# Essay on food testing

Literature, Russian Literature

# Introduction

Food items are always prone to spoilage which in most of the cases is precipitated by an increase in bad microbes that cause the food to change its property and thus food becomes unsafe for eating. The main purpose of inspection of food is to trace the presence of bad microbes that are available in most of the food products but below certain level they are harmless. Microbes are nothing but cells which are so microscopic that it is not possible to detect them when they are in very small numbers. In order to detect the presence of harmful microbes, the testing techniques that are used involve methods to increase the number of microbes present in a food to a certain level so that they are easily detectable. Once the presence of microbes is detected, then whether the microbes are good or harmful is determined. The purpose behind conducting a microbiological test on food is to identify the presence of these microbes and their good and bad effect on the final food product. The presence of some microbes increases the shelf life of a food product and on the other hand some quicken the process of spoilage.

In our case “ Milk” has been returned by the customer and it is visibly different from the natural texture and color of the normal item which is sold. We will discuss the general procedures for microbiology testing and also discuss specifics for testing milk in the following discussion. Even before we proceed with a microbiology test we first need to collect some information that will make the testing phase easier for us.

## Step 1: Information Gathering

Before we go into the laboratory to test the returned food we need to find out the following:

- First we must try to determine the source of the food (milk in this case) or in other words where it was produced.
- Once we gain information about the source of the food, we would try to determine under what environmental conditions, temperature, pressure and moisture level the food was produced.
- Once that is done, we would try to obtain information regarding the amount of time the food stayed in the storage and under what condition ( temperature, pressure and other factors)
- Then we would determine how the food was delivered to the customer (transportation and then handling).
- Also we would try to gather information from the customer for how many days or under what circumstances he/she kept the food before it was spoiled.

## Step 2: Visual Inspection

As in our case there were some visible signs of contamination in the food product, a deeper visual inspection may reveal the reasons of spoilage of the food. The following things can be checked and concluded:

- If there is slime formation, bad odors and discoloration (grey, brown, green) :
- There is chance that excess bacteria or yeast related spoilage has taken place.
- If the food was packed in a vacuum based packet and smells like some

distinctive pungent organic gas—

- Chances of bacteria related spoilage.
- Sticky Surface and fuzzy whisker appearance ---
- Molds caused spoilage.
- Normal Appearance ---
- Needs further investigation for other dangerous pathogenic microbes.

## Step 3: Sample Preparation/ Pretreatment

As we have already collected the sample our next action would be to look into the sample preparation known as the pre-treatment of the sample food. Depending on the type of sample, solid or liquid, the sample preparation varies. Below diagram shows a typical sample preparation process flow.

Figure 1: Sample Preparation process (Waters Corporation, Sample Pre-treatment and preparation for food analysis 2012)

Sample treatment turns the sample into a form which will be easy to test and culture in the next phase of testing and will remove the common interferences. For example, salt is a common interference that causes problem while testing salty snacks. (Waters Corporation, Sample Pre-treatment and preparation for food analysis 2012)

The first step involved in sample preparation is to extract the target analytes. First, for solid samples, the sample is cleaned to get rid of any external dirt or dust particles or mud etc. It can be done by simple washing but too much of washing can cause alteration in the texture and the property of the food. After that the sample is crushed or ground in order to be made more homogeneous so that when testing is done, we can quickly determine if any part of the sample has the same property. It is done using mixer

grinder, stirrer, agitator etc. Once the first two steps are done, external moisture from the sample is taken out so that it does not contribute to the heterogeneity of the sample. However, the food should not be dried at very high temperature as that can cause the analytes to die or some uncalled for chemical reaction may occur at high temperature. Next step involves removing the interferences from the sample. Common interference like lipid in milk product can be easily extracted using some well-known chemicals. After the extraction often the sample is passed through a filter for absorption of interferences. H2SO4, Florisil, Alumina, Silica gel are most commonly used to clean up material. In recent years more sophisticated techniques have emerged. Matrix Solid Phase Dispersion (MSPD) is one of them. In this case blending, clean-up and extraction are done in one single step. In MSPD the sample is mixed with a resin (it varies with the type of food sample) such as C8 and C18. Liquid food samples are in many cases much easier to prepare for the actual test than the solid ones. The last phase of sample preparation is the analyte extraction. LLE (liquid –Liquid Extraction) is one of the most used methods. This is used for the analysis of toxins in foods like milk, beer, soft drinks etc (Curren and King, p 869-875).

In case of milk, we need to take out the Matrix elements like fats, lipids. Milk fats are dispersed on water so just making a watery solution will not take out the interference. A solution made out of silica, alumina or florisil will be able to take out the milk fat out of the solution. These non-polar solvents will reduce the effect of fat and the solution will be ready for use.

## Step 4: Culture Media Preparation

Culture media is the medium where microbes like bacteria from a food sample can grow into a big colony and become easily identifiable. There are simple media including chocolate-agar, blood agar, peptone water etc.

Figure 2: Culture Media (Wiki, what is culture media, 2013)

Media varies depending on factors like ingredients, pH, density etc. For example, Peptone water contains.

## Peptone -10gm.

Sodium Chloride - 5gm.

Distilled water - 1000ml.

Once these ingredients are put together, the mixture is warmed to dissolve sodium chloride and the culture media is sterilized at high pressure and kept in bottles or tube till the time it is used for testing. (Nitin, Preparation of Culture Media, October 2009). The main parameters important for the preparation of any culture media are percentage of ingredients, pH value and sterilization. Once prepared the culture media should be stored in a controlled environment with no chances of contamination and regulated temperature (15-20 deg C)

For milk most commonly used culture media are AGAR. For milk testing we can select some of the agar. Like Eliker Broth culture media can be used for detecting Lactobacillus bulgaricus. BSM Broth can be used to identify and isolate Bifido bacteria.

## Step 5: Inoculation

In previous steps we have prepared the sample and extracted the analyte from it. Also, in step 4 we have created the culture media. Once these two steps are completed, it is time to transfer some part from the prepared sample to the culture media. It should be done with utmost care. This process of mixing a slight amount of sample to the culture media is called inoculation. There are several different types of tools used for this transfer, wire loop made out of platinum or nicrome being the most common ones.

Figure 3: Inoculation wire loop (Wiki, Inoculation loop, 2013)

The wire loop is first heated till it is red hot to sterilize it. Then it is cooled down to normal temperature and then with the help of the small loop (around 5mm) a very tiny portion of the sample is collected (surface tension helps) and put into the culture media. Do not use the wire loop while it is still hot as it may kill all the bacteria in the sample.

## Step 6: Incubation and Temperature Monitoring

Once the sample is put into the culture media it is time to monitor it. The process of culturing or cultivating bacteria is same as the process of incubation. In this phase a controlled environment is maintained. The main factor is to maintain the temperature at a level where the growth of the bacteria is highest. Often temperature between 20-40 deg C is maintained in this phase.

## Step 7: Rapid Microbiology

In normal circumstances even in culture media and under controlled environment the growth of many bacteria can take days or even weeks.

Often it is not a viable option to test food in a commercial environment. The need is to create an environment or equipment which can accelerate the growth rapidly or an equipment which can detect even the smallest colony formation of bacteria. These methods which detect the microbes fast are known as Rapid Microbiological methods (RMM). Most of the RMMs use techniques to detect bacteria colony formation much earlier than conventional methods. For instance, RMMs which employ impedance method checks the resistance at different points in time and a decrease in resistance/impedance indicates bacterial growth. There are many other RMM techniques which can be used to detect quickly. RMM techniques have started gaining popularity and there are several manufacturers which sell commercial RMM machines for quick detection of growth.

In the absence of RMMs, classical techniques should be used to detect the colony. The culture of the media should be continued till the solution becomes turbid. Once it is turbid, use microscope to find any colony formation in the culture media to conclude which bacteria or microbe was present in the food sample.

In case of milk coliform colony forming can be found out after few days from agar plate. Bactoscan analysis of the agar plates will give us results about Lactobacillus presence and other type of bacteria analysis.

## Step 8: Disposal

Once the testing is done the waste food should be disposed of as per the law of the country and state. In some countries the laboratory equipment or food processing units can be washed with water or chemical and that water can be drained through sewer but in most of the countries it is not permitted. It

should be treated in house before disposing into sewer system or into some trap system.

## Conclusion

Food testing is a very important part of the commercial food business. Any contamination in any part of production or supply chain can cause the food to get polluted by some bad microbes which will make the food inedible. In order to make sure that the food production and distribution process are generating safe and healthy food products, multiple testing stages are put in place. Regular sample collection from different stages of food production and then testing them rigorously using the above 8 stages will ensure food safety and early detection of any problem.

In case of milk as it is a liquid sample it is much easier to culture see the results. However, If you encounter any other type of sample you can use the above methods to do the analysis.

## References

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