

# Differences in Microplastic Content in Commercial Salt and Salt at the Semiringkai Coastal Local Center in Kupang City and Kupang Regency

Anna Stephanie Mengga Dapa Taka, Christina Olly Lada<sup>1</sup>, Anita Lidesna Shinta Amat<sup>2</sup>

Faculty of Medicine, Universitas Nusa Cendana, Departments of <sup>1</sup>Nutrition and <sup>2</sup>Biochemical, Faculty of Medicine, Universitas Nusa Cendana, Indonesia

## Abstract

**Background:** Plastic waste that ends up in the ocean can undergo a degradation process into small plastic particles measuring 5 mm called microplastics. The presence of microplastics in the sea can contaminate marine products such as sea salt. Microplastics in the salt consumed by humans can cause adverse health effects. This study aims to determine the difference in the content of microplastics in commercial salt and local salt from the semiringkai coast in Kupang City and Kupang Regency. **Material and Methods:** This research is an observational analytical study with a comparative analysis design. The method used is laboratory observation using a microscope. This study used 10 salt samples which were divided into 2 groups, namely the commercial salt group and the local salt group, each consisting of 5 salt samples. Samples were taken using non-probability sampling method with purposive sampling technique. Data were analyzed univariately and bivariately using the independent T-comparison test. **Results:** The results of the analysis test in this study were  $P = 0.065$  ( $P > 0.05$ ). **Conclusion:** There is a content of microplastic in commercial salt and local center salt of the semiringkai coast in Kupang City and Kupang Regency with an average that is not significantly different.

**Keywords:** Commercial salt, local center salt, microplastic content

## INTRODUCTION

Plastic waste that ends up in the sea because it is dumped directly by the community into coastal areas or through rivers can undergo a degradation process into small plastic particles measuring 5 mm which are called microplastics.<sup>[1]</sup> A study conducted by H. Hiwari *et al.*<sup>[2]</sup> (2019) showed the presence of microplastic content in the sea water surface around Kupang. Another study by F. Kapo *et al.*,<sup>[3]</sup> (2020) on seawater samples at 10 locations in the waters of Kupang Bay, East Nusa Tenggara, the results showed that there were 1,618 microplastic particles.

The presence of microplastics in the sea can contaminate various marine products ranging from biotic products such as plankton, shellfish and marine fish to abiotic products such as sea salt.<sup>[4,5]</sup> Microplastics contained in salt consumed by humans can have a negative impact on the body such as nausea, vomiting and diarrhea, interfering with the work of hormones in the body, and have the potential to cause cancer.<sup>[6,7]</sup>

A study conducted in Spain on 21 different commercial salt samples showed that there was microplastic content in the studied salt.<sup>[5]</sup> Another study conducted in South Korea and Greenpeace East Asia to determine the microplastic content in 39 brands of salt from various countries found that 36 brands contained microplastics, with the highest number of microplastics found in salt sold in Indonesia.<sup>[8]</sup> Research in Indonesia by L. Vasa *et al.*, (2018) on salt samples from local salt ponds in Probolinggo, Surabaya, and Lamongan showed microplastic content of 303 particles/kg salt studied.<sup>[9]</sup> Another study by Ramadhanty *et al.*<sup>[10]</sup> (2020) is related to the microplastic content in water, sediment, and salt samples in the

**Address for correspondence:** Dr. Anna Stephanie Mengga Dapa Taka, Damai Street, Oebobo, Kupang City, East Nusa Tenggara, Indonesia.  
E-mail: fanidapataka@gmail.com

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Wallacea area; the results were 111.22 particles/ml water, 14.26 particles/gr sediment, and 55.64 particles/ml salt from NTT.

Based on the data above, from studies that have been carried out abroad, in Indonesia and in NTT, the results show that there is microplastic content in varying amounts in most of the salt samples studied. However, research on the microplastic content in commercial salt and local salt specifically in Kupang City and Kupang Regency has never been carried out. Therefore, researchers are interested in examining the content of microplastics in commercial salt and local salt centers in Kupang City and Kupang Regency. This research is part of an umbrella research entitled “Analysis of Microplastics in the Food Chain in the Semiringkai Islands, NTT Province”.

## MATERIAL AND METHODS

This is an observational analytical type. The method used is laboratory observation using a microscope, with a comparative analysis design to look for differences between the microplastic content in commercial salt and local salt centers on the coast of Kupang City and Kupang Regency. This research was conducted at the Laboratory of the Faculty of Medicine, Universitas Nusa Cendana, Kupang, from August to November 2021.

Data collection was carried out directly by researchers by collecting salt samples available in modern markets, traditional markets, and other sales places in Kupang City and Kupang Regency.

The method of processing salt samples refers to the research of D. Yang *et al.*, (2015). Each salt sample of 100 grams was put into a glass beaker, and then, 400 ml of distilled water was added and stirred using a magnetic stirrer for 15 minutes and then filtered on filter paper and observed under a stereo microscope with a magnification of 10x to identify the microplastic content and count them.

The statistical analysis used is univariate analysis and bivariate analysis. Independent T test is used to determine the mean difference between two variables, with the independent variable and the dependent variable in the form of a ratio scale. The T test is said to be significant if the *P* value of the test is  $<0.05$ . The assessment of normality of data was done by the Shapiro–Wilk normality test.

## RESULTS

### Univariate analysis

The distribution of microplastics in commercial salt presented in Table 1 showed that Gr salt contained the maximum microplastics compared to other salts, namely 13 particles (34.2%), followed by CK salt with 8 particles (21%), Rf salt and Fl salt each with 6 particles (15.8% each), and 5 particles of Al salt (13.1%). The total microplastics contained in the commercial salt studied were 38 particles/500 grams of commercial salt preparations (average 7.6 particles/100 grams).

Table 2 presents the distribution of the number of microplastics in local salt. Oes salt contained the maximum microplastics compared to other salts, namely 22 particles (30.5%), followed by Inp salt showing as many as 20 particles (27.8%), Obb salt as many as 12 particles (16, 7%), Osp salt 11 particles (15.3%), and Obl salt 7 particles (9.7%). The total microplastics contained in the local salt studied were 72 particles/500 grams of local salt preparation (average 14.4 particles/100 grams).

### Bivariate analysis

Based on Table 3, the bivariate analysis with independent T test was conducted to determine differences in microplastic content in commercial salt and local salt in Kupang City and Kupang Regency. The results of statistical test showed that there was no significant difference between the microplastic content in commercial salt and the microplastic content in local salt with a value of  $P = 0.065$  ( $P > 0.05$ ).

## DISCUSSION

The results of the T-independent comparative test analysis showed that there was no significant difference between the microplastic content of commercial salt and local center salt in Kupang City and Kupang Regency, with a value of  $P = 0.065$  ( $P > 0.05$ ). These results indicate that seas in

**Table 1: Distribution of microplastic content in commercial salt by amount**

Salt Initial	f/100 gram	Percentage (%)
CK	8	21
Rf	6	15,8
Al	5	13,1
Fl	6	15,8
Gr	13	34,2
Total	38	100

**Table 2: Distribution of microplastic content in local salt by amount**

Salt Initial	f/100 gram	Percentage (%)
Obl	7	9,7
Oes	22	30,5
Osp	11	15,3
Obb	12	16,7
Inp	20	27,8
Total	72	100

**Table 3: Analysis of differences in microplastic content in commercial salt and local salt in Kupang City and Kupang Regency**

Type of Salt	<i>n</i>	%	The Average of MP	<i>P</i>
Commercial Salt	5	50	7,60	0,065
Local Salt	5	50	14,40	
Total	10	100	22	

Independent T test, \* $P > 0.05$

Indonesia have been contaminated by microplastics, especially on the island of Java and Timor island, which are the centers of commercial salt and local salt being studied. The research of Purba *et al.*, (2017) shows the conditions that occur in Indonesia, especially the island of Java, where an average of 68% of waste found in nine points in coastal areas is plastic waste.<sup>[2]</sup> When viewed from the current circulation in Indonesian waters, the Java sea currents known as the giant river indicate that these waters flow from east to west and vice versa. Waters on the island of Timor, including the waters of Kupang City and Kupang Regency, which are located in the east of Java Sea, can be easily contaminated by plastic and microplastic waste carried by seawater from the Java Sea.<sup>[11]</sup> The presence of microplastics in the waters of Kupang City and Kupang Regency can also be influenced by activities in the coastal areas of Kupang City and Kupang Regency such as residential development, ports, industry, tourism, restaurants, hotels, and shops which continue to increase from year to year.<sup>[3]</sup> This can result in more waste including plastic waste being dumped into the waters and then degraded into microplastic particles. The absence of a significant difference between the microplastic content in commercial salt, which almost all of the centers are on the island of Java and local salt produced in Kupang-NTT Regency, may indicate that the amount of microplastic contamination in waters in NTT, especially waters in Kupang City and Kupang Regency is not much different from the waters on the island of Java.

Based on the results of interviews with local salt sellers, it is known that all local salt studied used media in the form of plastic sacks and plastic packaging in the distribution and sales. The use of media and plastic packaging on salt may be a source of secondary contamination that can affect the amount of microplastic in salt.<sup>[12,13,14]</sup>

## CONCLUSION

1. The number of microplastics in commercial salt in Kupang City and Kupang Regency is 38 particles/500 grams of commercial salt preparation (average 7.6 particles/100 grams).
2. The number of microplastics in the local salt center of the coastal district of Kupang Regency is 72 particles/500 grams of local salt preparation (average 14.4 particles/100 grams).

3. There was no significant difference between the microplastic content in commercial salt and the local center salt of the semiringkai coast in Kupang City and Kupang Regency, as indicated by the acceptance of H<sub>0</sub>, where the significance value obtained was  $P = 0.065$  ( $P > 0.05$ ).

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## Conflicts of interest

There are no conflicts of interest.

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