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HEALTHCARE COMMUNICATION REVIEW

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UNDERSTANDING & MANAGING INFECTIOUS DISEASES

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Germs and Infectious Diseases

Germs. They're here, there and everywhere. And they are the culprits when it comes to infectious diseases. Not all germs are harmful. Harmful germs are called *pathogens*. When pathogens invade our bodies, they can cause diseases. Some of the many ways germs can enter our bodies include direct contact, such as touching the hand of someone who just sneezed; eating, drinking and breathing contaminated food, fluid and air; and sexual contact.

More About Germs

There are four main types of germs: **bacteria, viruses, fungi** and **protozoa**. Both bacteria and viruses are invisible to the naked eye. 1000 lined-up bacteria can fit across an eraser on a pencil and viruses are even smaller. Only a very small percentage of bacteria – less than 1 percent – cause harmful bacterial infections. Many others are not only helpful, but are also necessary for healthy living. Types of bacterial infections include Strep throat and E-coli.

Antibiotics are used to treat bacterial infections. *They are of no help in treating viral infections*, which include the common cold, the flu, HIV/AIDS, and a whole host of other diseases. Viruses are hard to treat, though a few antiviral medicines are available. The best approach to dealing with viral infections is to prevent them. Vaccines have not only been very helpful with this, but have virtually eliminated some – smallpox and polio, for example.

Fungi (plural for fungus) are very primitive plants that include mold, mildew and mushrooms. Not all fungi cause diseases, as evidenced by the fact that many mushrooms end up on our dinner plates. Fungi can be found almost anywhere. Some of them reproduce through tiny spores in the air, which can be breathed in or land on us. For this reason, fungal infections often begin in our lungs or on our skin. If we are taking antibiotics or have a weakened immune system, we are more susceptible to fungal infections – for example, some women taking antibiotics develop vaginal yeast infections. While some fungi are hard to kill, medications are available to combat them.

Protozoa are one-celled living things that act like animals. Because they use other living things for food and a place to live without giving anything in return, they are called parasites. Like bacteria, they can live almost anywhere – including in our intestinal tracts. Also like bacteria, many are harmless. Diseases caused by protozoa include malaria, giardia and toxoplasmosis.

More About Infectious Diseases

Infectious diseases, also known as communicable diseases, are responsible for more deaths, worldwide, than any other cause of death. And while great advances have been made in preventing and treating these diseases, harmful germs, like cockroaches, not only persist, but may well prevail. The following pages detail why they persist as well as what can be done about it.

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But first…
If a link that extends beyond one line doesn't work, copy and paste that link in your browser.

From the Editor

Hand sanitizers in supermarkets. Flesh-eating bugs. Superbugs. SARS and Swine flu – infections transmitted from animals to humans. What's it all about? Do we need to worry or don't we? In 1967, William Stewart, then U.S. Surgeon General declared that we "…have basically wiped out infection in the United States." Sadly, that has not been the case as several hundred new infections have surfaced between the 1940s and 2004 – more than half of them appearing from the 1970s and on.

As a country with pretty savvy people, you might expect that we would be well versed on what we need to do to manage infectious diseases. And yet, studies have shown that many of us are not. Take antibiotics, for instance. Some take them when they shouldn't. Some don't take them as directed. In general, our misperceptions contribute to the re-emergence of diseases that were once thought conquered and to the hastening of antibiotic resistance, among other things.

This issue, therefore, goes back to the basics in the hope of building understandings that will help individuals better prevent and manage infectious diseases. To that end, we begin with explanations of germs – the cause of infectious diseases – then move on to the challenges they present; to what is being done to meet those challenges; and to what still needs to be done. Links to more detailed information are provided on page 8. As usual, we hope readers find this issue of value.
Be well. *Judith Greenfield*

Infectious Diseases in a Global Village

"The world really is just one village. And our tolerance of disease in any place in the world is at our own peril."
Dr. Joshua Lederberg, Nobel Laureate. cited in
Betrayal of Trust: The Collapse of Global Public Health, pg. 281

If every cloud has a silver lining, then it's fair to say that every silver lining has a cloud. If globalization is a silver lining, easing our abilities to travel and introducing us to interesting, new people, animals and foods, then one of its clouds is that it also introduces us to new pathogens. Whether we go to them, or they come to us, we can no longer assume that diseases occurring in other parts of the world will not reach us.

For this reason, we cannot ignore the health concerns that arise elsewhere. Detecting and responding to them is our best hope of protecting ourselves. To this end, the European Union has created the European Centre for Disease Control and Prevention (ECDC). This is a very positive move. Yet it is not enough for American, European and other fairly developed and wealthy nations to take such steps. While undeveloped and poorer nations do not have the resources to establish similar programs, the health of the world depends on them doing so. We are, after all, only as strong as our weakest link.

With this in mind, the World Health Organization (WHO) and others have called for developed nations to assist less developed and poorer nations in establishing public health systems for detecting and responding to outbreaks of diseases – a move that will not only help the assisted nation, but all nations.□

Infectious Disease Challenges

Humans have suffered from infectious diseases for thousands of years. Evidence of smallpox, for instance, has been found in mummies dating back to 1570 BCE. Malaria was also noted in the BCE-era and Diphtheria was noted in the first century. The list goes on. Over the centuries, as travel within and between countries increased, some of those diseases have resulted in **epidemics** (when more than the expected cases of disease occur in any given community or region within a limited period of time) and **pandemics** (when epidemics go global and affect communities around the world).

Epidemics occur all over the world. In the United States, we've had epidemics that have included smallpox in the late 1600s and yellow fever in 1743. In 1918, the influenza pandemic led to a global death toll that exceeded the 16 million killed in World War I. Here, in America, one quarter of the population suffered from that epidemic – and in one year, our average life expectancy dropped by 12 years. More recently, we have experienced the HIV/AIDS epidemic – a new virus surfacing in the 1980s. Despite both this and the warnings that other epidemics and pandemics are almost certain to come, many of us give little thought to these threats. Why? Perhaps because of the many medical advances such as antibiotics and vaccines along with improvements in sanitation and public health efforts that have helped us avoid the frequency of past epidemics. But we should give it more thought because much is changing and the challenges in preventing and treating infectious diseases are still many. In some cases, they are huge.

Challenges in preventing and treating infectious diseases are still many and, in some cases, they are huge.

Challenge: Old and New Pathogens & Diseases

Preventing and treating infectious diseases in individuals and subsequent epidemics has always been hard to do. The difficulties are many, beginning with those posed by each of the many different diseases, some of which can be caused by a variety of harmful germs (pathogens). The flu, for instance, can be caused by different variations of the flu virus and developing the right vaccine to prevent and contain the coming year's outbreak depends upon correctly predicting which variation will be responsible for that next outbreak. We are also seeing an unprecedented increase in new diseases which often finds us, at least at first, without effective treatments – think HIV/AIDS and West Nile. And diseases thought to be eliminated, or close to it, are reappearing – think TB, whooping cough and measles.

Challenge: Food-Borne Illnesses

Globalization and the ease of travel compound it all. Not only are old and new diseases brought to different world communities by travelers, but food-borne diseases are also on the rise as a result of global trade in food. Today, large amounts of our foods are imported and much of what we eat comes from abroad – about 80% fish and shellfish, 45% fruits, 15-20% vegetables, and almost 50% nuts. Much as we might enjoy the 'fruits' of other countries, however, these offerings are not without their risks as they sometimes bring harmful pathogens to our shores. According to the American Academy for Microbiology, however, less than 1% of imported foods are inspected as they cross the U.S. border and less than 0.5% of those that are inspected are sampled as follow-ups to those inspections.

Domestically grown foods also present food safety problems, much of which go undetected until an outbreak occurs. In large part this is due to an inadequate food inspection system. Since its creation in 1981, the Food Safety Inspection Service (FSIS), a public health division of the U.S. Department of Agriculture (USDA), has reportedly seen its staff levels drop – from 190 inspectors per billion pounds of meat and poultry in 1981 to 88 inspectors in 2007. Yet during this same period, the pounds of slaughtered meat and poultry that are inspected and approved have doubled. And now, the USDA has proposed eliminating up to 800 inspector positions and letting companies inspect themselves.

Challenge: Antibiotic Resistance

The discovery of penicillin in 1929 led to its eventual use in the mid-1940s as a means of fighting bacteria. With the subsequent discoveries of other antibiotics, lives were saved and our average life expectancy grew. This was a medical game changer, one that was all for the better. Bacteria, however, are nothing if not resilient and the introduction of each new antibiotic is *always* shortly followed by bacterial adaptations that eventually lead to their full-blown resistance to these bactericides. Today, this natural process has been, for the most part, aided and abetted by the overuse and misuse of antibiotics and by hospital acquired infections – both of which have greatly contributed to the ability of bacteria to resist, in many cases, not just one but multiple antibiotics. What we need now, *and continually need*, are new classes of antibiotics, but the development of these new drugs has slowed down to a crawl. As such, we are now on the brink of another medical game changer – this time, all for the worse.

See **Challenges** *on page 4*

Challenges *continued from page 3*

As much as 50% of the antibiotics given in hospitals are reported to be inappropriately or unnecessarily prescribed. Patients and doctors outside of the hospital also play a role in the overuse of antibiotics when, for example, patients ask for, sometimes insist on, starting antibiotics even though it is not yet clear that their sniffles, or aches and pains are due to bacterial infections and not viruses. And though clinicians well know that antibiotics will be of no help with viral illnesses, they often honor their patients' requests – in large part because of the relatively new emphasis placed on patient satisfaction. This overuse of antibiotics is further compounded when patients do not take their medication as prescribed, for example, by stopping early and not taking them all. But stopping early often leaves untouched the bacteria that, having survived thus far, are stronger, more resistant and ready to be shared with (spread to) other hosts – family, friends, even strangers.

More antibiotics are given to healthy animals than are given to unhealthy humans…as much as 80% of the antibiotics sold in the U.S. are given to livestock to promote growth and prevent infections… due to unsanitary, overcrowded growing conditions.

The non-therapeutic agricultural use of antibiotics is also of great concern. As noted in a keynote address given by Dr. Margaret Chan, General Director of the World Health Organization (WHO), more antibiotics are given to healthy animals than are given to unhealthy humans. Indeed, we are told by Moms for Antibiotic Awareness, that as much as 80% of the antibiotics sold in the U.S. are given to livestock to promote growth and prevent infections that might arise due to unsanitary, overcrowded growing conditions. (See **www.saveantibiotics.org/moms.**)

Not only is such non-therapeutic agricultural usage problematic because the more antibiotics are used, the more quickly resistance is developed, but it is also problematic because we ingest these same antibiotics when we eat the flesh of these animals and drink from the ground water and streams that have been contaminated by runoff from housing facilities and feedlots. Additionally, the subsequent resistance to antibiotics used in animal husbandry often translates to resistance to antibiotics used in humans. Why? Because, experts say, bacteria can pass along their drug-resistant genes to other bacteria – not only to the same strains of bacteria, but to different species of bacteria.

This is especially problematic when some of those passed-along genes are resistant to multiple drugs, as in the case of Methicillin Resistant Staphylococcus Aureus – MRSA (pronounced Mer-sah). What, then, will happen when the few antibiotics that remain effective against some bacteria are no longer so because of this ability to transfer drug resistance genes? That day, it seems, is not so far away. For this reason antimicrobial resistance is considered by experts to be the greatest threat to public health.

Challenge: Hospital (or Healthcare) Acquired Infections (HAI)

Hospital patients have long been susceptible to nosocomial infections – that is, infections that originate, or are acquired, in hospitals. High rates of such infections were first reduced in the mid 1800s, after the separate efforts of Joseph Lister and Florence Nightingale finally convinced the medical establishment that hygiene – hand washing along with the cleaning of surfaces and equipment using antiseptic solutions – would make a difference. A second reduction in hospital acquired infection (HAI) rates occurred in the mid-1900s with the gradual introduction of antibiotics.

And there's the rub. Introducing antibiotics helped cut hospital infection rates but the use (and overuse) of antibiotics in hospitals, hastened the build-up of resistance and the emergence of 'superbugs' (bacteria that are resistant to multiple antibiotics). For this reason, in her keynote address, Dr. Chan also stated that hospitals have become "*hotbeds of highly resistant pathogens…that are resistant to last-of-the-line-antimicrobials."*

Other contributing factors include poor infection control practices (hand washing, for instance) and more patients with weakened immune systems, especially in the ICU. Common nosocomial infections are pneumonia, surgical site infections (SSI), urinary tract infections (UTI), respiratory infections, vascular catheter infections and septicemia (blood poisoning).

All of these challenges are huge – especially those posed by antibiotic resistance, which threatens to bring us back to the pre-antibiotic era and undermine advances in clinical medicine and public health. Thankfully, they are not insurmountable. Read on to see how they are currently being met and what more can be done – by the healthcare community, by the public and private sectors, by us.□

Meeting the Challenges of Infectious Diseases

"Do we have the knowledge? Yes. Do we have the means? Yes. Do we have the will?"
Michael Marmot, World Health Organization Chair, Commission on the Social Determinants of Health

Many of the challenges associated with infectious diseases can be met. In broad terms, it boils down to the prevention, early detection and containment of infectious diseases. Some of the steps to be taken are relatively easy to do – like washing our hands. Others are not. In part, the problem is mustering the public and political will to make necessary changes. Few people, for instance, want to see their taxes increased. As such, government spending on necessary public health initiatives is not what it should be.

Economics also play a role in the private sector – when an interest in increasing agricultural production leads to the non-therapeutic use of antibiotics; or expected profits from the development of new classes of antibiotics pale in comparison to those expected from the development of drugs for chronic diseases. Nevertheless, experts do know what needs to be done. Steps for meeting these challenges are recommended by our own Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO) and other experts in the field. Many are already being taken. More are needed. We all have a role to play.

Vaccines are a simple and effective way of limiting, sometimes eliminating, outbreaks of infectious diseases.

Disease Prevention

Vaccines play a powerful role here. Where available, they are a simple and effective way of limiting, sometimes eliminating, outbreaks of infectious diseases. Smallpox is a case in point, having been declared eradicated around the world in the late 1970s. Vaccines also helped banish diseases like measles and whooping cough in America – for a while. Now, however, they are reappearing. Why? Because measles and whooping cough still exist in other countries and are being brought back to the U.S. by world travelers. And because a fear of side effects – both real and unproven – are keeping some parents from vaccinating their children, we now see many here coming down with these two, highly contagious diseases. Enough, in some cases, that some states are declaring epidemics. In May of 2012, for instance, the state of Washington declared a whooping cough epidemic.

This is worrisome, because the consequences of not vaccinating our children or ourselves can be far reaching – with the potential of infecting many inside and outside our circle of family and friends. As such, these consequences are an important consideration when deciding whether or not to vaccinate. For more information about vaccines, including how they work and possible side effects, visit **www.historyofvaccines.org/content/articles/vaccine-development-licensing-events**.

Early detection of diseases requires that we have a disease surveillance system (a.k.a. a public health surveillance system).

Early Detection

Early detection of diseases requires that we have disease surveillance systems (a.k.a. a public health surveillance systems) – not just in some towns, regions or states, but in all towns, regions and states. And we do. However, if early detection of an infectious disease is to be effective in preventing more widespread outbreaks, our surveillance systems need to do more than just detect the emergence of diseases. And they do. Data is collected, analyzed and shared with health officials and professionals so that they can quickly respond to, and contain, outbreaks.

Our surveillance works like this. Each of the 50 states and U.S. independent territories operates its own surveillance system, but the CDC serves as the national coordinating agency for these systems. State and territorial health departments collect data sent electronically by medical practices, hospitals, and medical laboratories as well as by sending workers into communities to investigate reports of diseases. They then notify the CDC of any health threats and respond to those threats with prevention and other control activities. The CDC, in the meantime, tracks diseases nationally, notifies all other health departments and, because we live in a global village, also notifies the WHO.

More details of how our system works can be found at **http://www.cphfoundation.org/diseasesurveillance.html**. Although our system has worked quite effectively at times, experts agree that improvements are needed. For the Institute of Medicine, those improvements should begin with the creation of a national surveillance system that would close gaps in monitoring and evaluating the health status of our nation.

See **Meeting** *on Pg. 6*

Meeting *Continued from Pg. 5*

Containment

Today, antibiotics are our primary means of containing bacterial diseases. But few remain effective in containing the alarming rise of superbugs. A two-pronged approach is needed to remedy this situation: reduce the rate in which bacteria develop resistance and develop new drugs. This is taking place on several levels. Hospitals here and abroad, for instance, have successfully reduced their infection rates by a combination of measures that include stepping up infection control practices (beginning with hand washing) and limiting their use of antibiotics.

As a result, the U.S. Department of Health and Human Services (HHS) reports decreased infection rates here include an 18% decrease in Methicillin Resistant Staphylococcus Aureus (MRSA) and a 33% decrease in catheter line associated bloodstream infections. They have also reduced surgical site infections and catheter associated urinary tract infections. Striking reductions have taken place in hospitals in other countries, as well. For instance, hospitals in Perth, Australia, have reduced MRSA to 0.4% – a vast improvement over MRSA rates in the rest of Australia, which are reported to range from 11 – 25%. More progress is needed, though, and more is expected – especially since the HHS now requires states to submit and then implement approved action plans for reducing infections acquired in all of their hospitals.

Another effective step, taken by some states, has been to require hospitals to publicly report their infection rates.

Another effective step, taken by some states, has been to require hospitals to publicly report their infection rates. Because publication of these rates has, in many instances, resulted in reduced infections, some are calling for a federal mandate requiring all hospitals to publish their rates. For now, however, hospitalized patients can take steps to protect themselves from infections. Before admission, they might look for published reports of hospital infection rates at **http://safepatientproject.org/tags/state-disclosure-reports.** And at **www.consumerreports.org,** click on 'Health', then on 'Doctors and Hospitals,' then on 'Hospital Survivors Guide.'

On a different front, organizations such as the Pew Campaign on Human Health and Industrial Farming raise awareness of the non-therapeutic agricultural use of antibiotics and encourage its banning. See **www.saveantibiotics.org/moms.** Banning this practice in other countries has been quite effective. Indeed, Dr. Chan, General Director of WHO, reports that its ban in Denmark resulted in an increase in livestock and poultry production as well as a decrease in antibiotic resistance and reduced health risk for humans – all without significantly affecting animal health or farmers' incomes. No such ban currently exists in the U.S.

Also not to be ignored is our pressing need for new classes of antibiotics to replace our existing, and increasingly ineffective, arsenal of drugs. But deterrents, both regulatory and financial, have severely limited research and development. For instance, getting FDA approval for new antibiotics is difficult and once approved, usage of these new drugs is limited to as a last resort (to delay the build-up of resistance). Add to that the drug's likely short-term effectiveness due to the ultimate development of resistance and the financial incentives for developing new antibiotics drop more.

Taking these deterrents into account, the Infectious Disease Society of America (IDSA), and the Food and Drug Administration have submitted proposals which, along with the Generating Antibiotics Incentives Now (GAIN) Act are being considered by Congress. Information about these proposals can be found at **http://specialty.pharmacytimes.com**. Once there, search for 'IDSA.'

Last but not least, we, the general public, also have a role to play in containing outbreaks. For starters, we can help stop the spread of germs by washing our hands often and properly and by properly handling and storing foods. Effective hand washing techniques and related information, can be found at, **www.chp.edu/CHP/P02516.** For a video on how to buy, store and wash fruits and vegetables as well as tips for preparing and storing meats, check out **www.foodsafety.gov/keep/types/fruits/tipsfreshprodsafety.html**

We can also help slow down the rate of antibiotic resistance by learning when, and when not, to ask for them; by listening to our doctors when they advise a 'wait and see' approach to medication; and by completing the full course of antibiotics, even if we feel better before they are used up. Because using anti-bacterial cleansers can also contribute to the build-up of resistance, we should learn how best to protect our family and home from harmful bacteria. Helpful tips on hygiene for a healthy household can be found at **www.tufts.edu/med/apua/consumers/healthyfamilies.pdf**.□

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Food-Borne Illness
http://www.fsis.usda.gov/Factsheets/Foodborne_Illness_What_Consumers_Need_to_Know/index.asp

Food Safety
http://www.foodsafety.gov/

Antibiotics…
http://www.cdc.gov/getsmart/

…and more, including questions for doctors
http://www.tufts.edu/med/apua/consumers/faqs.shtml

Antibiotic Use in Industrial Farming
http://www.tufts.edu/med/apua/about_issue/antibiotic_agri.shtml

Hospital (Healthcare) Acquired Infections
http://safepatientproject.org/topics/hospital_acquired_infections

How We Can Protect Ourselves
- http://www.empoweredpatientcoalition.org/
- www.hospitalinfection.org/protectyourself.shtml
- www.cdc.gov/HAI/patientSafety/patient-safety.html

Prevention of Infectious Diseases
- http://www.noah-health.org/en/infectious/prevention.html

Public Health Surveillance
http://publichealthobserver.com/definition-of-surveillance-system/

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