Investigation 3.8

3.8A: Fever and Cough
3.8B: The Lungs

Investigation

3.8A: Fever and Cough

Introduction:

Fever and cough are two of the most common complaints you see in your family medicine practice. These two symptoms let you know something is not right with the patient, but fever and cough occur in many illnesses, both acute and chronic. Hearing or seeing these symptoms doesn't take your mind immediately to the source of the problem; rather, they cause you to ask 'Why' does the patient exhibit these symptoms?

How many times in your life would you guess you have asked the question, "Why?" Your parents might say you asked that question a million times, but they might also say that your curiosity about the world made you the special person you have become. Today you must ask lots of questions of a new patient in your office complaining of episodes of fever and a cough, a cough that stubbornly refuses to go away.

Chief Complaint:
"I thought it was just a viral infection that came on about four weeks ago," said 20 year-old, Manjula Mehroul, a business student at the community college in your community. "I just cannot seem to shake it. I am worried that I have mono. Do you really get that from kissing?"

History of Present Illness:
You answer Manjula's question about **mononucleosis**. Mono, a common **viral infection** among college students, can spread through saliva which leads to its slang name, "the kissing disease." Manjula knows people who have mono.

As you listen to Manjula you have mono high on your differential diagnosis list, except a history of cough is usually not part of the normal presentation of mono. You want to ask some basic questions to better understand what has been happening to Manjula. You soon learn that she came to the United States at age 4. Her parents both grew up in India. Manjula can barely remember anything about living in India. However, she has visited her relatives in India. In fact she returned to India two months ago with her parents because her Grandmother had fallen ill and died. Manjula's recent visit to India lasted only a week. Back at school in America, Manjula noted that her schoolwork and study seemed exhausting, much more exhausting than her previous year. In fact, she complained that she could never remember being this tired, and she wondered at first if she somehow had chosen professors who demand excessive work from their students.

You ask Manjula about her complaint of fever and she says that three times she has felt feverish and awakened in the morning feeling damp and sweaty. She added that she had also awakened during the night coughing, and even had violent episodes of

coughing during the day. The coughs brought up thick mucus sometimes and once she thought the mucus may have had just a little blood in it.

You also learn that Manjula has never smoked. She does not recall ever having had a headache. She has not had a recent sore throat or any problem with her tonsils or sinuses. She does not recall any muscle pain, and has not had any rash, or swollen lymph glands in her neck, groin, or armpits.

Review of Systems:
A review of systems reveals that she had both **measles** and **chicken pox** as a child. Her parents made sure she got her childhood shots. She had no surgery ever and had never been in the hospital. She had no problems ever with her heart, lungs, kidneys, stomach, or nervous system.
Medications: none
Allergies: none

Examination:
Wt: 127 lbs. Respirations: 18 /min Pulse: 86 /min
Blood Pressure: 122/76 Temperature: 98.8° F.
General: Healthy appearing young female, well developed, well nourished, of Asian dissent, in no acute distress.
Head: No abnormal findings. No enlarged **lymph nodes**. No redness in the ears or throat. Normal range of movement of the neck. No **thyroid** enlargement.
Heart: No abnormal sounds
Lungs: Rhonchi (coarse rattling sound), and deep breaths stimulated coughing episode. Small sample of **sputum** collected.
Abdomen: Soft, no tenderness, normal **bowel sounds**.
Extremities: No deformities. No swelling. No tenderness.

Assessment: Normally healthy and active young woman in no acute distress but appears to have some **respiratory** symptoms and fevers, and a history of **international** travel in the recent past.

Differential Diagnosis:

Symptoms:	Fever	Cough	Lymph Nodes	Fatigue	Mucus/Sputum	Skin Rash	Headaches	Hoarse Voice	Sore Throat	Joint Pain	Acute/Chronic	Weight Loss	Appetite Loss	Rales/Rhonchi	Night Sweats
Mononucleosis	X	X	X	X	X	X	X	X	X	X	A	X	X	X	**X**
Lung Abscess	X	X	X	X	X	X	X	X	X	X	AC	X	X	X	X
Hodgkin's Lymphoma	X		X	X	X	X		X	X	X	AC	X	X	X	X
Atypical Pneumonia	X	X	X	X	X	X	X	X	X	X	A	X	X	X	X
Lung Tuberculosis	X	X	X	X	X	X	X	X	X	X	AC	X	X	X	X
Sarcoidosis	X	X	X	X	X	X	X	X	X	X	AC	X	X	X	X
Brucellosis	X	X	X	X	X	X	X	X	X	X	AC	X	X	X	X
Blastomycosis	X	X	X	X	X	X	X	X	X	X	AC	X	X		X
Non-Hodgkin's Lymphoma	X	X	X	X	X	X		X	X	X	AC	X	X	X	X
Cat-Scratch Fever	X	X	X	X		X	X	X	X	X	A	X	X	X	X
Lupus Erythematosis	X	X	X	X		X		X	X	X	AC	X	X	X	X
Patient Manjula															

Look at the following "Hallmark Signs" summary to examine some of the "classic symptoms" of each of the diseases from our list.

Looking at this differential diagnosis list you likely found unfamiliar names. This is proof that medical science often seems like a foreign language. Just the names of all known diseases takes you well beyond 10,000 words; indeed the number of **genetic diseases** alone experts think exceeds 10,000. You can look up each disease on this list and see how closely that disease fits this particular patient's situation. Hopefully, you noticed the symptoms for all of your choices are very similar. And this is often the physician's dilemma, and the reason that finding the actual diagnosis is often a process of elimination by symptoms and medical tests.

It is important to determine if Manjula's illness is contagious, since we don't want her spreading whatever she has throughout our entire community. So you might ask yourself if this list represents particular categories of disease; and indeed it does, **infectious diseases** and m**alignancies** (cancers). Put an **"I"** before each disease that you categorize as infectious and a **"C"** before each disease that you categorize as a cancer in this list:

Hallmark signs:

1. _____ **Mononucleosis**: sore throat, swollen lymph nodes, swollen tonsils, headache or body ache, fatigue, loss of appetite, and pain in the upper left abdominal quadrant (spleen).

2. _____ **Lung Abscess**: fever, cough with foul-smelling sputum, night sweats, appetite loss, and weight loss.

3. _____ **Hodgkin's Lymphoma**: swollen, painless lymph nodes, fevers, fatigue, drenching night sweats, unplanned weight loss, unexplained itching, unexplained low back pain, lymph node pain on consuming alcoholic beverages.

4. _____ **Atypical Pneumonia**: low-grade fever, headache, hacking cough, fatigue, chills, sore throat, chest or stomach pain, appetite loss, vomiting

5. _____ **Lung Tuberculosis**: bad cough lasting more than three weeks, pain in the chest, coughing up blood or sputum, fatigue, appetite loss, weight loss, chills, fever, night sweats.

6. _____ **Sarcoidosis**: wheezing, coughing, shortness of breath, weight loss, night sweats, bone or joint pain, anemia, or no symptoms at all.

7. _____ **Brucellosis**: fever, sweats, appetite loss, headache, muscle ache, joint or back pain, or fatigue

8. _____ **Blastomycosis**: fever, chills, cough, muscle aches, joint pain, and chest pain or no symptoms.

9. _____ **Non-Hodgkin's Lymphoma**: swollen lymph glands, fever, chills, night sweats, itching, weight loss, headaches.

10**.** _____ **Lung Cancer**: persistent cough that may worsen, chest pain worse with inspiration, coughing, laughing, hoarseness, weight loss, appetite loss, coughing up blood or rust-colored sputum, fatigue, new onset wheezing.

From the history would you expect Manjula has cancer or an infection?

_____

What laboratory studies would you like to conduct?

[ ] White blood cell count
[ ] Pulmonary function test
[ ] Cultures of the sputum sample obtained
[ ] Chest X-Ray of lung and a PPD skin test for TB
[ ] Blood test for illicit drugs
[ ] Pregnancy test
[ ] Endoscopic examination of nose and throat

If you elected to have the sputum sample analyzed in the microbiology lab you might have gotten a report back saying that they found “Acid-Fast Bacilli smear and culture positive” and those results strongly suggest that Manjula has TB or Mycobacterium tuberculosis (also simply called tuberculosis) that she picked up during her trip to India.

You could easily spend months reading and learning about tuberculosis because this disease has such an extensive and long history. See if you can research which of these statements are true?

True or False:

[ ] Tuberculosis still kills over a million people every year.
[ ] About 2 out of 3 people test positive by a skin test (called a PPD or a Mantoux test) for TB exposure around the world.
[ ] Although TB can attack many sites in the body, 90% of cases involve the lungs.
[ ] TB resistant to the standard antibiotics that once cured TB has become a current world health crisis.

Additional thoughts about TB and insights:

Robert Heinrich Herman Koch (1843-1910) received the Nobel Prize in Physiology/Medicine for his remarkable research that allowed physicians to understand and treat TB. Koch was the first to think formally about how one would actually go about proving definitively what causes a disease. Suppose, for example, half of your class members at school become sick at their stomach tomorrow, and you suspect that they got sick from a contaminate in a treat someone brought into school for everyone to

enjoy at a class celebration. How could you prove that the treat caused the illness? Koch said you would need to satisfy 4 conditions:

1. You would need to find the contaminant in everyone who got sick, but no contaminant in the students who did not get sick. But you cannot stop there.
2. The contaminant must be isolated from a sick student.
3. The isolated contaminant must then be able to make a healthy student sick.
4. The contaminant must then be isolated again from that healthy student now sick and shown to be identical to the original contaminant. (Koch was very thorough.)

Koch's postulates remain today as the established criteria for medical scientists to accept that a specific organism or substance actually constitute the true cause of a disease. You will recognize that Koch's postulates might actually serve as sound guidance, with some adjustments, for proving conclusions in many other areas of life and science. When two things seem to happen together the coincidence encourages us all to suspect that one thing caused the other. Koch's rules try to separate coincidence from causation, and not allow us to jump to the conclusion one thing caused the other. Only people with automobiles get into automobile accidents, so would you agree that cars cause accidents?

Mycobacterium tuberculosis has made people sick and die probably for just about as long as there were people on this earth. But now we have tuberculosis germs that no longer go away when treated with the antibiotic medications that almost always cured TB in the past. We believe that the germs evolve **resistance** to our drugs over time. You probably have a familiarity with the notion of **evolution**. We believe that genetic material, the RNA or DNA that makes possible living cells that can do many amazing things to include becoming human beings, can change over time to make living organisms better adapted to survive threats in their environment. We do not believe that process comes about from any actual intention or design, but rather from an accident. Not an automobile accident this time, but a mistake in the process of copying the genetic code inside cells. We think an accident or a mistake results in a new gene or combination of genes that makes a particular living organism better, and because of that new feature the new organism reproduces more successfully to make that feature become the new standard for that type of organism over many generations. If the accident makes the organism less advantaged in dealing with enemies or weaker in some other way, the trait fades away in future generations.

Why then would the Mycobacterium tuberculosis evolve to continue to cause disease in humans instead of human beings evolve to become resistant to the tubercular bacillus? Certainly by acts of intention humans have come up with medications to fight off TB, and yet this tiny Mycobacterium seemingly "outsmarts" those medications invented by scientists. The answer lies in what we said about evolution; the accidental improvements in the living species take generations to become the norm. A generation for humans occurs in the order to 20 years. A generation for a Mycobacterium occurs about every 18 hours, actually a long generation time compared to many bacteria that divide more than twice an hour. For every generation of humans, Mycobacteria have nearly 10,000 generations. That difference in generation duration represents a huge

biological advantage for the evolution of microscopic organisms. Thank goodness lions, tigers, and snakes have generations much more closely aligned with our own!

You live in an era in which molecular biology continually unlocks the secrets of the genes, how they work and what they can do. As a consequence you might very reasonably expect that in the not too distant future someone might figure out how to manipulate a virus that selectively makes the Mycobacterium tuberculosis sick. That virus might save millions of human lives and that sort of new genetic biology thinking appears increasingly popular in the fight not only against infections, but also against cancer.

And while you are thinking about the mechanism of evolution, have you ever thought about how your favorite flower evolved such a lovely **visage**? Again, we do not believe the design came about due to any intention on the part of the plant; instead, the beauty of the flower represents an accidental advantage the plant has in regard to its environment. The plant has no eyes with which to even evaluate its beauty. What eyes do see the flower and turn its beauty into an advantage?