

Differential Diagnosis and Treatment of an Immune Response

by

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Part I – The Investigative Process

Jamie is a 26-year-old graduate student at the University of Arkansas—Monticello. She is working on her PhD in biology. As a biologist, she enjoys spending time outdoors when she can. The campus is on the edge of the woods and it is a nice place for Jamie to walk and relax to relieve the stress of graduate school. Jamie has not been able to enjoy her walks lately due to the fatigue she has been experiencing. Others have noticed that she does not have the stamina she had in the past to complete her research.

Her major professor convinces her that it would be a good idea to make an appointment to see her family physician to determine the source of her fatigue. He suggests that maybe she has a viral infection, and she just needs to get some rest. She is able to get an appointment with her family practitioner. When she arrives at the clinic, the nurse takes her blood pressure and temperature. Her blood pressure is 128/74 and her temperature is a slightly elevated 101.2°F.

She is asked to provide her family medical history and to describe any symptoms she has noticed. Jamie tells her doctor that her maternal grandmother had rheumatism and was not able to get around. Her father had prostate cancer. She cannot think of any other family illnesses. She tells her doctor that in addition to feeling run down, her knees and elbows have been aching, and she has been having trouble pipetting because of pain in her hands. She has been experiencing frequent cold sores that she has been treating with over-the-counter medication. She attributes her recent weight loss to poor eating habits as a student. On general examination, the doctor finds a rash on her upper back where she is typically exposed to the sun and swollen lymph nodes on her neck.

The doctor decides that further tests are required to rule out some obvious possibilities. He suspects an autoimmune disease such as lupus (systemic lupus erythematosus, SLE) or rheumatoid arthritis (RA), a tick born disease like Lyme disease, anemia, or chronic Epstein Barr virus syndrome. Jamie is sent to the lab where blood is drawn. She is asked to return the following week to review the lab test results.

Questions

1. What information provided by Jamie would lead the physician to suspect a systemic disease? Include any environmental or lifestyle clues.
2. Define *autoimmune disease* and *autoantibody*.
3. What environmental triggers are associated with autoimmune diseases?
4. What are some of the autoimmune diseases?
5. What are the typical signs and symptoms of autoimmune diseases using lupus as an example?
6. Using WebMD (www.webmd.com) or MedlinePlus (www.nlm.nih.gov/medlineplus), find the criteria for the diagnosis of systemic lupus erythematosus, rheumatoid arthritis, Lyme disease, and chronic Epstein Barr syndrome.
7. Why does the doctor suspect that Jamie may be anemic?

Part II – Understanding Results

| Lab Test | Jamie's Results | Reference Range for Women |
|-----------------------------------|-----------------------------|------------------------------------|
| CBC | | |
| WBC count | $3.8 \times 10^9/L$ | $4.8\text{--}10.8 \times 10^9/L$ |
| RBC count | $3.2 \times 10^{12}/L$ | $4.0\text{--}5.0 \times 10^{12}/L$ |
| Hemoglobin | 10.6 g/dl | 12.0–16.0 g/dl |
| Hematocrit | 32.8% | 36–46% |
| Platelet count | $140 \times 10^9/L$ | $150\text{--}450 \times 10^9/L$ |
| Differential | | |
| Neutrophils | 44% | 40–60% |
| Lymphocytes | 40% | 20–40% |
| Monocytes | 9% | 2–10% |
| Eosinophils | 6% | 0–5% |
| Basophils | 1% | 0–1% |
| ESR – (Sedimentation Rate) | | |
| | 61 mm/hr | 0–20 mm/hr |
| Chem Panel | | |
| Sodium | 141 mEq/L | 136–148 mEq/L |
| Potassium | 4.2 mEq/L | 3.6–5.0 mEq/L |
| Chloride | 108 mEq/L | 95–110 mEq/L |
| Carbon Dioxide | 26 mmol/L | 23–29 mmol/L |
| Glucose | 101 mg/dL | 70–99 mg/dL |
| Total Protein | 6.9 g/dL | 6.5–8.3 g/dL |
| Albumin | 4.8 g/L | 3.5–5.0 g/L |
| BUN | 18 mg/dL | 6–20 mg/dL |
| Creatinine | 0.9 mg/dL | 0.6–1.1 mg/dL |
| Iron | 189 $\mu\text{g}/\text{dL}$ | 30–150 $\mu\text{g}/\text{dL}$ |
| Microbiology | | |
| Blood Culture | Negative | Negative |
| Immunology | | |
| C-Reactive Protein | 5.8 mg/L | 3–5 mg/L |
| Rheumatoid Factor | Negative | Negative |
| VDRL | Positive | Negative |
| ANA | Positive 1:640 | Negative |
| Rickettsial Immunofluorescence | Negative | Negative |
| Mono-spot | Negative | Negative |
| Lyme Antibodies | Negative | Negative |
| Direct Combs | Negative | Negative |

Questions

1. Which test results are abnormal?
2. What do these test results indicate? Include a discussion on what conditions have been eliminated. What condition could be causing the abnormal results?
3. Based on your assessment of Jamie's condition, what kind of doctor (specialist) should she see?

Part III – Therapeutic Treatments

Jamie meets with the rheumatologist and she explains to her the diagnosis of systemic lupus erythematosus. She reviews with Jamie the short-term and long-term treatment options. She explains that even though lupus can be controlled in many cases, there are often complications associated with the drugs used to treat symptoms. She outlines a treatment plan, and they agree to take a moderately aggressive approach. Jamie leaves the doctor's office understanding that this will be a lifelong fight and very likely her symptoms will get worse. She plans to make the most of her life and treat the flares of this potentially aggressive disease.

Questions

1. Describe the four different groups of medications that are used to treat lupus.
2. How do these medications work in controlling lupus? Give some specific examples.
3. With lupus, what approach to treatment would you take?
4. What are possible long-term complications with the use of these medications?

Part IV – Late Stage Complications

After Jamie’s visit with the rheumatologist, she was treated with high levels of prednisone after NSAIDs (non-steroidal anti-inflammatory drug) and anti-malarials were not effective. After graduation, Jamie married another doctoral student. Soon after she was married, Jamie became pregnant, but sadly, the pregnancy ended in miscarriage. Jamie was told by her physician that sometimes patients with lupus produce antibodies that make pregnancy high risk. Jamie and her husband decided to adopt to avoid the pain of another miscarriage.

Ten years have passed since her initial diagnosis and Jamie has continued to suffer frequent lupus flares. As a result of long-term drug usage, she has developed steroid-induced diabetes, hypertension, and osteoporosis. Over the past two weeks, Jamie has not been feeling well. Her symptoms are different from her usual lupus flares. She is experiencing fatigue, chest pain, and shortness of breath with minor activity. Jamie decides she needs to start exercising and begins running on the treadmill and collapses. She regains consciousness and is rushed to the emergency room. She describes to the physician that she is having chest pain, and the physician evaluates her for a cardiac event. An ECG (electrocardiogram) is performed and shows abnormal results. The laboratory testing includes myoglobin, cardiac troponin I, and CK-MB. The results are as follows:

| <i>Cardiac Indicators</i> | <i>Jamie’s Results</i> | <i>Reference Values</i> |
|---------------------------|------------------------|-------------------------|
| Troponin I | 15.8 ng/ml | 0–1.5 ng/mL |
| CK-MB | 8.5 µg/L | < 5 µg/L |
| Myoglobin | 153.7 ng/ml | 0–85 ng/ml |

Questions

1. What is myoglobin?
2. What are the three types of troponin found in cardiac muscle?
3. What are the three isoenzymes of creatine kinase? Which one is found predominately in heart muscle?
4. What does an elevated myoglobin, cardiac troponin I, and CK-MB (creatine kinase isoenzyme) in the blood indicate to the physician?
5. What is Jamie’s long-term prognosis?



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