

Case Study Report on Respiratory Tract Infection

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Introduction

The human respiratory framework is a progression of organs in charge of taking in oxygen and ousting carbon dioxide. The essential organs of the respiratory framework are the lungs, which make this trade of gases as we relax. Red blood cells gather the oxygen from the lungs and convey it to the parts of the body where it is required. During the procedure, the red platelets gather the carbon dioxide and transport it back to the lungs, where it leaves the body when we breathe out. As we inhale, oxygen enters the nose or mouth and passes the sinuses, which are empty spaces in the skull. Sinuses help direct the temperature and moistness of the air we relax. The trachea, likewise called the windpipe, channels the air that is breathed in. It branches into the bronchi, which are two tubes that convey air into every lung. The bronchial tubes are fixed with small hairs called cilia. Cilia move forward and backward, doing bodily fluid up and. The bodily fluid, a sticky liquid, gathers tidy germs and another issue that has attacked the lungs. We remove bodily fluid when we sniffle, hack, spit or swallow.

The bronchial tubes prompt the projections of the lungs. The correct lung has three projections; the left lung has two, as indicated by the American Lung Association. The left lung is little to permit space for the heart. Flaps are loaded with little, springy sacs called alveoli, and this is the place where the trading of oxygen and carbon dioxide happens.

The alveolar dividers are, to a great degree, thin (0.2mm). These dividers are made out of a solitary layer of tissues called epithelial cells and small veins called pneumonic vessels.

Blood goes through the vessels. The pneumonic supply route conveys blood containing carbon dioxide to the air sacs, where the gas moves from the blood to the air. Oxygenated blood goes to the heart through the aspiratory vein, and the heart draws it all through the body. The stomach, a vault-molded muscle at the base of the lungs, controls breathing and isolates the chest cavity from the stomach cavity. At the point when a breath is taken, it smoothes out and pulls forward, making more space for the lungs. Amid exhalation, the stomach extends, and powers let some circulation.

The respiratory tract can be separated into two: the upper and the lower respiratory tracts. The previous comprises the nose, nasal ways, paranasal sinuses, pharynx, and the piece of the larynx that is over the vocal strings. The list comprises the piece of the larynx underneath the vocal ropes, the trachea, the bronchi and the bronchioles.

The primary reason for the respiratory tract is the vaporous trade, and in this way, it is inclined to presentation to natural material, for example, infections and microorganisms that can be found in the vaporous condition. Living beings in the tract can cause diseases known as respiratory tract contaminations. These are, for example, pharyngitis, where the throat is inflammation and agony on gulping; the normally cool, symptomized by nasal release, uneasiness and sniffing; flu; otitis media, where there is intense ear aggravation; otitis outside, which causes irritation of the outer sound-related meatus; laryngitis-irritation of the larynx; bronchitis; pneumonia; aspiratory tuberculosis and others (Watson-Williams, n.d.). The respiratory tract, similar to some other body areas, has guard components. These are, for example, reflexes, for example, hacks and wheezes that oust the breathed-in irresistible operator; cell segments like macrophages and lymphocytes; mechanical obstructions, for example, the glottis and cilia; and bodily fluid in coating liquids. Notwithstanding, the disappointment of these guard instruments consolidates with expanded pathogen load to the time when the track can never again protect itself, causing contaminations. For the location of these diseases, a microbiological examination is key.

The part of such tests could be to distinguish the causative specialist of disease and, in doing so, help the clinician accountable for the patient start or adjust the restorative mediation that the patient is now experiencing. Distinguishing proof trials of microorganisms could likewise be utilized to decide the susceptibility of a life form to certain restorative mediations and, in this way, figure out how to control diseases caused by the living being. Timing is imperative when handling examples to guarantee that they don't get traded off. Another explanation behind directing such tests is to distinguish microorganisms valuable in making certain sustenance or anti-infection agents.

This particular case includes microbiological tests on the sputum of a 45-year-old female persistent in serious care. The motivation behind such tests is to decide the causative operator of side effects being shown by the patient other than her typical pneumonia side effects or whether the living being itself is the reason for pneumonia. Pneumonia is lung contamination that influences the alveoli and can be caused by microscopic organisms, infections or parasites (CDC). Distinctive microorganisms require different situations to recreate and take risks to human well-being (Petrakova, 2013). It will likewise be proficient in deciding the anti-infection intercession fundamental since the tests include an anti-infection susceptibility trial of the obscure living being. The examination likewise includes another example given in the research facility; additionally, of an obscure microorganism that will be described utilizing biochemical tests and anti-infection susceptibility tests.

The outcomes are required to give the particular life form or life forms displayed in each example and their responses to the presentation of the provided anti-infection agents (antibiotics).

Material And Method

For the provided sample:

- Sputum was the specimen that was collected from a 45-year-old woman patient in intensive care for three weeks.
- The sample of bacteria was coded as “sample 25,” which was taken for the biochemical characterization experiment.

First-day biochemical tests of sample 25:

HBS, CHA and MAC plates were used for culturing the sample of sputum. These plates were then placed in the incubator and incubated for 42 hours. After the incubation of 42 hours, a few biochemical tests were performed as per the RMIT Manual of Microbiology Techniques.

For the gram-negative bacteria test, a MacConkey (MAC) Agar plate was used. It was also used to determine whether or not the gram-negative bacteria were lactose fermenters.

To check whether the organism was fastidious or not, the Horse Blood Agar and CHA agar were used.

Second-day biochemical test of sample 25:

Colonial growth and morphology results were observed.

To determine the type of bacteria, i.e., Gram-positive or Gram-negative, a rapid gram stain procedure was performed. Oxidase tests were performed.

Third-day biochemical tests of sample 25:

The organism was determined by biochemical tests, and an antibiotic susceptibility examination was done.

Table1. Tests were used to derive the identity of sample 25.

Test	Source	Page
Gram staining	MEDICAL MICROBIOLOGY Techniques Manual, RMIT Department of Biotechnology and Environmental Biology, 2013	8
Oxidase test	MEDICAL MICROBIOLOGY Techniques Manual, Department of Biotechnology and Environmental Biology, 2013	20

MIL (motility, indole, lysine) agar	MEDICAL MICROBIOLOGY Techniques Manual, Department of Biotechnology and Environmental Biology, 2013	17
Nitrate reduction	Microbiology Laboratory Techniques Manual, 2013	30
Lactose, xylose peptone water	Microbiology Laboratory Techniques Manual, 2013	52
Acid-fast glucose	Microbiology Laboratory Techniques Manual, 2013	
H ₂ S production	Microbiology Laboratory Techniques Manual, 2013	
ONPG	Microbiology Laboratory Techniques Manual, 2013	
Citrate Utilization	Microbiology Laboratory Techniques Manual, 2013	

Results

Colonial progression and morphology outcomes for the sample 25:

- +++ small white colonies
- MCA plate: CO₂, 42 °C, 24 hours
- +++ small white colonies
- HBA plate: CO₂, 42 °C, 24 hours
- +++ small White colonies
- CHA plate: CO₂, 42 °C, 24 hours

Table 2 shows the results of morphology under the microscope, and biochemical tests for sample 25.

Test for the sample 20	Results
Gram stain	Gram negative bacilli
Oxidase	Negative
Catalase	Negative

Citrate utilization	Positive
Nitrate reduction	Positive
Acid from: Lactose Acid-fast glucose	Positive positive
MIL: Motility Indole Lysine decarboxylation	Positive Negative Positive
ONPG	Positive
Kligler test	Negative
Antibiotic susceptibility testing: Ampicillin 0ug Gentamicin 19ug Chlronplencol 19ug Cephalothin 0ug Cephotaxime 25ug	Resistant Susceptible Susceptible Resistant Susceptible

Gram stain

Gram-negative bacilli

Growth on MCA (+ve)

Fastidious?

No

Facultative anaerobe?

yes

Nitrate reduction

(+ve)

Oxidase test

(-ve)

Positive

Lactose test

(-ve)

Indole test

(-ve)

ONPG test

(+ve)

H₂S production

(-ve)

Acid from: fact glucose +ve

Enterobacter aerogenes

The Biochemical and antibiotic susceptibility tests were performed and the organism identified from sample 25 was *Enterobacter aerogenes*.

Laboratory Report:

Patient ID: sample 25 Patient notes: 45years old woman in intensive care with

Sputum

Dates of collection and processing: 12/4/2018

Gram: Numerous polymorphs, moderately mixed organisms resembling oral flora and a heavy growth of Gram-negative bacilli resembling *E. aerogenes*.

Culture: the Heavy growth of *E. aerogenes* and moderate growth of oral flora.

Susceptible to gentamicin, Chlronplencol and cephotaxime.

Discussion:

The biochemical characterization examination of the obscure microscopic organisms was done at the species level. No unusual outcomes were seen amid the tests. Sample 25, on which the tests were led, was found to contain the living being *Enterobacter aerogenes*. All *Enterobacter* life forms are gram-negative, and that was the correct finding of the gram stain test. Sample 25, on experiencing the gram stain test, stained on the expansion of $\text{CH}_3\text{I}_2\text{CO}$ and kept up the red shade of safranin, demonstrating the nearness of a gram-negative bacilli life form. Likewise, it developed on MacConkey agar, which contains precious stone violet and bile salts that don't bolster the development of gram-positive microorganisms. Gram-negative microbes can withstand these segments of MAC agar on account of their bile-safe external films. Likewise, the living being was resolved to be non-lactose matured, seeing as it didn't turn the medium red. Had it been lactose aging, the lactose in MAC agar would have been separated, shaping lactic corrosive, lessening Ph and turning the medium red. A few strains of *Enterobacter aerogenes* deliver prodigiosin, a red color, which could make one trust that it is lactose aging when put in MacConkey (Mahlen, 2011). Additionally, its development on the HBA and CHA agar plates that showed vast, white mucoid provinces and white settlements with red pigmentation individually demonstrated that the life form is non-exacting and facultative, matching the qualities of *Enterobacter*.

Most creatures found in the sort are oxidase, indole and urease negative, so these tests additionally filled in as an affirmation of the class. Be that as it may, a few types of *Enterobacter* cause infection while others don't. Since the example was gathered from a wiped outpatient, the biochemical tests were then directed to isolate the infection causing the non-illness-causing types of *Enterobacter*.

The indole test affirmed the presence of the malady causing *Enterobacter* spp. Kligler press agar is utilized to distinguish different sorts of enterobacteria that can mature lactose and glucose and cause the creation of hydrogen sulfide, and the outcome was negative. The indole and xylose tests were negative, affirming the character of the living being in test 25 as *Enterobacter aerogenes*.

For the anti-microbial powerlessness tests, sample 25 demonstrated protection from ampicillin and cephalothin while it was helpless against gentamicin, Chlronplencol, and cefotaxime. *Enterobacter aerogenes* contain R-factors, which are particular plasmids that convey more qualities, and this might be the reason for protection. Protection could likewise be credited to the Chromosomal AmpC β -lactamase of *Enterobacter aerogenes*. The creature likewise has efflux pumps that dispose of poisons that discover their way into the life form, and this might be another reason for protection.

Enterobacter aerogenes is an Enterobacteriaceae that is gram-negative, non-lactose aging, DNase creating the living being that can cause contamination. *Enterobacter aerogenes* was found by Hormaeche and Edwards in 1960. *Enterobacter aerogenes* is a Gram-negative, oxidase-negative, catalase-positive, citrate-positive, indole-negative, bar-shaped bacterium. The bacterium is around 1-3 microns in length and is fit for motility utilizing peritrichous flagella.

E. aerogenes is a nosocomial and pathogenic bacterium that causes sharp defilements including most sorts of illnesses. The bigger part is delicate to most against disease operators planned for this minute life forms class, yet this is entrapped by their inducible insurance segments, particularly lactamase, which infers that they quickly end up impenetrable to standard antimicrobials in the midst of treatment, requiring an alteration in hostile to microbial to keep away from increasing of the sepsis.

A bit of the sickness caused by *Enterobacter aerogenes* comes about going from specific hostile to contamination solutions, venous catheter considerations, and surgical frameworks. *E. aerogenes* is, all things considered, found in the human gastrointestinal tract and does not all around reason illness in strong individuals. It has been found to live in various wastes, sterile chemicals, and soil. The bacterium, moreover, has some business enormity – the hydrogen gas conveyed in the midst of development has been investigated in diverse roads using molasses as the substrate.

E. aerogenes is an exceptional hydrogen creator. It is an anaerobic, facultative and mesophilic bacterium that can exhaust particular sugars, and instead of the advancement of strict anaerobes, no exceptional assignment is required to remove all oxygen from the fermenter. *E. aerogenes* has a short duplicating time and high hydrogen productivity and improvement rate. Also, hydrogen age by this bacterium isn't subdued at high hydrogen midway weights; in any case, its yield is cutting down stood out from strict anaerobes like *Clostridia*. A speculative most extraordinary of 4 mol H₂/mol glucose can be conveyed by strict anaerobic tiny living beings. Facultative anaerobic microorganisms, for instance, *E. aerogenes* have a theoretical most outrageous yield of 2 mol H₂/mol glucose. It was starting now and into the foreseeable future, be perceived as a sharp pathogen that is responsible for countless office-acquired pollutions.

The living thing has been exhibited to cause afflictions of the central tangible framework, for instance, meningitis, pneumonia and other respiratory tract defilements, sicknesses of the urinary tract, dissemination framework pollutions, for instance, endocarditis and even wound defilements (Mahlen, 2011). Mahlen's examination, in like manner, reports an occurrence of the living being found in the sputum of pneumonia calm and the colonization of a patient's respiratory tract by a comparable animal. Regarding the sputum case from the relevant examination, the living being may have either been accountable for pneumonia or found its way into the patient's respiratory tract after narrowing of the ailment. In hazard groups for compression of contaminations caused by this living being are kids under five years old and old individuals as for the situation examined above.

In Conclusion, the creature is principally either group-obtained or clinic-procured, and he might be the reason why it was available in the emergency unit sputum. Notwithstanding, aversion is constantly superior to cure and measures to keep the event and spread of this species ought to be taken through sufficient cleanliness and separation of debilitated patients.

References

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