it ended up earning a roughly 75% margin on its

infringing sales. Even if Apotex paid 50% of its profits out of this lower margin, it is still left with a profit margin of 36%, which is solidly in the range of 31 to 48% margins it typically earned on its products at the time.

C. Two remaining factors: Factors 2 and 14

Two Georgia-Pacific factors remain to be addressed. Factor 2 requires consideration of the rates paid by the licensee for the use of comparable patents. Just as Astra had no practice of licensing generic drug products that competed directly with its branded products, Apotex had no practice of entering the generic market via a licensing agreement with the branded drug. Apotex has not placed any particular emphasis, however, on this issue at trial. Since the analysis conducted above gives careful consideration to Apotex's general experience in selling generic products, including the gross margin it customarily achieves through those sales, the absence of a practice of negotiating licenses does not alter the conclusion that it would have readily paid a licensing fee of 50% here.

Factor 14 requires the Court to examine with care the opinion testimony of qualified experts. That has been done here. Where their opinions were well supported by the evidence they proved helpful to the analysis of the issues. On many

background facts, such as the operation of the prescription market or the procedures followed by the FDA in reviewing a PAS, the parties' experts largely agreed. On occasion, the experts presented by Apotex did not provide well supported testimony or provided testimony that was substantially undercut by cross examination. When that occurred, their opinions were accorded less weight.

This Opinion has carefully considered all of the testimony, including that given by lay and expert witnesses, and has found substantial support in their testimony and the trial exhibits for the findings herein. Astra has shown not just by a preponderance of the evidence but convincingly that the hypothetical licensing fee to which Astra and Apotex would have agreed would have been at least 50% of the Apotex gross margin from its sales of omeprazole. Applying that rate to the infringing sales made by Apotex, Apotex owes $76,021,994.50 plus pre-judgment interest.

CONCLUSION

Following trial, Astra has carried its burden of showing that it is entitled to damages in the amount of $76,021,994.50

plus pre-judgment interest. The parties shall present a proposed judgment by December 6, 2013.

SO ORDERED:

Dated: New York, New York
November 26, 2013

DENISE COTE
United States District Judge