# turnitin_analysis TPC on snacks_fhasya

*by* maulin inggraini

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# ANALYSIS TOTAL PLATE COUNT (TPC) ON SNACKS

**Fhasya Algina Hawatul Haq[1], Najwa keumala Putri[1], Muhammad Aufa Wirayudha[1], Irvan Christian[1], Putri Novianti[1], Hany Pratiwi[1], Mira Karlina Br Sebayang[1], Trisyah Meistya Ardhiani[1], Shabrina Zatil Nur Aqmar[1], Mutiara Rengganis[1], Muhammad Wahyu Saputra[1], Dian Navita Purwati[1], Dinnar Rofah Hadi[1], Lolita Purnomocasi[1], Tiar Ayu Kumala[1], Sarsya Mardliyah[1], Keisya Nur Raudah[1], Maulin Inggraini[2],**

**Abstract**

**Introduction:** Snacks are a type of food that is often eaten outside the time of the main meal and it is usually consumed to relieve hunger for a while, in the community are a necessity that cannot be separated in daily life. The composition contained in snacks varies which can provide benefits and can even cause various problems for the health of the body, for example microbial contamination found in snacks. Microbial contamination found in snacks can be related to the process of selecting raw materials, production processes, packaging processes, marketing processes, and food storage processes. The purpose of the study was to test microbiological samples of snacks based on the Total Plate Count (TPC).

**Method:** The methods used in this study are quantitative. The study was conducted in June 2022 at the Bacteriology Laboratory of STIKes Mitra Keluarga, Bekasi City. The sample of snacks that used in this study was collected by 17 people. The snacks are weighed as much as one gram and mashed first, then diluted to a dilution of $10^{-4}$. In the $10^{-3}$ and $10^{-4}$ dilutions, the samples were incubated using the spread plate and pour plate methods at 37°C for 1x24 hours. After that, the colonies formed were counted using the Total Plate Count (TPC) formula and reported in units of CFU's/mL.

**Results:** The results of this study indicate that from 5 samples of snacks, there is 1 sample of snacks that have a Total Plate Count (TPC) value greater than 2.500, namely the egg drop biscuits sample with a Total Plate Count (TPC) value $1{,}3\times10^{6}$ CFU's/mL.

**Conclusion:** After conducting research on samples of snacks, it was found that one of the five samples used, egg drop biscuits had the highest Total Plate Count (TPC) numbers, which is $1{,}3\times10^{6}$ CFU's/mL. Then the sample of egg drop biscuits exceeds the standard from SNI 01-3553-2006 which has beenset, namely with the maximum Total Plate Count (TPC) limit $1\times10^{5}$ colonies/ml.

***Key words*** : Nutrient Agar, Pour Plate, Snacks, Spread Plate, Total Plate Count (TPC)

## INTRODUCTION

Snacks are food that can relieve hunger someone temporarily very attracted by various groups, especially children and teenagers because of the different colors interesting and delicious taste. The rise Various types of food that are produced and consumed by various groups in this modern era are increasing from year to year. This development is due to the community's need for snacks and the public's desire to enjoy the different flavors offered by producers in food with an attractive appearance and affordable prices, so the right decision to enliven the industrial world is snack food. Snacks are found in many places such as in shops, mini markets and supermarkets (Oktavia, 2018). The presence of microorganisms that are certain pathogens or microorganisms that need to be careful in snacks can cause health problems consumer. This can be caused by snacks directly in into the consumer's body and digested by stomach which will indirectly circulated throughout the body (Oktavia, 2018).

Based on Food Law No. 7 years1996 (Mukhtar et al., 2017), the safety of a food is condition and effort needed to prevent food from possible biological, chemical and other objects that can interfere, harm and endanger human health. Microbiological analysis is important in determine the safety and quality of a food (Stahlhut, Struve, Krogfelt, & Reisner, 2012). Safe products are products that are free of preservatives or chemicals that are not recommended. Regulations and SNI set two types of maximum limit for Total Plate Count (TPC), from start to end. The regulation does not explain the initial and final information, while SNI explains that the initial TPC is tested at the factory and the final TPC is tested on the market. The maximum limit of the initial TPC is $10^{2}$ CFU/ml while the final TPC is $10^{5}$ CFU/ml. For purpose of compliance with

microbiological criteria for the final product of a lot/batch, generally only one criteria is established for TPC (Makhabbah, 2022).

One of the parameters used in determining the feasibility and safety of food is to measure the microbiological content of food. Given the low price, the concern that arises is the use of raw materials that have the potential to enter food or beverage contaminants in the form of microorganisms that are harmful to the body. The presence of these microorganisms can cause digestive disorders. Foods whose safety quality is guaranteed are those that are free from biological hazards, chemical hazards, and physical hazards (BPOM RI, 2012). Biological hazards result from living things such as microbes that can produce toxins, which can cause disease (FAO, 2009). The results of research in 2012 by the Food and Drug Supervisory Agency (BPOM) showed that there were 141 extraordinary cases due to food poisoning. One of the causes is the addition of preservatives, dyes and harmful microbial contamination. not meeting food safety standards can cause health problems (Rizki, 2016).

Microbiological contamination testing on snacks includes quantitative and qualitative tests. The quantitative microbiological contamination test is the Total Plate Count (TPC) test, while the qualitative microbiological contamination test is the Most Probable Number (MPN) test (Oktavia, 2018). In this study, only quantitative tests were carried out by analyzing the total number of plates using the pour plate and spread plate methods Microorganisms contained in snacks can potentially cause food infection and food intoxication so snacks consumed can cause diarrhea and even poisoning for consumers (Depkes RI, 2006). The aim of this study is to determine the amount of Total Plate Count (TPC) with the pour plate and spread plate methods on snacks, namely sugar crackers, grilled corn, roast beef sticks, cassava clanting, and egg drop biscuits.

**METHOD**

The methods used in this study are quantitative. The study was conducted in June 2022 at the Bacteriology Laboratory of STIKes Mitra Keluarga, Bekasi City. The sample of snacks that used in this study was collected by 17 people. The snacks are weighed as much as one gram and mashed first. In this study, two methods were used. which is spread plate and pour plate methods. For the spread plate method, the sample that has been weighed and mashed is then put into a test tube that contains 9 ml of sterile distilled water for the first dilution, then a gradual dilution is carried out to a dilution of $10^{-4}$. The last 2 dilutions were planted as much as 0.1 ml onto NA (Nutrien Agar) media twice for each dilution (duplo). After that it is leveled with drugalsky rods. Incubate at 30° C for 1-2 x 24 hours. After growing, the colonies were counted.

Foe the pour plate methods, The samples that were weighed and crushed were then put into a test tube contains 9 ml of sterile distilled water for the first dilution, followed by a gradual dilution to a dilution of $10^{-4}$. The last 2 dilutions were taken as much as 1 ml and inoculated into in an empty petri dish and then add the liquid NA (Nutrien Agar) medium, do it in duplicate for each dilution. Flatten the surface by shaking the petri dish to form a figure 8. Incubate at 30° C for 1-2 x 24 hours. After growing, the colonies were counted.

The colony requirements determined to be counted are as follows ; one colony is counted as 1 colony, two overlapping colonies are counted as 1 colony, several related colonies are counted as 1 colony, two colonies that are close together and can still be distinguished are counted as 2 colonies, colonies that are too large (larger than half the area of the cup) do not counted, colonies that are less than half the size of the cup are counted as 1 colony. Formula to calculate relative cells (CFU's/ml = number of colonies x dilution factor).

The formula for calculating the total plate number according to SNI 01-2332.3-2006. A plate containing less than 25 colonies or plates without colonies, if the two dilutions used, the colonies are less than 25, then record the colonies present, but express the calculation as less than 25 and multiplied by 1/d, where d is a factor the first dilution used and reported as an estimate TPC. If a plate containing 25-250 colonies the formula is,

$$N = \frac{\sum C}{[(1xn_1)+(0,1xn_2)]x(d)}$$

N= Number of colonies (colonies/ml or colonies/g)
C = Number of colonies in all counted plate
$n_1$= Number of plates in the first calculated plate

$n_2$= Number of plates in the second calculated plate
d = First dilution calculate

**RESULTS**

Based on the results of the Total Plate Count (TPC) analysis on snack samples that have been carried out by Medical laboratory technology students batch 2021 STIKes Mitra Keluarga below are obtained:

Table 1. Total Plate Count (TPC) result

| No. | Sample | TPC (CFU's/mL) |
|---|---|---|
| 1 | Sugar crackers | $2,5\times10^4$ CFU's/mL |
| 2 | Grilled corn snack | $2,5\times10^4$ CFU's/mL |
| 3 | Roast beef stick | $2,5\times10^4$ CFU's/mL |
| 4 | Cassava klanting | $2,5\times10^4$ CFU's/mL |
| 5 | Egg drop biscuits | $1,3\times10^6$ CFU's/mL |

The results of the Total Plate Count (TPC) analysis on five samples of snacks obtained the highest result, $1,3\times10^6$ CFU's/mL which is from the egg drop biscuits sample. Meanwhile, for the lowest result, $2,5\times10^4$ CFU's/mL. On nutrient agar media, the bacteria that grow from the snack samples looks white (Nonpigmented) with a convex surface.

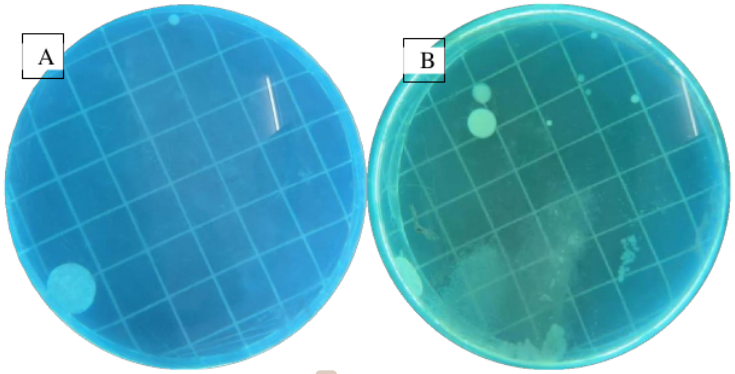


**Figure 1.** (A) Bacterial colonies from snack sample on nutrient agar media with pour plate method (B) Bacterial colonies from snack sample on nutrient agar media with pour plate method.

**DISCUSSION**

After observing, based on the results obtained of the Total Plate Count (TPC) analysis on five samples of snacks obtained the highest result, $1,3\times10^6$ CFU's/mL which is from the egg drop biscuits sample. Meanwhile, for the lowest result, $2,5\times10^4$CFU's/mL. Based on guidelines contamination criteria from SNI 01-3553-2006 on snacks maximum Total Plate Count (TPC) limit $1\times10^5$ colonies/ml. So in this study, 1 out of 5 samples could be declared unfit for consumption because the number of bacteria had exceeded the threshold. In this case, there are several factors that can cause contamination of the snacks. Storage conditions after drying may also be of high humidity, thus leading to an increase in moisture levels here creating conducive environments for growth and proliferation of microorganisms. Unhygienic conditions during production (for instance, lack of protective clothing, lack of hand washing areas, drying on dirty surfaces), storage and slow sun-drying especially during the rainy seasons, often results in bacteria and mould contamination (Chiona et al., 2014). Generally, the bacteria that contaminate food are salmonella sp. and

Escherichia coli. If food contaminated with these bacteria is consumed and enters the body of a person who has a weakened immune system, it can cause bacterial poisoning or infection. Symptoms caused by infection begin to appear after 12-24 hours and are characterized by lower abdominal pain (abdominal pains), dizziness, diarrhea, vomiting, fever and headache (Ivani, 2019).

In this study, the method used was pour plate and spread plate. Based on the results obtained, the average bacteria that grew were bacteria on the plate using the spread plate method. Meanwhile, on plates that use the pour plate method, there are no bacteria that grow, the growth of bacteria is only on the surface of the media. The pour plate method aims to count the number of living cells in both aerobic and anaerobic conditions because in this method it will be seen that the bacteria growing on the surface of the media are aerobic and all of the agar media are anaerobic bacteria (Nataya, 2015). So it can be seen that the bacteria contained in the food sample are aerobic.

## CONCLUSION

Based on the results of the study, it can be concluded that sugar crackers, grilled corn snacks, roasted beef sticks, and cassava klanting are safe for consumption because the amount of microbial contamination does not exceed the maximum limit of the Indonesian National Standard which is $10^5$ CFU/ml. While the results on the egg drop biscuits sample showed the amount of microbial contamination that exceeded the maximum limit of the Indonesian National Standard, namely the TPC value of the egg drop biscuits sample is $1,3 \times 10^6$ CFU's/mL.

## ACKNOWLEDGMENTS

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