

**SPEAKER:** So NTM pulmonary disease really requires three criteria for diagnosis, the first of which is having clinical symptoms, which I just described, including cough, sputum production, fevers, chills, night sweats, weight loss, fatigue. The second includes the radiographic criteria. So in the radiographs, MAC or NTM pulmonary lung disease can cause bronchiectatic nodular features and cavitary features. And patients with cavitary disease are considered to have more severe disease. And as we'll talk about later, they're managed differently.

So we really want to see all three, the radiographic features, the clinical features, and the microbiologic criteria, to be able to say that someone has pulmonary NTM disease. Importantly, from the microbiologic standpoint, because these organisms are ubiquitous in the environment, we ask that there are two separate sputum cultures that are positive to be able to define them as having pulmonary disease due to NTM. We do allow one positive bronchoscopy that will meet the microbiologic criteria for disease.

Now, as far as which cultures are necessary or which cultures are more important or easier to obtain, I will say if your patient is expectorating, just get expectorated sputum for the diagnosis. If patients aren't expectorating, either they just don't produce sputum or they've really never been taught how to produce sputum. So all of our patients that we see are taught how to use a flutter valve, such as an Aerobika, first to help mobilize secretions. And they're also taught how to use hypertonic saline.

So the hypertonic saline is what we use with a sputum induction with a respiratory therapist. And there are many different concentrations to hypertonic saline, including 3%, 7%, and 10% saline. And I would say the vast majority of patients are able to obtain a proper, adequate sputum specimen by one of those two modalities, either expectoration or a sputum induction. Therefore, proceeding to a bronchoscopy in our practice is quite rare, and so it's really the rare patient that has an ineffective induction and will proceed to bronchoscopy for the diagnosis.

Now, as part of the diagnostic criteria, they also talk about tissue sampling and histologic abnormalities. And the scenario where that occurs typically is a patient that has a concerning lung nodule on their CAT scan, and they have a lung biopsy really with the purpose to rule out a malignancy. And on that biopsy, they find histopathologic changes consistent with a chronic infection, such as granulomas. So if a patient had a positive biopsy, and the pathology was consistent, and then had a subsequent culture that was positive for NTM, that would also meet the diagnostic criteria.

But just to take a step back, if you have a patient that's a suspect for NTM lung disease, almost never do you need to do a lung biopsy to obtain the diagnosis. Either with sputum, sputum induction, or bronchoscopy, you can make this diagnosis. Typically in our practice, we ask our patients at the time of diagnosis or trying to achieve a diagnosis to submit a total of three specimens to us. And ideally, these are early-morning specimens.

And as we're following patients on treatment, the whole mantra of treatment is to treat until the patient has converted their cultures to negative and treat for an additional 12 months. So that requires us to obtain sputum cultures in our patients. If we give them the tools at home with a flutter valve and hypertonic saline, I think the likelihood that you're going to have a high-yield specimen is even greater if they're submitting cultures to you.

Ideally, we like to check cultures once a month while patients are in treatment. And that allows close monitoring to understand, when do they, in fact, achieve culture conversion? And again, you're going to treat them for an additional 12 months beyond culture conversion.

Now, some practices will ask you to check cultures every other month. But looking at this from the perspective of the patient, I would certainly want to know when my culture converted. And if you're only checking it every other month, you may be allowing your patient to take an unnecessary length of medication therapy. So I think close monitoring is advised.