

HOW TO WRITE AN UNKNOWN LAB REPORT IN MICROBIOLOGY

GENERAL

Unknown reports in microbiology are written in scientific format. Scientific writing is written differently from other types of writing. The results of the exercise or experiment are what are being showcased, not the writing. The purpose of scientific writing is not to entertain, but to inform. The writing should be simple and easy to understand. There is a specific style that must be followed when writing scientific reports.

Scientific writing is typically written in the passive voice. The pronouns "I", "We" and "They" are not typically used.. For example, instead of writing "I used a TSA agar plate to isolate my unknown," it is customary to write, "A trypticase soy agar (TSA) plate was used to isolate the unknown."

It is also customary to write in the past tense for most of the report. This includes the introduction, the summary, the description of the materials and methods and the results. The present tense is reserved for the conclusions about the results. See the examples given below.

Some other general rules that should be followed are:

Microbial nomenclature: The name of the bacterium should be written and spelled correctly. The name should be italicized or underlined. Italicized is preferred. For example, *Staphylococcus aureus*.

The genus is capitalized but the species is not. After the full genus name is given in the paper, it can be written as *S. aureus*, but still italicized. This is as long as there are no other genera in the paper that start with the same letter.

PARTS TO THE UNKNOWN LAB REPORT

(Note: Other than the title page, the pages of the report must be numbered)

TITLE PAGE

There should always be a title page and should include the following information:

EXAMPLE OF TITLE PAGE

Title should be centered and at the top or in the middle of the page

UNKNOWN LAB REPORT # 1

This information should be centered and at the bottom part of the title page:

UNKNOWN LETTER (OR NUMBER)

YOUR NAME

DATE (the due date)

LAB INSTRUCTOR'S NAME

COURSE NAME

SEMESTER / YEAR

SECTION NUMBER

INTRODUCTION

This section introduces the reader to the study and why the study was done. This should only be a few sentences long.

Example: "There are many reasons for knowing the identity of microorganisms. The reasons range from the knowing the causative agent of a disease in a patient, so as to know how it can be treated, to knowing the correct microorganism to be used for making certain foods or antibiotics. This study was done by applying all of the methods that have been learned so far in the microbiology laboratory class for the identification of an unknown bacterium."

MATERIALS AND METHODS

This is where the details of the study are listed. Where did the specimen come from, and what methods were used to identify it? Be specific, but do not re write the lab manual. One way is to mention the names of the materials used and reference the lab manual for the procedure or method and then continue to elaborate when necessary. See example 1.

Example 1: "An unknown labeled as letter G was given out by the lab instructor. The methods that have been learned thus far for identifying bacteria have been applied to this unknown. Procedures were followed as stated in the course laboratory manual by De Mers (1), unless otherwise noted.

The first procedure that needed to be done was to streak the unknown out on a Trypticase Soy Agar plate, using the T streak method described in the lab manual.. This needed to be done in order to test the purity of the unknown. After the plates were incubated and grown, the morphology was observed and recorded and a Gram stain was performed. Quality control bacteria were Gram stained along with the unknown to make sure that the Gram stain reaction was done correctly . After determining the Gram reaction, specific biochemical tests were performed. The biochemical tests were chosen from the unknown identification tables that were in the lab manual. Since unknown G was determined to be a Gram negative rod, an oxidase test was performed and the organism was inoculated into a BCP lactose tube. Note all of these tests were performed by the methods listed in the lab manual by De Mers (1). Table 1 lists the test, purpose, reagents and results. All of the following tests were performed on this unknown:

1. Oxidase test
2. BCP Lactose
3. Indole
4. H₂S
5. Citrate
6. Motility
7. Methyl Red
8. Urea"

Another way is to write out the methods in detail in either a paragraph form or listed. This way is not necessary for this type of paper, since this is lab report for the identification of an unknown bacterium and the methods are explained in detail in the lab manual. If there is a procedure that the instructor added or made changes to, or the student used another procedure not in the course lab manual, then it should be written out and referenced. See some of the examples of papers identifying an unknown from the web sited below.

RESULTS

This is where the results are summarized. The method results should be in a table format (see examples below). This is also where the flow chart showing how you arrived at the answer is stated. A short paragraph explaining how the results are presented can be included.

Example: Unknown G had the following morphology on a TSA plate: medium sized opaque cream colored colony. After determining that it was a Gram negative rod, an oxidase test was performed and it was inoculated into a BCP lactose tube and onto a TSA slant. Table I lists all of the biochemical tests, their purpose and results. The results are also shown in a flow chart form.

Example: Table 1: Biochemical Test Results

TEST	PURPOSE	REAGENTS	OBSERVATIONS	RESULTS
Gram stain	To determine the Gram reaction of the bacterium	Crystal violet, Iodine, Alcohol, Safranin	Pink rods	Gram negative rods
Oxidase test	To determine the presence of cytochrome c	Oxidase paper	Purple / black color change	Positive oxidase test
BCP Lactose	To determine the ability of a bacterium to ferment a specific carbohydrate	None	Color change from purple to yellow	Positive lactose fermenter
Indole Test	To determine the ability of an organism to split indole from tryptophane	Kovac's added to 1 ml of tryptone broth	Red Ring at top of broth	Positive indole test
ETC.				

Another type of table: Table 1: Physiological and Biochemical Results

TEST	REAGENTS OR MEDIA	TEMP	OBSERVATIONS	RESULTS	INTERPRETATIONS
Citrate	Citrate slant (green)	35 ⁰ C	Color changed from green to blue	Positive	Organism is able to utilize citrate as a carbon source
Methyl Red	MRVP	35 ⁰ C	After adding methyl red to one ml, color changed from light yellow to a darker yellow	Negative	Organism is not able to produce large amounts of acid from glucose fermentation

FLOWCHART

UNKNOWN G



Gram stain



Gram negative Rod



Oxidase test (positive)

Positive

- Citrobacter freundii*
- Enterobacter aerogenes*
- Escherichia coli*
- Klebsiella oxytoca*
- Klebsiella pneumoniae*
- Pseudomonas aeruginosa*
- Pseudomonas aureofaciens*

Negative

- Proteus vulgaris*
- Proteus mirabilis*
- Serratia marcescens*
- Morganella morganii*



Indole test (Positive)

Positive

- Escherichia coli*
- Klebsiella oxytoca*

Negative

- Citrobacter freundii*
- Enterobacter aerogenes*
- Klebsiella pneumoniae*



Citrate Test (negative)

Positive

- Klebsiella oxytoca*

Negative

- Escherichia coli*



Motility Test (positive)

- Escherichia coli*



Methyl Red Test (positive)

- Escherichia coli*

Unknown B - *Escherichia coli*

DISCUSSION / CONCLUSION

This section interprets the meaning of the results. The following questions should be answered here: How did the test result lead to identification? Was it the correct identification? If not, why not. What problems were encountered? This is also where the background information on the organism (environment/pathogenicity) that was identified is mentioned.

Example of a discussion: After several differential tests, it was concluded that unknown G was *Escherichia coli*. After performing the Gram stain to determine that the unknown was a Gram negative rod, the organism was grown on a TSA slant for use in inoculating the rest of the biochemical tests. All of the biochemical tests worked well except for the indole test. It gave a false negative result at first. This was determined since it was inconsistent with the rest of the result. The TA suggested that the test be repeated and it was repeated. The repeated test gave a positive result, consistent with the other data. Therefore it was concluded that the unknown was *Escherichia coli*. THIS CAN BE ELABORATED MORE FOR EACH TEST.

E. coli is in the Enterobacteriaceae family. It is typically found in the human intestines, as well as other animals. It can cause disease in the right host. THE REST OF THIS INFORMATION SHOULD BE RESEARCHED FROM THE TEXTBOOK, INTERNET OR OTHER MICROBIOLOGY RESOURCES.

REFERENCES:

Note: the minimum number of references is three, the lab manual, textbook and atlas. More can be used. Correct reference format must be used. References should be numbered and the number added to the report when necessary. See example 1 under materials and methods. Spelling of the authors of the references must be correct.

Example:

1. De Mers, Marlene. Fundamentals of Microbiology Laboratory Manual, 4 th edition. San Diego: Montezuma publishing, 2004
2. Tortora, Funk, Case, etc.....
3. Leboffe, Michael, etc.....
4. http://oregonstate.edu/dept/microbiology/writingmanual/WIC_WritingManual.pdf

SOME ADDITIONAL POINTS:

1. Attach both the working worksheet and the final worksheet
2. Attach the unknown identification table that was used for identifying the unknown with the marks used to help narrow down results.
3. Number the pages
4. Use a spell checker
5. Check out the following book from the library: "Successful Lab Reports" a manual for science students by Christopher S. Lobban and Maria Schefter.
6. Use the comments from the instructor for the first report to write the second report even better.
7. Check out the following PDF file on the web:
http://oregonstate.edu/dept/microbiology/writingmanual/WIC_WritingManual.pdf