

## **Human Case Scenario**

Only two weeks until Christmas and John is really looking forward to what gifts he might receive. He is on the school bus headed for home and talking with his friends about what they plan to do over the Christmas holidays. Suddenly he does not feel well. He has a really bad headache and feels chilled. He gets off at his bus stop and walks the half block to his house. Everything hurts! Instead of heading to the kitchen to grab a cookie, he heads up to his room and flops on the bed. His mom comes in and recognizes that her 10-year-old son is not feeling well. She asks what is going on and feels his forehead. He feels very warm. She gets the thermometer and John has a temperature of  $39.1^{\circ}\text{C}$  ( $102.3^{\circ}\text{F}$ ). She puts John to bed and gets some acetaminophen. She is worried he may be coming down with the flu, which is beginning to circulate locally. John did not want anything to eat for dinner, and only drank a little cola.

John's temperature is down to  $38.1^{\circ}\text{C}$  ( $100.5^{\circ}\text{F}$ ) in the morning. His headache is not as bad, but he still aches everywhere. He stays home from school and spends most of the day sleeping. He does not feel like eating, which is highly unusual. His temperature increases in the afternoon to  $39.4^{\circ}\text{C}$  ( $103^{\circ}\text{F}$ ). John's mom calls the pediatrician's office and makes an appointment for the following morning. She is instructed to continue the acetaminophen and make sure John drinks plenty of fluids. If his symptoms should precipitously worsen during the night, then she should take John to the emergency room.

**Summarize John's clinical signs and symptoms as presented.**

John lives in an affluent suburb of a large metropolitan city in the southeastern United States. He has been going to the same pediatrician, Dr. Carmichael, since he was an infant. All his childhood vaccines are current, although he has not been vaccinated for influenza this season. John's mom kept meaning to do it, but everything has been so busy. She thought she still had time. John has no history of major medical problems except a broken collarbone when he was eight.

In the exam room, John's temperature is 38.6° C (101.5° F). He complains to Dr. Carmichael about achy muscles and joints. John's mom says he is not eating much. The physical exam is unremarkable except for swollen cervical and axillary lymph nodes. Dr. Carmichael orders a complete blood count (CBC) and serum chemistries. He assures John's mom that it is probably just influenza or another mild infection that will resolve without treatment over time, and John should be feeling better within a week.

Lab results come back the next day. All tests are within normal limits. Dr. Carmichael's office calls John's mom to inquire about how he is feeling. His temperature is only slightly elevated and he is feeling somewhat better. As the doctor predicted, John is feeling better after a week.

**Discuss John's case to date. You already know that he has brucellosis because of the title of this case study, but is there any reason for the doctor to consider this as a differential? What questions should be asked to acquire information that might help to include brucellosis as a differential? Where could he have been exposed? Why is John's environment a possible impediment to asking the right questions that might lead to brucellosis as a differential? Which people are at greater risk for exposure?**

John enjoys Christmas but is not his usual energetic self. Otherwise, he seems fine to his mom. John heads back to school after New Year's Day. He has no complaints until January 12th when at school he complains of a severe headache and back pains to his teacher. He is sent to the school nurse who takes his temperature, which is 39.9° C (103.8° F). John's mom picks him up and they head directly to Dr. Carmichael's office. He is out of the office, but his associate, Dr. French sees her son. Her physical examination of John is unremarkable until she palpates around his neck. His neck is stiff and rigid. John complains of discomfort when she moves his head up and down. Dr. French is concerned about meningitis, and she makes arrangements for John to be admitted to the hospital for tests and observation. She contacts Dr. Simpson, the infectious disease specialist at the hospital, about John's clinical history and his arrival at the hospital soon. A MRI study of John's head and neck is ordered followed by a spinal tap. The cerebrospinal fluid (CSF) analysis from the clinical pathology laboratory reports lymphocytes, low glucose, and elevated protein, which is consistent with aseptic meningitis. The absence of neutrophils in the CSF is good news because meningococcal meningitis, a life-threatening illness, is probably not the cause of John's problems. Some of the CSF sample was submitted to microbiology for culture.

**Arriving at a diagnosis is analogous to solving a mystery. Establish a timeline for John's symptoms. Describe the incremental steps for obtaining information (i.e. evidence) in John's case. Discuss collaborations between medical specialists to facilitate making a diagnosis. How do these steps resemble problem solving in other disciplines?**

John has been in the hospital for three days. He is stable but not showing any significant improvement. John's mom receives a call from her brother, who has a farm a little over 200 miles from them, where he raises pasture-reared pigs. He tells his sister that brucellosis has been diagnosed at his farm, and brucellosis can infect people. He reminds her that over the Thanksgiving holidays when they visited that John helped to pull some stillborn piglets from the birth canal of a sow experiencing a difficult labor (dystocia). Could John have brucellosis? She thanks her brother and immediately goes to find someone to give them this information.

The doctors request that the standard tube agglutination (STA) test for *Brucella* spp. is run on John's previously collected and banked serum and CSF samples. The STA is a quick screening test. Currently, there is no growth on any culture plates streaked with CSF from John, but *Brucella* spp. are slow-growers and it is too early to expect any growth.

The request also alerts the diagnostic laboratory that samples from John may be infected with *Brucella* spp. and additional precautions should be observed to prevent laboratory personnel from inadvertently becoming infected.

Based on the additional history and clinical presentation, a probable diagnosis of brucellosis is made, and John begins treatment with a combination of three antibiotics demonstrated to be efficacious against *Brucella* spp.

**Multiple interactions are occurring in a very short time frame. Discuss the dynamics of these interactions and the ramifications for the participants.**

John has antibodies to *Brucella* spp. in his serum and CSF, which supports a presumptive diagnosis of brucellosis. The diagnosis is confirmed when colony growth appears in culture 8 days post-inoculation and *Brucella suis* is identified. The state public health laboratory has been aware of John's case since brucellosis became a probable differential. Confirmation of *B. suis* is forwarded to the Center for Disease Control (CDC).

Laboratory personnel who handled John's blood and CSF samples prior to recognition of brucellosis as a differential are advised of their relative risks of exposure, recommended antibiotic therapy for post-exposure prophylaxis, and subsequent monitoring of serum for antibody titers and daily self-fever checks for 24 weeks. Brucellosis is the most commonly reported laboratory-associated bacterial infection.

Meanwhile, John has been on antibiotics 5 days before the diagnosis of brucellosis is confirmed. He is showing a good response to therapy and ultimately makes an uneventful recovery.

**Discuss how this case represents a One Health approach to solving a problem.**

**What are the benefits and challenges of a One Health approach?**

**How is information best shared across disciplines?**