microbiology case study essay sample

ASSIGN BUSTER

INTRODUCTION

Microorganisms cause a great amount of diseases. For healthcare providers it is very important to be aware of what organisms are pathogenic and cause a disease and, therefore, to find an appropriate treatment. Different microorganisms require various environments in order to replicate and to become dangerous for a person’s health. An integral part of any medical treatment is to be able to recognize and identify a specific bacterium that can create potentially a big problem for a patient. Current study aims to identify unknown microorganisms using all the necessary test and techniques, learnt during microbiology laboratory classes.

MATERIALS AND METHODS:

A tube labeled 117 was given out by the lab instructor. The tube contained two different types of bacterium. In order to identify what bacterium were present in the tube isolating techniques were performed first. Using lab manual recommendations the first procedure was isolating pure cultures. Using inoculating loop and dry heat technique, isolation streak was performed and nutrient agar plates were to be incubated in a room temperature for the next 48 hours. Nutrient Agar plate was used for isolation streak technique in order to see two types of bacterium growing in a room temperature. After incubating for 48 hours Nutrient agar plates were examined for bacterial growth of two different colonies. On a Nutrient agar plate two different cultures were observed. In order to proceed identification, those cultures were isolated as separate organisms, using inoculating streak technique and incubated until the next class period. The expected result was supposed to show Gram positive and Gram negative bacterium growing on a

separate media. Having checked two Nutrient plates, signs of visible growth of two different bacterium were present.

Due to the fact, that one type of bacteria didn’t appear to be fully grown (only one visible different color dot), the result couldn’t be considered successful and most likely the plate was contaminated. In order to get accurate results the inoculation and separation techniques were conducted again from the beginning, taking tube labeled 117 and using inoculating streak technique. After five days of incubation the result showed only one type of bacteria growing. Conducting Gram staining procedure, bacteria that showed most of growth turned out to be Gram negative rods/bacillus. For further accurate results inoculated plate was kept in the incubator for another 48 hours. The result was confirmed to be Gram negative bacillus. For identification Gram positive it was necessary to perform Mannitol Salt Agar (MSA) test, which inhibits growth of Gram negative bacteria and lets Gram positive bacteria grow. From a nutrient plate in order to identify the type of Gram negative bacteria (isolated Gram negative) following tests were performed:

Indole (SIM)

Simmons Citrate

Methyl Red (MR)

Voges-Proskauer (VP)

Nitrate

MSA for Gram positive and previously mentioned tests for gram negative were incubated for further examination. Nitrate and MR-VP tests were

supposed to be redone, due to a technical mistake. After accurately conducted test, the results of Nitrate test and MR-VP tests turned out to be negative. Indole test was negative as well and didn’t show any color change. However, Simmons Citrate was positive, showing that Gram negative bacteria can use citrate its sole carbon source and therefore, color of the slant was changed from green to blue. After performed test it was possible to eliminate tree types of Gram negative bacteria. They were Escherichia coli, Pseudomonas aeruginosa and Proteus vulgaris. In order to identify which Gram negative bacteria was present, Klebsiella pneumonia or Enterobacter aerogenes, it was decided to perform Urea test, that finally confirmed that gram negative unknown was Enterobacter aerogenes. Checking MSA plate Gram positive bacterium were actively growing and Gram stain procedure confirmed that the bacteria was Gram positive cocci. For further accuracy a small amount was isolated from MSA into Nutrient agar to confirm the result. Based on Gram staining, second bacteria turned out to be Gram positive cocci, therefore, two types of Gram positive bacillus could be successfully eliminated. They were Bacillus Cereus and Bacillus subtilis. For further Gram positive bacteria identification following tests were conducted:

Nitrate

Simmons Citrate

Urea

Indole (SIM)

Mannitol (fermentation tube)

Checking the results, Nitrate, Simmons Citrate and Indole tests showed negative result, however Urea test showed positive result that eliminated

Staphylococcus aureus and Enterococcus Faecalis. Contradictory results were shown in Mannitol (fermentation) test, which returned positive, eliminating Staphylococcus epidermidis. Based on the conducted test it wasn’t possible to come to an accurate conclusion which Gram positive bacteria was isolated.

Selective media, that inhibits Gram negative bacteria. To isolate gram positive. NoneColor of the agar changed from pink to yellow, obvious growth of bacteriaPositive resultGram stainTo determine bacteria reaction to Gram stainingCrystal violet, Iodine, decolorizer, SafraninPurple dot-shaped microorganismsGram positive cocciIndoleTo determine an ability of bacteria to convert tryptophan to indole1 ml of indole reagent added to tryptone broth. No color change. Negative resultSimmons citrateTo determine if a microbe can use citrate as a sole carbon sourceNoneNo color changeNegative resultNitrateTo determine if microorganism is capable to reduce nitrate to nitriteNitrate I & II, zincNo color changeNegative resultUreaTo determine if bacteria is capable of hydrolyzing urea using urease. NoneColor changed form yellow to bright pinkPositive resultMannitol (fermentation)To determine carbohydrate fermentationNoneColor change from red to yellowPositive result

All of the following tests were performed on this unknown:

1 Mannitol salt agar (MSA)

2 Gram stain

3 Indole

4 Simmons Citrate

5 Nitrate

6 Urea

7 Mannitol (fermentation)

DISCUSSION/CONCLUSION

After conducting previously mentioned biomedical tests in order to identify the unknown bacteria, it became obvious that unknown Gram negative was Enterobacter aerogenes. Having eliminated all the bacteria that didn’t show expected results and confirming with such tests as Simmons citrate and Urea, it was accurate to name the unknown Gram negative. Gram positive, on the other hand, leads to contradicting results. After Gram staining test, it was obvious that the unknown bacteria was cocci, however such tests as Mannitol (fermentation) and Urea returned with the contradictory results. In order to identify the type of microorganism all other possible tests were conducted, but nevertheless, a final conclusion could not be successfully made. There can be different explanations to that, either initial unknown was contaminated or some of the tests were conducted incorrectly. According to microbiology instructor Gram positive bacteria was Staphylococcus aureus, that leads to the conclusion that final Urea test had shown wrong results. For future healthcare providers, it is extremely important to be able to identify what kind of pathogen is thriving in a patient’s organism.

Different microorganisms have alternative ways to become resistant to antibiotics. Current study is a great example of how easy it is to make a mistake when the unknown organism is identified incorrectly. Bacterium have structural differences, therefore it is very important to know how to distinguish them and what treatment to prescribe, at the same time not harming healthy human cells. In this study in the tube # 117, there were two

bacterium Staphylococcus aureus and Enterobacter aerogenes. Staphylococcus aureus is a common type of bacteria for a human being. It can be present on the skin or in the nasal cavity of a person. Under normal circumstances it doesn’t cause any problems, however, if a patient has a compromised immune system Staphylococcus aureus can become a serious problem and lead to Methicillin resistant Staphylococcus aureus (MRSA). MRSA is a type of staph bacteria that can be easily spread through a physical contact with a sick person. Unlike other staph infections, MRSA is very hard to treat, due to the fact that it is resistant to a majority of antibiotics, including Methicillin, which is a part of most common antibiotic group – Penicillin.

MRSA is a bacteria that is considered to be a “ super bug”. It can’t be easily treated with common antibiotic because of the staph strains that form a resistance. When certain types of antibiotic are overused or used incorrectly MRSA changes it structure and develops causing infection. MRSA used to be hospital-spread infection and was common among already sick people. However, today there are more and more cases of healthy people getting MRSA, meaning that this bacteria not only develops and becoming more resistant to a treatment, but also it finds the way to get out from hospital environment and target people outside medical facilities. Knowing the differences in bacterial structure and response is essential for all future and current healthcare providers. Dealing with people’s lives and health is it necessary to know what kind of antibiotic can be prescribed to a patient in order to fix his problem. Therefore, knowing bacterial respond to alternative treatment can improve a patient’s health and safe life.

REFERENCES

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