



World Health Organization

Topic C:

The Treatment and Prevention of Tuberculosis

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Introduction

Tuberculosis (TB) is an illness that has plagued humans for millennia, being found in remains as old as those of the ancient Egyptians. Yet, unlike other ancient killers, this disease not only continues to kill more than two million people every year, but its global prevalence rate is still growing. This is especially true in less developed parts of the world, including Asia and Africa, where treatment and prevention are still lagging.

The biggest issue with curing TB is the long period of time required to make any headway. Furthermore, due to the proliferation of drug resistant strains and the easily transmitted nature of the sickness, there is little hope of eradicating the illness without a concerted international effort.

As the World Health Organization (WHO), the eradication of disease falls well within our jurisdiction as we aim for the overall improvement of human life through higher health standards. It is necessary that we work together to solve the problems of TB's continued growth and mutation or else it will continue killing ever larger populations.



Background

TB is a slow growing bacteria that thrives in wet parts of the body that receive large amounts of blood flow. As such, it is most commonly found in the lungs and referred to as pulmonary TB. While far less common, TB can also grow outside of the lungs in which case it is called extrapulmonary. Extrapulmonary TB is usually far less contagious than its pulmonary counterpart due to the bacteria's decreased ability to exit the body via a person's respiration.

TB can also be either latent or active in any individual carrier. When a body's natural defenses are able to keep the disease from growing or spreading and the host thus experiences no symptoms of the illness, then the infection is latent. In this state, it is not highly contagious and due to the lack of symptoms, it cannot be spread to others. However, when the disease overwhelms an individual's immune system and the bacteria are spreading and causing system, then the TB is termed active. Active TB is easily spread because of the symptoms and prevalence of the bacteria. Moreover, latent TB can become active over time, especially if its host's immune systems weakens or becomes comprised, perhaps due to a period of malnutrition or the development of AIDS.

The most common way to spread TB is through the air. When an infected person breathes out air, any bacteria in his lungs are also exhaled and can then be inhaled by another individual. Additionally, coughing or talking only increases the amount of bacteria released by the host. While extrapulmonary TB does not spread easily, it can be passed through the exchange of bodily fluids, infected needles, et cetera depending on where the bacteria have taken root.

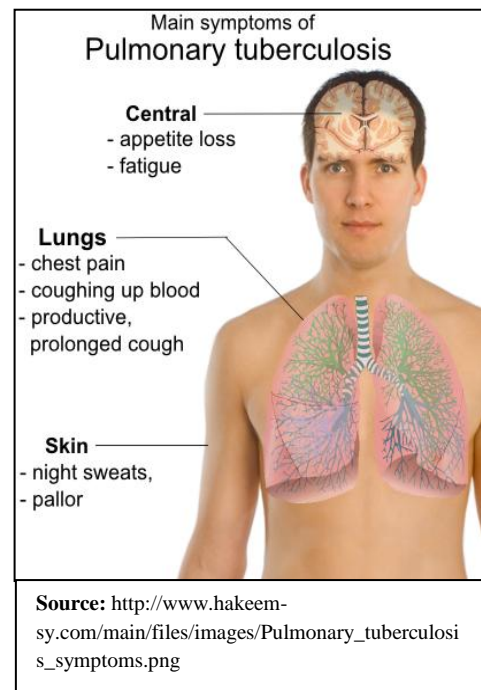
Having a weakened immune system or sharing common contact with TB carriers increased the risk of contract the sickness. As such, healthcare professions, the homeless, prisoners, and children are all among those who are more susceptible to infection. Furthermore, people with HIV



are especially vulnerable to the disease as their weakened natural defenses are often unable to combat TB effectively. For the same reasons, substance abusers and those lacking access to good healthcare are also particularly vulnerable to TB. Finally, due to the airborne nature of pulmonary TB, simply living in or travelling to a country or region with a higher concentration of people already infected with the disease greatly increases risk of contraction.

TB's symptoms are often so mild that it goes undiagnosed for long periods of time. This makes it especially dangerous as its host may often be unwittingly acting to spread the disease. In general, those infected by the disease can experience a range of symptoms, including:

1. A cough that brings up thick, cloudy, and sometimes bloody mucus from the lungs (called sputum) for more than 2 weeks;
2. Tiredness and weight loss;
3. Night sweats and a fever;
4. A rapid heartbeat;
5. Swelling in the neck (when lymph nodes in the neck are infected);
6. Shortness of breath and chest pain (in rare cases)¹.



There are several main methods to test for TB, however, many of these are not very definite due to both the slow growth rate of the bacteria and the existence of latent infections. Amongst the

¹ <http://www.webmd.com/lung/tc/tuberculosis-tb-topic-overview>



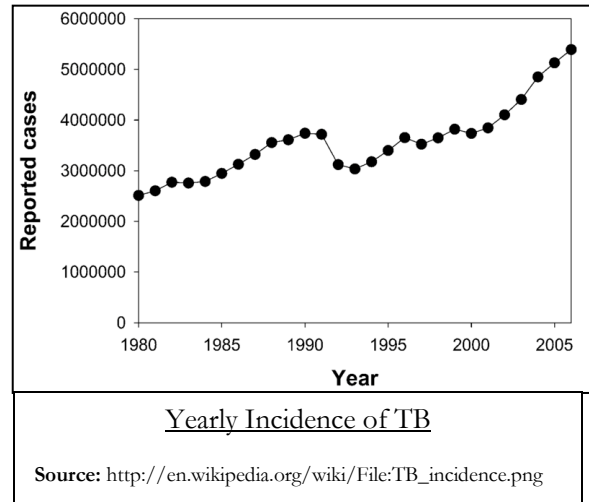
easiest examinations is the Mantoux skin test, which involves injecting exactly a tenth of a millileter of Tuberculin just under a patient's skin and analyzing their body's reaction 48-72 hours later. In general, if there is a ready response, as indicated by a raised bump of skin at the sight of the test, this indicates a possible positive. However, this diagnosis needs to be made carefully as different people's bodies will react differently to the test. For example, an HIV-positive individual will have a far smaller reaction than a healthy one. Moreover, having been vaccinated for the illness with bacille Calmette-Guerin (BCG) can result in a false positive when tested, while a suppressed immune system could lead to a false negative.

Moving on, probable TB can also be diagnosed via a chest X-ray where it will cause cloudiness in the film due to the cavities it causes in one's lungs. Yet, the only definitive way to test for the disease is by taking a clinical sample and identifying the bacteria in it. This could be done by analyzing blood or sputum, but is often not applicable as the test can take up to twelve weeks to complete. This is because of the slow-growing nature of TB, and makes the test impractical for much of the developing world, in spite of its accuracy.



Current Status

Nearly two billion people, or one third of the world's population, are infected with *M. tuberculosis*, and a new person catches it every second. However, while most of these cases remain latent and need no direct response, between 5% and 10% do become active eventually. As such, in 2007 there were nearly fourteen million reported cases of active TB.



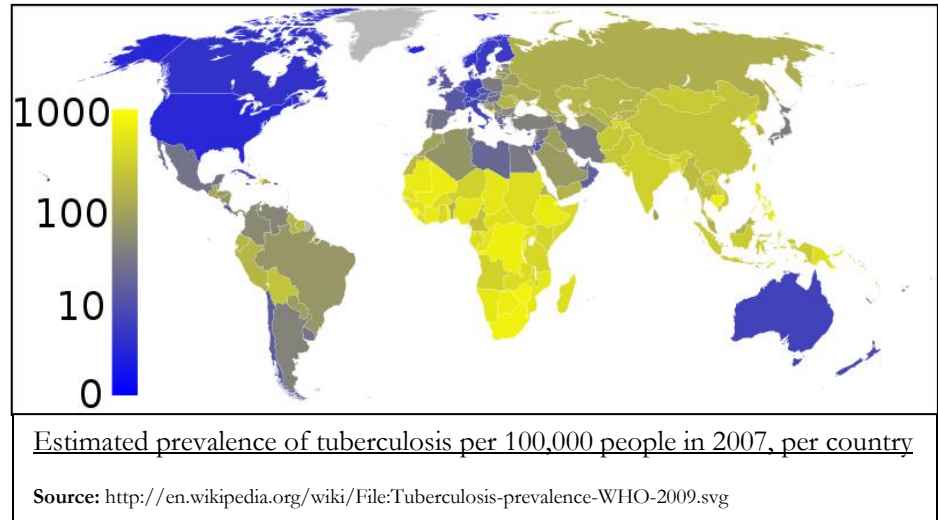
Since the early 1900s when the first TB vaccine was developed, the global prevalence rate of TB (the number of those affected as a percentage of the population) has quite steadily decreased. This was made possible by the vaccine itself, which helped prevent initial contraction of the illness, as well as by concurrent improvements in medical treatment. However, as population sizes have increased dramatically in the last hundred years, the incidence of TB (number of new cases) has also increased every year, more than doubling in the last thirty years alone. This is related to the trend of urbanization in the developing world, whereby populations move to more dense cities where it is more easy for the disease to spread. Remember that one of the main risk factor for catching TB is living in a region where it is common, and by having people live in closer proximity, the disease becomes more easily spread from one person to another. As such, there will be nearly nine million new cases of active TB this year, and around two million deaths caused by the disease.



TB prevalence varies greatly from region to region, with developed countries being far less affected than those in parts of Asia or Africa.

For example, while Swaziland had a

prevalence rate of around 1200 sick per 100,000 people in 2007, this number was only four in the United States of America. Furthermore, developing countries with large populations are disproportionately burdened by those affected with this disease, including India which has nearly two million active cases alone.



ESTIMATED TB INCIDENCE, PREVALENCE AND MORTALITY, 2005

WHO region	Incidence ^a		Smear-positive ^b		Prevalence ^a		TB Mortality	
	number (thousands) (% of global total)	per 100 000 pop	number (thousands)	per 100 000 pop	number (thousands)	per 100 000 pop	number (thousands)	per 100 000 pop
Africa	2 529 (29)	343	1 088	147	3 773	511	544	74
The Americas	352 (4)	39	157	18	448	50	49	5.5
Eastern Mediterranean	565 (6)	104	253	47	881	163	112	21
Europe	445 (5)	50	199	23	525	60	66	7.4
South-East Asia	2 993 (34)	181	1 339	81	4 809	290	512	31
Western Pacific	1 927 (22)	110	866	49	3 616	206	295	17
Global	8 811 (100)	136	3 902	60	14 052	217	1 577	24

^aIncidence - new cases arising in given period; prevalence - the number of cases which exist in the population at a given point in time.
^bSmear-positive cases are those confirmed by smear microscopy, and are the most infectious cases. pop indicates population.

Source: <http://www.who.int/mediacentre/factsheets/fs104/en/>

Generally speaking, Asia and Africa are the regions most plagued by TB and containing more than half of all cases, both active and latent. This is partly due to the high incidence of HIV in these areas, which allows TB to become active and spread more easily due to the host's compromised immune

system. In fact, TB is one of the leading causes of death for people with HIV in the world.

Furthermore, knowing that the number of TB cases increases annually due to population growth, it



follows that this disease particularly affects the young and adolescents in developing regions. Meanwhile, in Europe and America, TB has become something of an senior's illness, as it is no longer being commonly contracted in the population at large.

Once someone has contracted TB, treatment options are usually quite lengthy, necessitating drug use over a period of several months. More specifically, if you are diagnosed with latent TB, it is often recommended to take preventative measures to kill the bacteria before they can become active. This would involve taking daily or twice-weekly doses of a medication, often *isoniazid*, for a period of around nine months. Unless the carried strain is drug resistant, this often proves quite effective but may liver damage. Thus, patients on this medicine must be closely monitored, which requires time and resources.

Next, if it is discovered that you have active TB, far more aggressive measure need to be taken. Firstly, you would often be kept in the hospital during the first few weeks of treatment to keep you from spreading the sickness to others. To avoid the possibility of the disease developing drug resistance, you would then need to take a cocktail of medications, thus ensuring that each individual bacteria gets killed. This often consists of four specific medicines: *isoniazid*, *rifampin*, *ethambutol* and *pyrazinamide*. If even this proves to be ineffective, doctors may choose to change the dosages of any individual medication, or the medicines themselves, in order to best combat the illness. On the other hand, as things improve, one would often slowly lower dosages or discontinue certain medications after a few months to limit side-effects. Also, in some cases of extrapulmonary TB, surgery can be used to remove certain contaminated organs and decrease the quantity of bacteria in your body.



When the disease proves to be drug resistant, medication may continue for 18 months or more, involving a greater combination of medicines to try and kill all the bacteria before they can further mutate or spread. It is worth noting that a lot of drug resistance develops when people fail to continue medicating long enough for the full infection to be destroyed, thus allowing some mutated strains to persist and multiply. As such, the most important part of any TB treatment is that one finish it and continue taking medicine until it has been entirely eradicated.

One of the biggest difficulties with curing HIV-infected people of TB is that *rifampin* often interacts with their other medications. As such, one must often either stop taking their medications for HIV during a short course of TB-treatment, or try to use less effective methods of combating the disease.

Needless to say, this whole process is both expensive and time-consuming, making it difficult to implement when there are nearly two billion people affected who mostly reside in the poorest nations of the world. However, new developments are making this task more feasible, including the development of single pills containing cocktails of medication. This allows the distribution and dosage of treatments to be more easily controlled. Moreover, there are several very promising new drugs currently in development that may soon become available in the fight against TB.

Due to the highly contagious nature of active TB, the most obvious preventative measure is to do all that is possible to keep any infections latent. This involves general public health projects to make sure that population's immune systems are generally strong enough to keep any existing infections from further developing. This involves getting enough food, water, sleep and exercise to keep one's body strong. Next, getting tested regularly ensures that activating diseases can be



addressed before they have fully developed, greatly increasing the ease of treatment as the patient is often still healthier while there are less bacteria. Moreover, by testing often one could quickly isolate active cases of the disease and keep it from spreading to others. Given adequate resources, preventative treatment is also a possibility, and as it is often successful, this would also greatly decrease the chance of proliferation by keeping latent TB from ever becoming active.

Meanwhile, during the course of treatments in general, it is important to reiterate that one must finish the whole course of medicine even if one is feeling better to ensure that all the bacteria have been killed and to minimize the risk of a drug resistant strain developing. When infected with active TB, it is also important to stay away from crowded, public areas where you could easily spread it. Additionally, by staying in a well-ventilated location and also covering your mouth when coughing, you can further minimize the risk of transmission.



Bloc Positions

Being a disease affecting all parts of the world, each region tends to view TB in a similar light: as something that needs to be eradicated. Where the different blocs differ is along the lines of how this should be done and what priority any action would have. Whereas large swathes of Asia and Africa have made the suppression of TB a major goal, Europe and the U.S.A. tend not to be overly concerned as the illness is not a prevalent problem in their lands. Moreover, more developed countries tend to be very concerned with the prevention of TB, as they try to maintain their low infection rates and keep their people safe. Meanwhile, developing countries that have large numbers of infected citizens, such as India with around two million, need to find methods of treating their people and keeping them from getting killed by the bacteria.



Question to Consider

1. How can one address the main causes for TB infection?
2. How can one minimize the symptoms of TB?
3. Who is most in need of help?
4. Are there any key populations whose immunization would help minimize the spread of TB?
5. What are the main methods for preventing the contraction of TB?
6. What is the most cost-effective way of treating TB?
7. Which nations most need help in dealing with TB?
8. How can nations be helped without infringing on national sovereignty?



Recommended Sources

1. The Center for Disease Control < www.cdc.gov/tb >
2. National Institute for Allergy and Infectious Diseases < www3.niaid.nih.gov/topics/tuberculosis >
3. WebMD: TB < www.webmd.com/lung/tc/tuberculosis-tb-topic-overview >
4. Mayo Clinic: TB < <http://www.mayoclinic.com/health/tuberculosis/DS00372> >
5. WHO < www.who.int/mediacentre/factsheets/fs104/en >



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5. "Tuberculosis." *WHO*. Web. 14 Feb. 2010.
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