

Investigation 3.10

3.10A: Weak & Dizzy

**3.10B: Environmental
Toxins**

Investigation

3.10A: Weak and Dizzy

Introduction:

When medical students start seeing actual patients under the supervision of resident and faculty physicians, they quickly learn to dread the patient whose Chief Complaint reads, "I feel weak and dizzy." Such a chief complaint occurs frequently. The dread comes from the lack of **specificity**. The **differential diagnosis** of weak and dizzy could include hundreds of conditions, while the examination and lab work often may find nothing abnormal.

Guess what! This morning your first patient in your office appears on your schedule as, "Dorothy Westfield, 78 year old female, new patient, feeling weak and dizzy last few days. Brenda Kravetz, her daughter, scheduled the appointment.

Still feeling that old sense of dread, you head for Exam Room 3, remembering Brenda as a patient you have had in your practice for years. Brenda has two sons, both were attending college, but perhaps the oldest may now have graduated.

Chief Complaint and History of Present Illness:

You greet Brenda and introduce yourself to her Mother. Brenda explains that her retired Father's doctor in Chicago had found that her Father had advanced pancreatic cancer five months ago. Her Father fought hard, but died six weeks ago. Mrs. Westfield, his widow, had agreed to come live with her daughter Brenda while they sorted out the **estate**. Brenda and her husband were thinking they might just add a room onto their house and keep Dorothy with them indefinitely. But, over the last few days Dorothy Westfield, who had navigated the last five difficult months valiantly, seemed no longer her previously vigorous self. Now she has no interest in going anywhere except back to bed. She is not stable on her feet. She complains

of aches in her feet and hands. Her appetite has waned and Brenda added that her Mother has complained of stomach discomfort and diarrhea.

Physical Examination

The nurse has left you Dorothy's vital signs on the front of a new chart.

- Weight: 132 BP: 127/73 Pulse: 94 Respirations: 24
Temp: 98.8 F.

Dorothy Westfield appears sick, although her body looks well developed suggesting no long history of illness. But today she definitely seems **listless** and **disengaged**. She answers direct questions, but has no interest in a conversation. You find no abnormalities of the head and neck, except her mouth seems very dry. No enlarged **lymph nodes**. Her heart and lungs sound normal. **Palpation** of the abdomen evokes some reaction of discomfort, not severe but definitely real. The **liver** does not seem enlarged. Dorothy's skin appears dry. Her hands and feet appear normal although you do see a little swelling of the feet and ankles. You find some scattered areas of **hyperpigmentation** of the skin, but such findings are common in persons of her age.

Medical History

Dorothy's daughter, Brenda, answers most of your questions addressed to her Mother. Dorothy has led an active life, working originally as a high school English teacher, who also coached a very successful debate team. She married and raised two healthy children and filled her time after the children left home with oil painting and directing plays at a community theatre. She had no major surgery and took no medications, except for vitamins and some oral and topical **estrogen** replacements. She has had age appropriate **vaccines** for prevention of **pneumonia** and **shingles**, and periodic **tetanus boosters**. She has not traveled outside the country in the previous year.

Make a list of Dorothy Westfield's signs and symptoms that you would use to create a differential diagnosis. Do you appreciate the dread of

the “weak and dizzy” complaint? Nothing jumps out, but you feel confident of something abnormal that you need to track down.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____

The Isabel differential diagnosis software provides you with the following list of possible causes for Dorothy’s symptoms: **Diabetic Neuropathy, Pernicious Anemia, Addison’s Disease, Vitamin B12 Deficiency, Pancreatic Cancer, Brucellosis, Celiac Disease, Heavy Metal Intoxication, Pancreatitis, Cirrhosis, Compartment Syndrome, Food Poisoning, Iron Deficiency Anemia, Crohn’s Disease, Hepatitis A, Endocarditis, Rheumatoid Arthritis, Malignant Atrophic Papulosis, Transient Ischemic Attack, Polyneuropathy Disorder, and Postural Orthostatic Tachycardia Syndrome.**

The list jumps all over the body, even to include Pancreatic Cancer, which caused Dorothy’s husband’s death. Where do you even start?

Check off the lab tests you would order to begin the process. This choice we expect to prove very difficult. You want to find a clue to the problem but not spend thousands of dollars testing everything at once, unless you think the patient has a condition that threatens her life over the next few days. Try to

select a few simple tests that might point you in the right direction. You can then elect other tests down the road to get the right diagnosis.

- [] Combined Blood Count (CBC) to check for anemia and B12 deficiency.
- [] Electrolytes and Blood Urea Nitrogen to check on kidney function.
- [] Chest X-ray
- [] Heavy Metals Panel, blood test to check for arsenic, mercury, and lead.
- [] Complete blood metabolic panel to evaluate for liver function.
- [] Cardiac enzymes to rule out a heart attack.
- [] Blood culture to look for infection in the blood stream.
- [] Electromyogram (EMG) to measure conduction velocity in nerves.
- [] Cardiac angiography to evaluate circulation of blood to the heart.
- [] Acute Hepatitis Panel to rule out Hepatitis A, B, or C.
- [] Antinuclear Antibody (ANA) and Rheumatoid Factor blood test.
- [] Halter Monitor for detection of episodes of tachycardia
- [] Urinalysis
- [] X-rays of hands and feet.

In your office you can do a quick test for severe anemia and also get an idea of dehydration, so you elect to do that before anything else. If you selected other tests, they will require the hospital labs and those results will not be available until tomorrow at the earliest. Your nurse tells you in just a few minutes that Dorothy does not have a significant anemia but clearly needs some fluid replacement, perhaps because of the diarrhea she reported having which would drain water from her body.

You sit down with Dorothy and her daughter and explain what you have learned, and more importantly, what you still need to figure out. You will get all the results from the hospital laboratory back the next day, and you want to see Dorothy back in your office in 48 hours. In the meantime you ask Brenda to insist that her mother drink Gatorade® and eat as best she can. If she cannot eat regular meals she should try to get down a nutrition drink like Ensure® or Boost®. And obviously, if anything changes, call your office day or night.

Now, fast forward 48 hours. Dorothy and Brenda have returned to your office. Brenda reports not much has changed. Dorothy has tried to eat and drink fluids. She has continued to have all of her symptoms reported before, remains weak and listless, still has aches, still has diarrhea, and vomited once after working hard to drink a glass of Boost®. You report that the lab tests you ran confirm a systemic illness that appears to affect Dorothy's liver

and kidneys, producing mild impairment. Today you want to figure out the next step to getting to the root cause.

What would you do next? Before you read further, jot down your best idea for the next step. Perhaps you want to do an additional lab test from the list you considered before. Perhaps you want to ask a question not previously asked. This case does not seem to have any simple solution.

My next step: _____

Thank you for thinking hard about what you might do next for Dorothy. Practicing physicians in this same situation might indeed order more testing. They might also think of getting help from a specialist. It would not be unusual for a primary care physician faced with this case you are struggling to solve to send Dorothy to a Gastroenterologist since the most **definitive** symptoms appear to involve the stomach, intestines, and liver. But if you happened to write in the blank space above a different approach, especially if you would examine the patient again very thoroughly; please consider yourself exceptionally talented in medical science. You came up with the very best answer.

Today as you repeat your physical examination of Dorothy Westfield you discover three new findings. First, you detect some yellowing of the normally white surface of Dorothy's eye, a condition called **conjunctival** or **scleral icterus**. That finding points you toward disease in the liver, or hepatitis. Next you seek to feel or **palpate** the liver's edge under Dorothy's rib cage, and find it easily since it sticks out significantly below the rib. Touching it proves uncomfortable for Dorothy. This confirms a liver issue in your mind. Next you look carefully at Dorothy's hands and you find a distinct white line stretching across the base of her finger nails, a mark that was not visible there 48 hours earlier. Most physicians would need to refresh their memory using a textbook to recall the name of such lines. The textbook calls them **Mees' lines** or **leukonychia striata**. Medicine sure has a lot of big words.

The textbook also says that these Mees' lines appear when a patient has been poisoned with heavy metals, especially **arsenic**. Now you are ready to order that **Heavy Metals Panel** from the list you reviewed earlier. (Did you decide to do that test before, or did we talk you out of it?)

Now that you have gotten to this point in your study of medical science, you are thinking like a physician. You have a patient before you who displays symptoms you believe come from **chronic arsenic poisoning**. The treatment she needs now involves a process of chemically **binding** the arsenic so that she can eliminate it from her body in her urine. Physicians

call this treatment **chelating** and it involves the **intravenous infusion** of a chelating agent like Dimercaprol. So while Dorothy needs to go to the hospital for a Heavy Metals Panel followed by treatment, you need to think about how all of this came about.

Arsenic has a very long and interesting history as an **instrument** of murder because, as you have seen, one could blame the early symptoms on other causes. Arsenic has been used over the centuries to kill rats and insects, to preserve wood, to color paint, and even added to medicines in low doses; therefore our ancestors could easily obtain arsenic if they had a need. Before the twentieth century laboratory tests to identify the presence of arsenic proved difficult to carry out reliably, so many murderers probably were never discovered.

Arsenic poisoning appears to have a much wider array of symptoms than we have come to expect in our search for a diagnosis. Why? The answer lies in the mechanism by which arsenic affects the human body. This chemical disrupts very basic reactions that all cells have in common as they **extract** energy from food and use that energy to create complex molecules from simpler ones. The poison, therefore, causes malfunctioning in every organ in the body, so the symptoms appear everywhere in a very confusing fashion.

Has Brenda or someone else in the family been feeding Dorothy some arsenic? Had someone decided they would prefer her life ended soon? Is this a matter for the police? If the police were involved would Dorothy no longer have a place to live protected by people who love her? Certainly at this moment you cannot tell Brenda what you think might be happening.

Many times in life and in medical practice, one must decide on a single path of action among many possible paths, when all paths seem less than **optimal**. The authors of this book know of an actual case similar to Dorothy's in which a physician discovered chronic arsenic poisoning after struggling to understand his elderly patient's symptoms. Then he too struggled to decide what to do. Finally he simply confronted all the members of the household, except the patient, as a group with his findings, promising to go to the police if any future blood test showed arsenic or anything else bizarre happened to his patient. The patient continued to live happily in that household without further incident. Was that the best solution for all concerned? You can judge for yourself. This case illustrates the diversity of situations one can encounter in the practice of medicine.

So, what is arsenic? Arsenic is chemical element number 33 on the periodic table. It occurs in nature as a **metalloid** in water, rocks and soil; it is also found in manmade products. It happens to be highly toxic to humans. Most

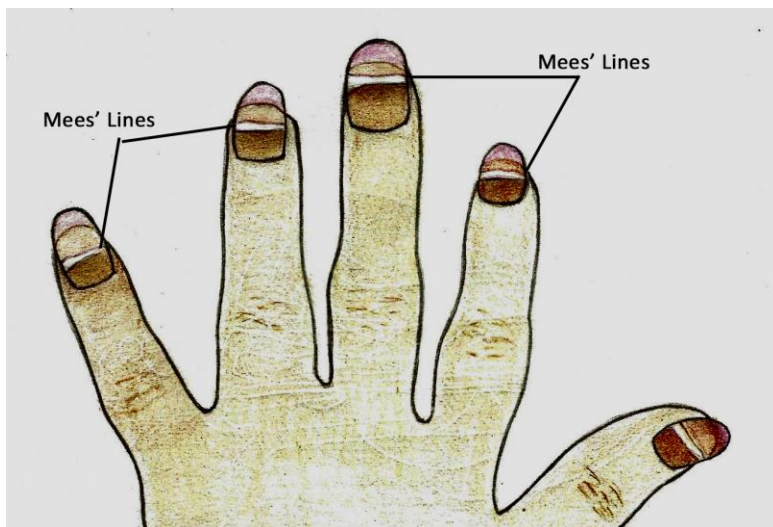
ingested arsenic is eliminated from our body in a few days, however, arsenic can be detected in nails and hair for up to a year after exposure.

One of the problems with arsenic arises because it occurs naturally in well water, and even in the soil. As fruits and vegetables grow the arsenic in the water or soil is absorbed into the plant. One of the largest episodes of deadly poisoning ever described occurred in Bangladesh because of an arsenic contaminated water supply. Attempted murder is not the only means of incurring arsenic poisoning.

Even without the results of heavy metal testing we see that some of Dorothy's symptoms are consistent with those expected in arsenic toxicity. Test results would, of course, confirm our diagnosis.

Arsenic toxicity primarily affects our skin, lungs, bladder, liver, and kidneys. Looking at Dorothy's symptoms we see many signs related to these areas.

Dorothy's skin is dry, most likely from dehydration associated with not eating and with vomiting. She also had areas of hyperpigmentation, which could be caused by arsenic toxicity. Most significant was the finding of Mees' lines in her fingernails noted in the second, more thorough examination. The skin and hair are extensions of the skin; Mees' lines are indicative of arsenic exposure lasting at least five or more weeks.



Mees' Lines

Testing of Dorothy's hair could provide further evidence of when exactly her arsenic exposure began.

Arsenic is **metabolized** in the liver; initially patients experience irritation and pain, with palpable enlargement of the liver. When Dorothy returned to the office her liver was enlarged and tender to palpation, indicating irritation; chronic arsenic exposure is thought to cause liver cancer. Arsenic

is then **excreted** by the kidneys, causing damage demonstrated by the presence of blood in the urine; prolonged arsenic exposure causes cancer there as well.

The lungs are also damaged by arsenic exposure. What clue was present in Dorothy's vital signs that she might have early signs of **pulmonary** damage? Did you notice that her respiratory rate was 24 breaths per minute? That is a very non-specific finding, but it could be another clue to this unusual medical puzzle. Prolonged exposure to arsenic is thought to cause lung cancer.

Finally, arsenic is toxic to the sensitive tissues of our **bladder**. After passing through the kidneys, the next stop on the way out of the body is a visit to the bladder. Prolonged exposure to arsenic can result in cancer of the bladder.

Surely you can see that arsenic is not a chemical we voluntarily ingest, but one that too often makes its way into our body without our knowledge. It is important to know from where your water source comes, as it is important to be aware when shopping for fruits and vegetables about where they were grown. Vegetables and fruits are often imported from other countries, especially during the "off season" of growing them locally. There is potential danger when we are not informed about the growth conditions related to their water and soil conditions.