Rx Roulette:
Counterfeit Pharmaceuticals in Developing Nations

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Abstract

The AIDS pandemic focused attention on the WTO/TRIPs Agreement, pharmaceutical patents, and the difficulties surrounding pharmaceutical policy in developing nations. The ensuing debate principally centered on the challenge of access to affordable medicine. Despite its importance, the focus on access alone limits the debate to but one aspect of the crisis. Counterfeit pharmaceuticals may be a larger problem, and are certainly a more insidious one. While both problems are arguably exacerbated by patent protection, the dangers and the remedies are very different. This paper broadens the examination of pharmaceutical patents in developing countries to consider the impact on drug safety in addition to access. For policymakers seeking affordable access to quality medicines, the best solutions must overcome both the difficulties of access as well as the dangers of counterfeiting.

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E-mail: Lybecker@drexel.edu I am grateful for the suggestions of many friends and colleagues in writing the piece. The usual disclaimer applies.
“As early as the fourth century BC people were warned about the dangers of adulterated medicines, and despite all the advances made over the years this concern has not disappeared.”
World Health Organization.¹

“‘In the next ten years, spurious drugs will be the single biggest problem’ in public health.”
Ranjit Roychoudhury, President of the Delhi Society for the Promotion of the Use of Rational Drugs, as quoted in The Lancet.²

“Some health officials in Africa have stated that counterfeit medicines are a greater public health threat than AIDS or malaria.”
Harvey Bale, President of the International Federation of Pharmaceutical Manufacturers Associations (IFPMA), as quoted in The Lancet.³

1. Introduction

The AIDS crisis focused attention on the complex debate surrounding pharmaceutical patents and treatment for patients in developing countries. Public health advocates and representatives of the pharmaceutical industry continue to grapple with the difficulties of finding a balance between access to medicines and appropriating the rewards to innovation.⁴ Pharmaceutical patents have been depicted as the primary barrier to access to affordable medicines for developing nations. Admittedly, resolving the tension between local production and patent infringement is an important step in improving access to medicines for developing countries. Nevertheless, the focus on access alone limits the discussion to but one aspect of the challenge facing developing nations. While patents are clearly central to the debate, it is an oversimplification to focus exclusively on this one factor since the challenge to public health in

⁴ This situation is further complicated by the very different interpretations of the provisions of the World Trade Organization’s TRIPs Agreement. In particular, Article 31(f) of the TRIPs Agreement states that compulsory licensing shall be “predominantly for the supply of the domestic market”. (http://www.wto.org/English/tratoc_e/minist_e/min01_e/mindec1_trips_e.htm) The 2001 Doha Declaration on TRIPS and Public Health sought to clarify the interpretation of this phrase. As of the completion of this draft, it appears that the United States may be close to an agreement that would allow the poorest nations to import generic medicines through exemptions to trade rules. (Becker 2003)
developing countries is multifaceted. Pharmaceutical counterfeiting is a barrier to access that is less understood, perhaps more prevalent, and certainly more insidious than patent infringement. To effectively address the public health challenges of developing nations, the debate must be extended to the problems of counterfeit drugs.

The aim of this paper is to reframe the public health priorities of developing countries in the context of pharmaceutical counterfeiting. Counterfeit drugs are a genuine threat to access and a growing problem. Advancing technologies and a changing market for pharmaceuticals have contributed to the problem. For developing countries, especially the least developed, the patent protection mandated by the WTO’s TRIPs Agreement may lead to an increase in counterfeiting before any improvements can be attained. These are important considerations in efforts to both reduce pharmaceutical counterfeiting and increase access to medicines. For policymakers seeking affordable access to quality medicines, the best solutions must address both the high prices of on-patent drugs as well as the dangers of counterfeiting.

The remainder of the paper is structured as follows. Section 2 examines pharmaceutical counterfeiting as an important challenge to public health for developing nations. Section 3 considers the characteristics of the counterfeiting problem and its dimensions. Section 4 discusses the factors that facilitate pharmaceutical counterfeiting. Section 5 examines the strategies available to combat counterfeiting. Section 6 concludes.

2. Pharmaceutical Counterfeiting and Public Health

Pharmaceutical patents are widely considered the principle barrier to access to drugs for poor countries. Until very recently, the focus of developing country health advocates has been getting drugs into the supply chain at affordable prices. The quality of these drugs and the threat of counterfeit pharmaceuticals have been largely ignored. However, there is mounting evidence that counterfeit pharmaceuticals pose a serious threat to public health, especially in developing countries. This begs the
question: What consideration, if any, should be given to counterfeit pharmaceuticals in the context of public health priorities for developing nations?

While counterfeit drugs are a less visible barrier to access, they are perhaps a more insidious threat to public health than high drug prices will ever be. Although precise estimates do not exist, use of counterfeit pharmaceuticals results in prolonged illness and death for many in developing nations. Consumers place their trust in drugs that provide no medicinal value and frequently result in therapeutic failure. The severity of the health risk associated with fraudulent drugs can vary greatly, from inconvenience to unwanted pregnancies to fatality. Moreover, counterfeit pharmaceuticals unarguably contribute to global microbial resistance and more virulent forms of disease. Counterfeit drugs that contain a greatly reduced dose of the active constituent contribute to the great increase in global drug resistance, undermining the fight against infectious diseases. Counterfeiting may also result in a loss of confidence in the system of western medicine, leading consumers to choose local healers and traditional medicines.

In addition, counterfeit pharmaceuticals result in squandered health resources, both for the individual and at the national level. Counterfeiters steal scarce resources from limited health budgets, diverting resources away from genuine treatment. Counterfeiting not only inhibits increased access, but endangers existing drug supplies. Unfortunately, the lower prices of the counterfeits encourage purchases

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5 It is worth noting that treatment failure may be mitigated by the placebo effect. For example, “[p]lacebos are about 55 percent to 60 percent as effective as most active medications like aspirin and codeine for controlling pain” (Blakeslee 1998, p.D1). While surprisingly powerful (Blakeslee 1998, pp.D1-D4), the results from placebo effect will not be as effective as those of the genuine product. (The author is grateful to Oliver Williamson for raising the issue and providing the source on studies of the placebo effect.)

6 Tracing illness and death to counterfeit drugs is obviously very difficult. Nevertheless, in several particularly egregious cases, the correlation is clear. The 1995 Haitian incident is illustrative, “Almost one hundred cases have been documented of fatal kidney insufficiency in children following the ingestion of a cough syrup containing glycerine heavily contaminated by diethylene glycol (antifreeze)” (ten Ham 2002, p.21). And in the case of counterfeit antimalarials, “[g]iven their widespread use, the fake malaria drugs are probably a major cause of mortality and morbidity due to malaria in Cambodia” (Rozendaal 2001, p.1).

7 As one study reports, “(Antibiotics and other anti-infective agents) . . . are seldom used or used properly in Third World countries. Antibiotics obtained as over-the-counter products, commonly without a physician’s prescription - or even a physician’s advice - are frequently used at too low dosages and for too few days. [Counterfeit drugs generate similar effects.] . . . One serious result of this widespread, inadequate treatment has been the rise of drug-resistant strains of bacteria” (Silverman, Lydecker and Lee 1992, p.7).
by consumers and health providers. In a study of fake antimalaria drugs in Cambodia, researchers found that “fakes were frequently preferred by patients and village health providers because of the lower price” (Rozendaal 2001, p.1). For the majority of pharmacies in developing countries, their “budgets are tight and they buy any drugs which are cheap. In rural areas, chronic drug shortages sometimes beg the question whether to take the risk even with suspected counterfeits” (VSO 1998, p.2). The most desperate markets are also, regrettably, often the most corrupt, opening the door to counterfeiters.8

Any examination of public health priorities and policymaking for developing nations should also incorporate pharmaceutical counterfeiting based on the sheer size and prevalence of the threat. The World Health Organization estimates that 10 percent of the global market for pharmaceuticals is comprised of counterfeits. Given that the annual turnover for the pharmaceutical industry is estimated to reach $435 billion in 2003, the financial loss for the industry could be as much as $43.5 billion per year.9 To put this figure in perspective, note that in 2001 PhRMA member companies invested close to $30.3 billion in research and development (PhRMA 2002, p.12).10 Moreover, pharmaceutical counterfeiting is a growing threat. Consider the experience of the United States as an illustrative example. According to the US Food and Drug Administration (US FDA), as recently as three years ago, the FDA was investigating six cases of counterfeiting annually. Most recently, the number has risen to twenty cases in the last year, including the highly-publicized reports involving Viagra, Lipitor, and Procrit. (Knox 2003)

3. Pharmaceutical Counterfeiting – Dimensions of the Problem

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8 Case in point, consider the recent case of AIDS drugs meant for patients in Africa which were discovered in the Netherlands, Germany, Belgium and France (Crouch 2002, p.1). It’s not unusual for the medicines so desperately needed in developing countries to disappear. In South Africa, “almost 50% of the pharmaceuticals entrusted to the government itself are stolen” (DeKieffer 2002, p.17).

9 Accounting for the industry growth and increasing counterfeiting, this calculation is inline with other published estimates, Goodman (2002), and ten Ham (2002).

10 Pharmaceutical Research and Manufacturers of America (PhRMA) is the industry association for innovative pharmaceutical firms in the United States.
Counterfeit pharmaceuticals comprise a significant and growing problem. To examine the threat of counterfeit pharmaceuticals, it is valuable to establish the extent of the problem. First, a definition is in order. The World Health Organization provides the following definition, “a counterfeit medicine is one which is deliberately and fraudulently mislabeled with respect to identity and/or source. Counterfeiting can apply to both branded and generic products and counterfeit products may include products with the correct ingredients, wrong ingredients, without active ingredients, with incorrect quantity of active ingredient or with fake packaging” (World Health Organization 1997, p.6).\(^\text{11,12}\)

While reports on counterfeiting incidents are plentiful, the magnitude of the problem is difficult to estimate,\(^\text{13}\) “counterfeiting has now assumed such an alarming size that it and associated activities (misbranding, substitution, adulteration, and spurious manufacture) are becoming a major threat to the industry, to future research and development, to employment, individual and community safety, and public health” (Tavis and Williams 1993, p.162). Pharmaceutical counterfeiting is a pervasive problem, impacting nations of every size and income level and drugs of every description. Given that medicines are very high value products relative to their bulk, and in very high demand, the problems of patent infringement\(^\text{14}\) and counterfeiting have assumed enormous proportions. In addition, the pharmaceutical

\(^{11}\) Even defining a counterfeit drug has been somewhat controversial. The definition provided by the World Health Organization is most frequently cited. The definition found in the US Food, Drug and Cosmetic Act (1938) is similar, though more elaborately defined. “A drug which, or the container or labeling of which, without authorization, bears the trademark, trade name, or other identifying mark, imprint, or device, or any likeness thereof, of a drug manufacturer, processor, packer, or distributor other than the person or persons who in fact manufactured, processed, packed, or distributed such drug and which thereby falsely purports or is represented to be the product of, or to have been packed or distributed by, such other drug manufacturer, processor, packer, or distributor.”

\(^{12}\) The importance of establishing a common definition is more than mere wordplay. In some nations, pharmaceutical counterfeiting is termed fraud, while in others the terminology is “production of counterfeit substances.” As a result, even Interpol would not have a unified database” (WHO 2000, p.1). A common definition is essential for cooperation among law enforcement agencies.

\(^{13}\) “In spite of various national and international efforts, including a WHO/DAP supported ongoing project in Africa, carried out by Reseau des Medicaments et Developpement (ReMeD), there is inadequate information about the scale of pharmaceutical counterfeiting and little consistent information on the source of counterfeits” (yjgjg Project 1996, p.1).

\(^{14}\) The term “patent infringement” is only correct if the developing country in which counterfeiting occurs has pharmaceutical patent protection legislation in place. Given that many developing countries did not extend patent protection to pharmaceuticals, prior to joining the WTO, the imitation that took place cannot be termed infringement.
market is one of tremendous size\textsuperscript{15} in which the great margin\textsuperscript{16} between manufacturing costs and market price creates an impressive economic incentive (ten Ham 1992, p.59). No company is untouched. No drug is invulnerable. No country is immune.

- **Aspirin**: “Because tablet-making machines are easily obtainable, even counterfeit ‘aspirin’ tablets containing little or no acetylsalicylic acid can be profitable, especially at open-air markets such as those in African villages” (McGregor 1997, p.1690).

- **HIV and Cancer drugs**: “[D]rugs to boost the immune system of cancer and HIV patients have become a favorite of counterfeiters. In one case . . . criminals realized a $28 million profit from a shipment of 11,000 boxes of counterfeit Epogen and Procrit, which is also often prescribed to cancer, AIDS and kidney-failure patients” (Associated Press 2003).

- **Children’s Vaccines**: “As many as 80,000 children in Nigeria have gotten fake meningitis vaccines. India has seen bogus polio vaccines” (Knox 2003).

- **Argentina**: The Argentine Food and Drug Administration (ANMAT) estimates that “seven out of ten health products sold outside of pharmacies are bogus” (Iglesias-Rogers 2001, p.47).

- **Colombia**: Authorities “interdicted millions of yellow tablets that were virtually indistinguishable from the genuine product – including the company logo. These tablets were made of boric acid, floor wax, and lead-based yellow paint used for road markings. Sacks of these ‘raw materials’ were stacked throughout the counterfeiter’s site” (Christian 2001, p.2).

- **China**: “Western health officials name mainland China as perhaps the world's largest producers of substandard medicines” (Hajari 1998, p.265). “Between 1998 and 2000, over 1.8 million units of counterfeit pharmaceutical products, representing more than 1,300 different brands, were seized” (Aaron 2001, p.4). In “March 2001, Novartis and other pharmaceutical companies participated in a raid with authorities in Shantou that resulted in the seizure of over 1800 cartons of counterfeit pharmaceutical products from 14 multinational companies” (Christian 2001, p.3).

- **India**: “‘India is fast becoming the capital for counterfeit drugs, accounting for one-third of the counterfeit drugs produced worldwide,’ [Mr. Ranjit Shahani, President of the Organization of Pharmaceutical Producers in India] points out, citing World Health Organization statistics. . . ‘India accounts for 35 per cent of the counterfeits produced, Nigeria produces about 23 per cent and Pakistan accounts for 13.3 per cent’” (Datta 2003).

- **Indonesia**: “[F]raudulent products may have risen to the point at which it involved thirty percent of all drugs in circulation” (Silverman, Lydecker and Lee 1992, p.7). “It is estimated that up to 25% of the market is served by these products with their associated serious health hazards” (PhRMA 1997, pp.2-3).

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\textsuperscript{15} In 1995, the world market for pharmaceuticals was estimated at $260 billion (Alam 1996, p.2). The global pharmaceutical market is expected to reach $435 billion in 2003.

\textsuperscript{16} The average profit margin of the ten largest pharmaceutical firms in 1996 was 30% (Carr 1998, p.S1).
• **Mexico:** “American law enforcement officials opined that the amount of counterfeit and substandard medications in Mexico could be as high as 25 percent” (Christian 2001, p.2). In addition, confidential sources reveal that “Mexican organized criminal elements are involved in the distribution and sale of counterfeit medicines in Mexico” (Glover 2001, p.4).

• **Nigeria:** “[I]t is estimated that 60-70 percent of all drugs in Nigeria are either counterfeit or contain only a fraction of the declared strength. Consequently, drugs manufactured in Nigeria . . . are banned in Ghana, Sierra Leone, Cote d’Ivoire and other West African countries” (Alubo 1994, p.98). More recent estimates place the share of counterfeits in Nigeria close to 90 percent.

• **Pakistan:** “Pakistani authorities claim that a mere two percent of the 20,000 drugs registered for sale nationwide are faulty. But private estimates are less reassuring. Dr. Kaleem Butt, head of the Pakistan Medical Association, thinks that the proportion could be as high as 50%” (Hajari 1998, p.265).

• **Senegal:** “A recent study in Senegal revealed that the parallel market for illicit drugs is very well structured inside the social and economic system. The turnover of the illicit market is about ten times the national health budget for the study area and is as large as the authorized drugs sold through the pharmacies” (Tavis and Williams 1993, p.167).

• **Southeast Asia:** In perhaps the most scientific, and precise, of all estimates Dr. Paul Newton, et. al. conducted a study of counterfeit artesunate, a key antimalarial drug. “Of 104 shop-bought ‘artesunate’ samples from Cambodia, Laos, Myanmar (Burma), Thailand, and Vietnam, 38% did not contain artesunate” (Newton, et. al. 2001, p.1948).

• **United States:** “In May 2001 Amgen, the world’s largest biotech company, reported that counterfeit Neupogen was in circulation in the US. . .In the same month, Serono reported that it had discovered a batch of counterfeit Serostim. . . (in June 2002) reports are coming in of tampered Zprexa, the leading psychiatric drug from Eli Lily” (Lancaster 2002, p.6).

• **Overall, in Developing Countries:** “Some 70 percent of medicines sold in Third World countries are knockoffs, according to the International Anti-counterfeiting Coalition, an industry-funded group in Washington, DC” (Stipp 1996, p.134).

• **Worldwide:** “Trade in counterfeit drugs is thought to account for some US$15 billion, 6% of pharmaceutical sales world-wide” (International Federation of Pharmaceutical Manufacturers Associations 1995, p.66). In 1992, the International Federation of Pharmaceutical Manufacturers Associations concluded that “in some countries as much as 60 percent of all drugs may be counterfeit” (Christian 2001, p.2). As a further illustration, consider the experience of one firm, Novartis. “Over the last five years, Novartis has assisted or otherwise been involved in over 100 investigations of counterfeiting operations, in over 33 countries, involving more than 11 Novartis products and more than 200 products manufactured by other companies” (Christian 2001, p.2).

Beyond the anecdotal evidence and the isolated reports, a general sense of the nature and scope of pharmaceutical counterfeiting is helpful. Some products are more vulnerable than others. While all

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17 Unfortunately, a comprehensive database on counterfeit pharmaceuticals is not available. The World Health Organization has a confidential collection of reports filed by member countries. The best information is held in confidentiality by the firms.
estimates and trends should be interpreted with a healthy dose of skepticism, the following common threads do seem to emerge. First, in general, very costly drugs that are purchased in small numbers or less costly drugs that are purchased in large quantities are especially susceptible to counterfeiting. In addition, counterfeiters primarily target expensive branded drugs. Lastly, clear injectibles and simple tablets seem most readily counterfeited.

4. Factors that Facilitate Pharmaceutical Counterfeiting

While pharmaceutical counterfeiting is an increasingly sophisticated operation, there are some market characteristics that seem to invite counterfeiters to set up shop. To start with a rather general list from the experts, the WHO has determined that counterfeiting is facilitated where “there is weak drug regulatory control and enforcement; there is a scarcity and/or erratic supply of basic medicines; there are extended, relatively unregulated markets and distribution chains, both in developing and developed country systems; price differentials create an incentive for drug diversion within and between established channels; there is lack of effective intellectual property protection; due regard is not paid to quality assurance” (World Health Organization 1992, pp.11-12).

Beyond those specified by the WHO, there are, of course, many additional factors that facilitate pharmaceutical counterfeiting. While a comprehensive review is beyond the scope of this work, it is worthwhile to describe several of the most important contributing factors: the low risk, the presence of organized crime, the enhanced intellectual property rights protection, and changing technology. These elements, in combination with those listed above, make pharmaceutical counterfeiting an almost irresistible temptation.
Rising pharmaceutical prices have made the market for counterfeit drugs increasingly profitable. While this alone is sufficient to attract the criminal element, pharmaceuticals are low bulk/high profit items. That is, based on weight and volume, drugs are highly profitable. In addition, pharmaceutical counterfeiting is relatively low risk. It is a crime that is difficult to uncover, one in which law enforcement officials are not well trained in detecting.\(^{18}\) Moreover, the penalties that do exist are frequently minimal and rarely imposed. Negligible punishment is the standard in too many places.

Consider the following examples:

- In Jakarta, Indonesia, reporters “…located three centers that police admitted were ‘unofficial wholesalers’ or ‘the illegal drug market,’ but that seemed to be violating no laws. Prices there were often astonishingly low. ‘A pharmacy that does not take advantage of this channel and buy at these bargain prices,’ a reporter was told, ‘practically cannot survive’” (Silverman, Lydecker, & Lee 1992, p.150).

- “In Malaysia the maximum fine for manufacturing counterfeit medicine is 25,000 ringgit ($6,580). . . The law also allows for a maximum three-year jail sentence, but a representative of the Pharmaceutical Association of Malaysia says no one has ever done time for making fake medicine in Malaysia” (Saywell & McManus 2002, p.36).

- In Vietnam, 64 per cent of all artesunate (a key antimalarial drug in Southeast Asia) samples tested were found to be fake. Nevertheless, while prison terms of “20 years have been given in Vietnam for trading in fake sildenafil (Viagra) . . . there have been no prosecutions of fake antimalarial traders” (Newton et al. 2001, p.1949).

- In the case of India, intellectual property laws need to be significantly improved. As a representative example of punishment consider “the current Designs Act [which] was created in 1911 and has an archaic provision limiting damages to Rs.1000 (less than $30)” (Anand 1998, p.5).

\(^{18}\) Counterfeit drugs are difficult to detect, even by the individuals taking them. Fake drugs are remarkably realistic in appearance. Today’s counterfeiters “equipped with the latest technology, can even buy their packaging from the same companies as the legitimate manufacturers, making it impossible for authorities to identify the fakes without expensive chemical analysis” (Schofield 2001, p.1564). Uninformed consumers only worsen the situation. “Poor and poorly educated patients are generally loathe to blame doctors and prescribed medicines for their ills, if the connection even occurs to them. The impotence of an inactive vaccine, for instance, may not reveal itself until well after a patient has been inoculated” (Hajari 1998, p.265). This is strikingly evident in the 1990 Nigerian paracetamol poisoning in which 109 children died. “For over five months the paracetamol deaths were regarded as resulting from an ‘outbreak of disease of unknown etiology’ with little mention of the possibility of contamination of drugs administered in the hospitals” (Alubo 1994, pp.99-100). In addition to the difficulty of detection, consumers in developing countries may not connect their lack of recovery to counterfeit pharmaceuticals. They may credit their continued medical problems to: a contaminated water supply, complications of other diseases or illnesses, malnutrition, a belief in curses and the supernatural, or a failure to take the indicated medication for the prescribed period of time. “The reality in the rural areas where there are strong beliefs in supernatural causes of death, in addition to the absence of hospitals, therefore, render the sale, usage and effects of poisonous (and other) drugs near impossible to detect” (Alubo 1994, p.102).
In addition, organized crime has established a visible presence in the counterfeit pharmaceuticals trade. There is a clear trend that indicates the increasing involvement of criminal syndicates in counterfeiting in all regions of the world. As described by Dr. John D. Glover, Vice President of Corporate Security for Bristol-Myers Squibb Company, “increasingly, the illicit pharmaceutical trade resembles the worldwide narcotics trade, where product is sourced in one country, formulated into tablets or capsules in another country, packaged in yet another country, and then transshipped through other countries to its final destination” (Glover 2001, p.2). In India, according to Ranjit Roy Chaudhury, president of the Delhi Society for the Promotion of the Use of Rational Drugs, it “started as a cottage industry, but others found it to be easy money and now there are highly organized cartels involved” (Saywell & McManus 2002, p.36). Moreover, Dilip Shah, secretary general of the Indian Pharmaceutical Alliance notes that “some local drug manufactures make legitimate products during the day and run a night shift to make counterfeits” (Saywell & McManus 2002, p.36). In Mexico, some of the pharmaceutical counterfeiters are large, highly sophisticated, well-financed operations. Law enforcement officials believe that “most, if not all, of the pharmacies located along the [US-Mexican] border, are owned and operated by Mexican organized crime groups. In Latin America, crime syndicates bring together manufacturing and printing skills and often link them with existing pharmaceutical distributors” (Christian 2001, p.3). In China, pharmaceutical counterfeiting is well structured by organized crime. Law enforcement officials claim that “production is typically split among small household operations to keep quantities in any one place below the threshold for criminal prosecution” (Goodman 2002, p.A1).

Changing market conditions and changing technology have also facilitated an increase in counterfeit pharmaceuticals. Patent protection and increased IP rights in developing countries, especially nations without the resources for enforcing such rights, may have exacerbated the problem. The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) entered into force with the formation of the World Trade Organization (WTO) in January 1995, establishing minimum standards for
the protection of intellectual property rights for all signatories. The TRIPs Agreement specifies the terms of protection for copyrights, trademarks, geographic indications, industrial designs, patents, trade secrets, and integrated circuits. The controversy leading up to the TRIPs Agreement focused on two elements: the impact of pharmaceutical patents in developing nations on access to affordable medicine and research on neglected diseases. Upon closer examination, it becomes clear that the challenge for public health in developing nations is comprised of three intertwined issues: access to affordable medicine, treatment for (and research on) neglected diseases, and counterfeit pharmaceuticals. While the relationship between higher drug prices and the TRIPs Agreement is an intuitive one, it is somewhat less clear where counterfeit pharmaceuticals fit into the picture.

Until very recently, the focus of developing country health advocates has been getting drugs into the supply chain at affordable prices. The quality of these drugs and the threat of counterfeit pharmaceuticals have been largely ignored. However, the IP protection afforded by TRIPS may have not only increased the prices of innovative medicines to poor consumers, but also exacerbated the problems of counterfeiting. The link between enhanced patent protection and pharmaceutical counterfeiting can be described as follows: Consider a representative developing nation. With the passage of intellectual

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19 The TRIPs Agreement and the protection provided for pharmaceutical patents, as well as the role of the pharmaceutical industry in the debate, are described in more depth in the Appendix. The text of the TRIPs Agreement may be found at www.wto.org.

20 The incentive provided by patent protection for research on neglected diseases has been touted as a “selling point” for enhancing such protection in developing nations. In reality, the evidence that patents have enhanced the research on neglected diseases is weak and slow to appear. For a glimpse of the problem, consider the following numbers. “An analysis of drug development outcomes over the past 25 years shows that only 15 new drugs were indicated for tropical diseases (11+2) and tuberculosis (2). These diseases primarily affect poor populations and account for 12% of the global disease burden. In comparison, 179 new drugs were developed for cardiovascular diseases, which represent 11% of the global disease burden . . . Only 10% of global health research is devoted to conditions that account for 90% of the global disease burden” (Medecins Sans Frontieres 2001, p.10). According to a 2001 survey of the world’s top 20 pharmaceutical companies, conducted by the Drugs for Neglected Diseases Working Group and the Harvard School of Public Health, these trends do not appear to be changing. “Overall R&D budgets for the responding companies ranged from $500 million to greater than $1 billion per year . . . Eight of the eleven companies spent nothing at all over the last fiscal year on R&D for the most neglected diseases included in the survey” (Medecins Sans Frontieres 2001, p.12). Despite this, it is worth mentioning that six of the eleven firms are participating in public-private partnerships working on neglected diseases.

21 The sequence of events described here paints a plausible picture of the impact of pharmaceutical patents on the market for counterfeit drugs, one supported by anecdotal evidence from developing countries. The set of events portrayed here is theoretically modeled in earlier work (Lybecker 2000) where asymmetric information is incorporated into a model of vertical differentiation. The model elaborates on the underlying real-world factors in developing nations that facilitate the potential increase in counterfeiting briefly described here.
property rights (IPR) legislation, enforcement becomes critical and different steps toward enforcement
generate distinct results. Through increased national legislation, the regime changes from one
characterized by a complete absence of intellectual property rights protection to one of strong IPR laws.22
With strengthened IP legislation in place, as a “first pass” at enforcement, the government targets the
(now) infringing generic drugs produced by local firms and drives the generic copies from the market.23
The elimination of the generic increases the demand for on-patent, brand-name drugs.24 Consumers who
previously purchased generic pharmaceuticals are then diverted to purchasing branded drugs or foregoing
treatment. The elimination of the substitute good increases the demand for on-patent drugs and the price
of these drugs rises. As demand and price rise, counterfeiting becomes increasingly tempting. Without
the resources and political will to enforce the newly-enacted IP legislation, pharmaceutical counterfeiting
worsens.

22 Intellectual property rights are determined not only by IP laws but by a host of other laws and policies as well. These include
contract law, commercial law, and public law, as well as trade policy and industrial policy (Park 1997, p.1).

23 Note that while these firms might not exit the industry, it is a likely outcome. “On the supply side, one of the impacts that
developing countries are likely to experience from implementing and enforcing the TRIPs Agreement is a reduction in the
domestic output and employment of firms which had been producing counterfeit copyrighted and trademarked goods” (United
Nations Conference on Trade and Development 1996, p.2). Specifically, a 1994 article from The Economist noted that an Indian
committee, “working on patent law estimates that most of the 10,000 local manufacturers, which now produce 70% of the
country's drugs, would eventually go out of business if the new TRIPs rules came into force” (The Economist 1994, p.73). If the
firms do not exit the industry, the imposition of IP legislation may lead them to adapt their facilities to the production of other
goods. In a recent study of the Indian pharmaceutical industry, Ghayur Alam, of the Centre for Technology studies, notes that the
“production of off-patent drugs will emerge as the most important activity of the Indian firms in the post-Dunkel period”
(Alam 1996, p.23). The elimination of generic pharmaceuticals happens for several reasons: (i) Costs will rise with the necessity
of licensing newly-protected intellectual property. “The introduction and enforcement of tougher intellectual property laws
would increase production costs for domestic producers who had not been paying for the intellectual property that they were
using. These domestic producers might be supplanted by the foreign firms that had originally produced the intellectual property
on which the domestic firms' production process were based . . . [The local firms] who continued to sell products of the intellect,
or used them in production processes, without paying the producers would in any case be run out of business” (Gruben 1992,
p.21). (ii) Local firms may be unable to get licenses to the newly protected intellectual property. Santoro (1995) notes that a
developing country official “…doubted that intellectual property protection would help the local pharmaceutical industry. ‘With
protection, it will be very difficult for Latin American producers to compete because they will be unable to get licenses. It is not
in the interests of foreign companies to give licenses’” (Santoro 1995, p.19). (iii) In addition, the changes in IP legislation will
make it very difficult for government authorities to ignore established local firms that now infringe upon foreign patents. While
counterfeiters are difficult to find and may therefore continue to produce, established local firms will be forced to close in order
to maintain an appearance of compliance. Pressure will be applied and these firms will exit the market if they are unable or
unwilling to license the technology that they previously utilized.

24 While the majority of counterfeit drugs are brand-name drugs, counterfeit generics may also appear in the market.
“Counterfeiting mostly concerns expensive branded drugs” (Ford and ‘t Hoen 2002, p.1351). Counterfeit generics are not
incorporated in this discussion for two reasons (1) the limited evidence available indicates most counterfeit are of brand-name
products, not surprising since these drugs are usually the most expensive and the most profitable, and (2) the arguments in this
discussion surrounding newly-enacted IP protection do not apply to the generic drugs. Empirical evidence provides few
examples of counterfeit generics. Intuitively, if one is producing fakes, they may as well be those that command the highest
price.
Alternatively, a subsequent, more “wholehearted approach” to enforcement is one in which there are sufficient resources to eradicate the counterfeitors. The “wholehearted approach” is what is traditionally considered in standard IP analysis, but may not describe what happens in developing countries due to the lack of resources and political will. As such, under some patterns of enforcement counterfeiting actually worsens following the passage of stronger intellectual property rights legislation. Without a concurrent financial and political commitment to enforcement, as opposed to mere political rhetoric, pharmaceutical counterfeiting will worsen. While the link between patent protection and counterfeiting is somewhat tenuous, the relationship is an important consideration for public health policymakers. Beyond the tie to TRIPs, counterfeit drugs present an additional challenge that must be addressed in engineering a comprehensive solution for developing nations.

Finally, changing technology has facilitated the increased production of counterfeit drugs. While the rapid advance of science has made possible many of the innovations responsible for new drugs, similar advances have also removed some of the obstacles for the counterfeiter. Illicit producers are undeniably more sophisticated “with respect to the counterfeiting of labeling, containers, seals, and documents” (Baker 2000, p.12). The advent of desk-top publishing and other technologies have enabled counterfeiters to reproduce the look of the original manufacturer in all aspects of packaging and production. Seals, blister packs, labels, tablets, capsules, and even holograms may be reproduced with varying degrees of accuracy and sophistication. The necessary technology is now widely available and many machines may be easily purchased on e-Bay. Moreover, the historically distinctive bottles that characterized specific brands and companies have been replaced by uniform vials and packaging, further paving the way for counterfeiters. Though anti-counterfeiting technology is rapidly advancing and increasingly intricate, counterfeiters are keeping up and adapting quickly. Lastly, though perhaps most importantly, internet sourcing allows counterfeiters to easily obtain materials (sometimes even genuine packaging materials) from all corners of the globe and quickly deliver their products to unsuspecting consumers.
5. Strategies for Combating Counterfeiting

While the factors that facilitate counterfeiting are, in some cases, the same ones that contribute to the high prices of drugs, the problems are distinct, and the remedies somewhat different. The potential for increased counterfeiting mandates a reevaluation of public policy priorities. In terms of access to safe and affordable medicine, the discussion presented here raises several issues.

Counterfeiting is always detrimental, which should mean that all (legitimate) actors would be willing to commit to combat counterfeiting. The challenge is finding remedies that are feasible and effective. The remedies discussed here provide a point of departure for thinking about strategies to pursue: parallel imports, local production, enforcement, and education. Access, safe access, is a function of affordability and a secure supply chain. In the interest of affordability, parallel imports from low-cost markets are frequently suggested by public health advocates. At first blush, this is an attractive solution, but it should be approached with caution. In several countries in which this has been pursued, the results have been disappointing. “Israel, the Philippines and Kenya have experimented with legitimizing ‘parallel imports’ to reduce drug prices, all with disastrous results. Counterfeits soon crowded out the ‘legitimate’ gray market products. Hundreds became ill. Dozens died. The drug regulatory schemes of those countries all but collapsed” (DeKieffer 2002, p.19). In addition, parallel imports work against the price discrimination that keeps prices low in the poorest countries. If the industry feels that parallel imports pose a significant threat to sales in more profitable markets, the lowest prices will be raised and the pricing differential will disappear.25 Finally, parallel imports pose a more subtle threat to drug safety. Drugs from different source-countries may vary in their appearance. Differences in product packaging

25 Evidence of this strategy is already visible in the single market of the European Union. Danzon (1998) notes that manufactures have delayed product launch dates and countered with a single, relatively high launch price for new products introduced in the EU. Danzon cites a number of examples, “Glaxo accepted a delay of several years for its antimigraine product sumatriptan (Imigran®) in France, rather than accept a low price that would have undercut its higher price elsewhere. In 1996, Merck launched its protease inhibitor indinavir (Crixivan®) at a common EU price, denominated in European Community Unites (ECUs). Other companies also report withholding or delaying launch of new products in traditional low-price countries of the EU, rather than accept prices that would invite parallel trade and hence erode the prices that they can earn in other larger markets” (Danzon 1998, p.300).
and drug appearances present an additional challenge since most counterfeits are discovered by consumers through visual detection. Without familiar packaging clues, interception of pharmaceutical counterfeits will be made that much more difficult.

Local production is another solution proposed in the face of high drug prices. Some have seen self sufficiency as a solution to ever-higher drug prices. However, the challenges of establishing a domestic industry capable of meeting a country’s need are considerable. It isn’t always a realistic remedy. In the words of the former director of WHO’s Action Programme on Essential Drugs (DAP), “DAP often did not advocate local production, particularly in countries with populations of less than 25 million . . . the value component in local-drug production was small and that quality and reliability of supplies were frequently questionable . . . DAP recommended that they start with packaging from bulk and only gradually move towards simple formulation of drugs” (Lauridsen 1997, p.1106). For small markets, domestic production is likely too costly, in terms of fixed costs, to be feasible. These nations are better off considering the multi-nation, bulk-purchase programs utilized by developing countries seeking lower prices. This is particularly true for the many nations without well-developed national drug regulatory authorities. “At present, out of the 191 WHO member states about 20 per cent are known to have well developed drug regulation. Of the remaining member states, about 50 per cent implement drug regulation at varying levels of development and operational capacity. The remaining 30 per cent either have no drug regulation in place or a very limited capacity that hardly functions” (WHO 2002, p.11).

For the pharmaceutical industry, the first step against counterfeiters is technology. The security industry has developed a vast array of technologies to both deter counterfeiters and facilitate authentication. Many technologies will do both. It is important to point out that there is no “silver bullet”, no single solution that can eradicate counterfeit drugs. Many of the available technologies, however, will make counterfeiting more difficult and more costly. Security features can be categorized as overt, covert and forensic. Overt features are applied to the external packaging, easily verified by sight or touch. Covert features, the next level of security solutions, may involve chemical taggants or machine-readable inks. Finally, the last layer of defense is the forensic level feature. For example, isotopic tags or
molecular markers which may be directly incorporated into the product. These solutions may be applied to any part of the product or packaging and are usually kept quite confidential. Verification though forensic means usually requires significant laboratory testing or expertise.

The most important strategy for defeating counterfeiting is perhaps effective enforcement. While difficult and costly, enforcement can payoff and reduce the share of counterfeits that reach the market. Consider a recent case from China, “a flood of unauthorized copies of a drug produced by an international pharmaceutical company caused a drop in annual sales in China to about $242,000. After counterfeiting was halted, sales reportedly climbed to $1.2 million” (Beach 2001, p.942). Effective enforcement must incorporate both detection as well as genuine punishment. As described above, negligible punishment is all too common. However, this too is changing. Recently, a government committee in India put forward a report, the Mashelkar Committee’s report, recommending instituting the death penalty for people who manufacture and sell counterfeit pharmaceuticals.

6. Conclusions

This examination comes at a critical time due to the serious threat posed by counterfeit pharmaceuticals, the increased attention given to infringement in the context of international trade, as well as the current efforts underway in many countries to bring existing legislation into compliance with the WTO’s TRIPS Agreement. With the signing of the TRIPS Agreement, the developing country signatories are moving toward comprehensive patent protection for pharmaceutical products and processes. These changes are happening simultaneously and happening now. As these changes takes place, a challenge is presented to each developing country – how to protect innovation while providing adequate access to safe and affordable medicines. The challenge is further complicated by the threat of counterfeit medicines.
The need for affordable pharmaceuticals for the world’s poorest citizens is pressing. The AIDS pandemic has created a demand for the most innovative drugs in the poorest regions of the globe. This demand combined with the rising costs of production make the market for counterfeit pharmaceuticals increasingly profitable. Taken into account with advancing desk-top publishing technology which facilitates near-flawless reproductions of original packaging, pharmaceutical counterfeiting has become an almost irresistible temptation. These facts have not escaped the notice of organized criminal entities and the trade in counterfeit drugs is increasingly dominated by sophisticated criminal operations.

All of this points to the need for change with safeguards. Counterfeiting endangers existing drug supplies, and reduces the incentives for R&D, especially in developing countries. As two of the most important public health priorities for developing countries, it is important to reevaluate them in the context of the counterfeiting threat. Obviously there is scope for benefiting both the consumers in developing countries, as well as international pharmaceutical firms. Effective enforcement improves the quality mix of the drugs available and eliminates the harmful reputational effects suffered by international pharmaceutical firms. Clear incentives exist for governments and pharmaceutical firms to cooperate in enforcement efforts and in securing safe and affordable drugs for consumers in developing nations. Masquerading as curative medicines, counterfeit pharmaceuticals are increasingly prevalent and at a time of unprecedented global IP protection. This paper takes an initial step toward examining the most pressing public health challenges for developing countries in light of the threat of counterfeit drugs.
References:


Baker, Dennis E. “Testimony on Counterfeit Bulk Drugs,” Testimony by Dennis Baker, Associate Commissioner for Regulatory Affairs Food and Drug Administration, before the House Subcommittee on Oversight and Investigations, Committee on Commerce, 8 June 2000.


“Indian Drug Firms Racing to Make Their Own Viagra,” Business Times (Singapore), 29 September 1998, p.16.


Appendix: The TRIPs Agreement and Pharmaceutical Patents

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) entered into force with the formation of the World Trade Organization (WTO) in January 1995, establishing minimum standards for the protection of intellectual property rights for all signatories. The TRIPs Agreement is the component of the GATT’s Uruguay Round (1986-1994) devoted to intellectual property rights protection. As one of the foundations of the multilateral negotiations of the World Trade Organization (WTO), the TRIPs Agreement is the first foray of the GATT into the field of intellectual property rights.

The provisions of the TRIPs Agreement cover a variety of elements: copyrights, trademarks, geographical indications, industrial designs, patents, trade secrets and integrated circuits. While the Agreement specifies the minimum level of protection, as well as the subject matter and main fields covered by each of the elements, it leaves the member countries with some flexibility in determining national IPR regimes. Signatories are required to apply the principles of most favored nation and national treatment to intellectual property protection.

Unlike previous international IPR agreements, the TRIPs Agreement explicitly addresses both enforcement and the settlement of disputes. Enforcement mechanisms are enumerated and cover all of the following: administrative and judicial procedures, civil and criminal penalties and procedures, and customs regulations. Specifically, the Agreement states that signatories must have enforcement procedures that allow for “...effective action against any act of infringement of IPR covered by this agreement, including expeditious remedies to prevent infringements and remedies which constitute a deterrent to further infringement. These procedures should be applied in such a manner as to avoid the creation of barriers to legitimate trade and to provide for safeguards against their abuse.” (General Accounting Office 1994, p.96)

The text of the TRIPS Agreement may be found at www.wto.org. The Agreement covers a range of intellectual property issues beyond patents, such as trademarks, industrial designs, and copyright applicable to any sector. Patent protection for pharmaceuticals is the focus of this examination.
If a member country finds that another member country is not abiding by the Agreement, it may initiate the settlement mechanism spelled out in the “Understanding on Rules and Procedures Governing the Settlement of Disputes”. Failing these procedures, the country concerned may apply trade sanctions against the country deemed to be infringing. These sanctions may extend beyond the industry in question, to other sectors.

The terms of the TRIPs Agreement became binding for all WTO members by the beginning of 1996. However, the TRIPs Agreement permits developing countries to bring their intellectual property systems into compliance with the new standards as late as January 1, 2000, with added provisions for an additional five-year transition period in the areas of chemicals and pharmaceutical products. In addition, least-developed countries have until 2006, 11 years from the entry into force of the Agreement, to reach compliance.

While the TRIPs Agreement specifies the terms of protection for copyrights, trademarks, geographic indications, industrial designs, patents, trade secrets, and integrated circuits, the focus of this paper is patent protection. The provisions in this area are spelled out as follows: The protection of patents will be greatly strengthened and extensively harmonized under the TRIPs Agreement, building upon the protection set forth in the Paris Convention. The Agreement stipulates that virtually all types of inventions are patentable, resolving the long-standing controversy surrounding the lack of protection for pharmaceuticals and agrochemicals. Inventions covered under the patent law have to meet the criteria of novelty, inventive step and industrial applicability. In addition, patent protection is available for both product and process patents for a period of 20 years. The Agreement also provides that importation satisfy local ‘working’ requirements (the necessity of local manufacture). While this eliminates the ability of developing countries to require compulsory licensing for patents not ‘worked’ in the country, compulsory licensing is not precluded under the TRIPs Agreement though it is subject to numerous restrictions.

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27 All countries had 1 year from the entry into force of the World Trade Organization (January 1, 1995) to apply the TRIPs provisions.
Leading up to the TRIPS Agreement, the debate over increased protection for intellectual property largely centered on the pharmaceutical industry. This can be traced to the following factors (Subramanian 1995, p.253; Weisburst & Scherer 1995, pp.3-4).

- The pharmaceutical industry is closely tied to the emotionally charged issues of public health and survival in developing countries.28

- The demand for pharmaceuticals is price-inelastic over a wide price range.

- Patent regimes differ most starkly across countries in the pharmaceutical sector, and pharmaceuticals are frequently targeted for explicit exclusion from patent and trade secret protection in developing countries. During the Uruguay Round of the GATT, close to fifty developing countries were not granting patent protection to pharmaceuticals (Lanjouw 1998, p.1). Many developing countries are moving from no protection for pharmaceuticals to twenty years of protection.

- Patent protection is disproportionally more important in the pharmaceutical and chemical industries than in many other sectors to ensure that the researcher appropriates the returns to R&D.29 Protection is essential in these industries due to the extremely high costs of R&D30 that accompany many new

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28 Consumers in developing countries spend a tremendous percentage of their health care budget on drugs. “The proportion of health spending for drugs can be much higher in developing countries. In the Cote d'Ivoire and Pakistan, up to 90 percent of household health expenditures are for pharmaceuticals” (Broun 1994, p.3). Moreover, this cost is primarily borne by the consumer. Compared to industrialized nations, in most developing countries “…less than 10% of the population has health insurance and 60% to 90% of drug costs are paid for directly by patients and their families” (World Health Organization Action Programme on Essential Drugs 1997, p.1).

29 Building on the 1987 “Yale Survey” (Levin, Klevorick, Nelson and Winter 1987), Cohen et al. reexamine the effectiveness of various means of appropriating intellectual property. Echoing the earlier findings, the 1994 “Carnegie-Mellon” survey finds that there are tremendous differences in the effectiveness of various appropriability mechanisms, both among industries as well as within them. Overall, while patents are again seen as “unambiguously the least effective of the appropriability mechanisms,” the drug industry regards them as strictly more effective than alternative mechanisms (Cohen, Nelson and Walsh 1996, p.14). This is confirmed by the industry’s high propensity to patent both product innovations (overall highest propensity at 99%) and process innovations (fourth highest propensity at 43%) (Cohen, Nelson, and Walsh 1996, pp.21-22). Several other studies report that the protection of intellectual property is disproportionally more important to the chemical and pharmaceutical industries. These include: Levin, Klevorick, Nelson and Winter (1987), Taylor and Silberston (1973), Scherer (1997), Mansfield (1986), Mansfield, Schwartz and Wagner (1981), and Tocker (1988). These studies are echoed by arguments from within the pharmaceutical industry: Mosshinghoff (1998), Peretz (1983), Mossinghoff (1987), Santoro (1995), Smith (1990a, 1990b), Mossinghoff and Bombelles (1996), PhRMA (1997), and Bombelles (1999).

30 While estimates of R&D costs are controversial, the following figures provide estimates from the pharmaceutical industry. The costs of innovation in the pharmaceutical industry were estimated in an article in the Journal of Health Economics. Joseph A. DiMasi et al. find “…an average cost estimate of $231 million (1987 dollars)” (DiMasi, Hansen, Grabowski and Lasagna 1991, p.3). Translating this into a more current estimate, DiMasi’s estimate comes to $312 million (1997 dollars). (DiMasi 1998) Granting the biased nature of the source, PhRMA, the Pharmaceutical Manufactures Association, estimates that it now takes 10-15 years and an average of $800 million to bring a new medicine to market (PhRMA 2002). More specifically, Smith (1990a) notes the increasing R&D expenditures of Ciba-Geigy. “R&D costs had been doubling every five years since 1970, due in part to rising registration costs, with regulators demanding greater evidence of economic as well as therapeutic benefits” (Smith 1990a, p.3). In contrast to the industry estimate, an examination of 58 NIH funded clinical trials placed the expected cost at “...less than 30 percent of the DiMasi et al. numbers” (Love 1997, p.24).
drugs, as well as the competitive nature of the industry.\textsuperscript{31} Given the ease of replicating chemical and pharmaceutical innovations, protection is vital for the economic profitability of these firms.

Many critics of the TRIPS Agreement argue that its implementation will lead to higher prices and further the already dire situation of limited drug access of the poor to medicines.\textsuperscript{32} The challenge for member countries of the WTO, particularly developing countries, is to find a balance between complying with WTO obligations and providing affordable, accessible patented medicines. The impact of the TRIPS Agreement largely depends on the pre-TRIPS patent regime (Maskus 2000). The effects will be most strongly felt by countries that have historically relied on a domestic generic industry or actively pursued generic substitution and imports.

\textsuperscript{31} The competitive nature of the industry has increased with the aggressive introduction of generics upon patent expiry. In a study of 18 patented brand-name drugs, Grabowski and Vernon found that generics gained close to half of the market share within two years of entry (Grabowski & Vernon 1990, p.805).

\textsuperscript{32} Scherer and Watal (2001) and Maskus (2000) both survey the existing literature and note that the majority of the studies point to higher prices. The notable exception is Rozek and Berkowitz (1998). More recently, Attaran and Gillespie-White (2001) concluded that ARV (antiretroviral) drug patents are not to blame for the lack of access to such drugs in Africa. That is, without explicitly stating it, their claim is that patents do not raise prices to the level where drugs are out of reach for consumers. However, the methodology utilized in the paper casts doubt on the reliability of the results. See Lybecker (2002) for a critical analysis of the Attaran/Gillespie-White results.