Factors Affecting the Occurrence of Suspected Contact Dermatitis in the Traditional Fishery Processing Area (PHPT) of Muara Angke

Nunuk Nugrohowati[1*], Frida Ayu Nawangsih[2], Erna Harfiani[3]
[1]*Departemen Ilmu Kesehatan Masyarakat, FK UPN Veteran Jakarta*
[2]*Program Studi Profesi Dokter, FK UPN Veteran Jakarta*
[3] *Departemen Farmakologi dan Farmasi Klinik, FK UPN Veteran Jakarta*
Jl. RS Fatmawati, Pondok Labu, Jakarta Selatan 12450, Telp. (021) 7656971

Keywords: Environmental Factors, Suspected Contact Dermatitis, Temperature, Muara Angke

Abstract: Contact dermatitis is considered trivial for some people. There are many environmental factors could be the main factors causing contact dermatitis on the salted-fish processor in *Pengolahan Hasil Perikanan Traditional (PHPT)* or Traditional Fishery Processing Area of Muara Angke such as water, temperature, fish, and humidity. These are due to the geographical location of the coastal establish the risk factors of the environment related in the contact dermatitis suspected of the salted-fish processor in the PHPT Muara Angke area. With a cross-sectional design and 112 subjects, the results showed that 53,6% of the salted-fish processor were contact dermatitis suspected. The suspected contact dermatitis increases with duration of contact (p=0,000), frequency of contact (p=0,000), and house temperature (p=0,003) while decreases with groundwater source and humidity. Duration of contact can make the lack of permeability of the skin therefore the material of irritant can infiltrate properly. The distribution of clean water must be comprehensive in order to prevent contact dermatitis, while the building should protect the worker from the heat temperature. Protective and personal hygiene should be organized to protect the worker from disease and keep the quality of the product.

1 INTRODUCTION

One of the factors that affect health is the environment. Environmental health is all physical, chemical, and biological factors outside the body that affect behavior including assessment and control that have the potential to affect health (WHO South East Asia, 2018).

Many environmental exposures can affect the skin, thereby reducing the mechanism of skin regulation and skin repair that cause dermatological diseases (Mahler, 2017). Skin is a part of the body that often receives damages from work, one of which is the work of processing fish. The work of the majority of Muara Angke residents is fishermen or fish traders due to the geographical location on the coast. One disease that can attack fish processors is a skin disorder such as dermatitis.

Dermatitis is an inflammatory reaction that occurs on the skin in response to exogenous and endogenous influences, while a substance or substance that attaches to the skin called Contact dermatitis (Djuanda, 2017).

Symptoms of contact dermatitis can be itchiness, redness, flaking of the skin, to the appearance of vesicles. In Jakarta, dermatitis is found in 100 people per 1000 population (Ministry of Health, 2007). The results of the 2007 RISKESDAS also suggested that there were 80.3 cases of dermatitis per 1000 residents in the North Jakarta area. Although North Jakarta is not the region with the most dermatitis in Jakarta, in publications carried out by Floating Hospital Dr. Lie, from 631 patients in Muara Angke on March 16, 2014, it was noted that dermatitis was the second most common disease after ARI. In the initial survey of researchers on November 18, 2017, it was found that 3 out of 5 salted fish processors experienced symptoms of contact dermatitis such as itchiness and redness. Dermatitis is an inflammatory reaction that occurs on the skin in response to exogenous and endogenous influences. Symptoms of contact dermatitis can be itchiness, redness, flaking of the skin, to the appearance of vesicles. In Jakarta,

Nugrohowati, N., Nawangsih, F. and Harfiani, E.
Factors Affecting the Occurrence of Suspected Contact Dermatitis in the Traditional Fishery Processing Area (PHPT) of Muara Angke.
DOI: 10.5220/0009863502080216
In *Proceedings of the 2nd International Conference on Tropical Medicine and Infectious Disease (ICTROMI 2019)*, pages 208-216
ISBN: 978-989-758-469-5

dermatitis is found in 100 people per 1000 population (Ministry of Health, 2007). The results of the 2007 RISKESDAS also suggested that there were 80.3 cases of dermatitis per 1000 residents in the North Jakarta area. Although North Jakarta is not the region with the most dermatitis in Jakarta, in publications carried out by Floating Hospital Dr. Lie, from 631 patients in Muara Angke on March 16, 2014, it was noted that dermatitis was the second most common disease after ARI. In the initial survey of researchers on November 18, 2017, it was found that 3 out of 5 salted fish processors experienced symptoms of contact dermatitis such as itchiness and redness.

Djuanda (2017) suggests that contact dermatitis can occur due to repeated contact with weak irritants, one of which is water. Where water is one of the basic elements and is needed for human life (Saniti, 2012). The coastal area is an area that often experiences difficulties with clean water. About 80% of groundwater in the Jakarta Groundwater Basin (CAT) area did not meet the Minister of Health's standard No.492 of 2010 concerning Requirements for Qualification of Drinking Water (Geological Agency of the Ministry of Energy and Mineral Resources, 2017). North Jakarta is the worst area, in general the CAT contains high levels of Fe (iron), Na (Sodium), Cl (Chloride), TDS (Total Dissolved Solids) and DHL (Electrical Conductivity) due to the influence from water intrusion. Those are potential irritants/allergens as suggested by Linauskiene, et al. (2017). In a study conducted by Jesika et al. (2016) the type of groundwater affected the incidence of dermatitis in Kedungrandu Village, Banyumas.

It is not impossible that this can happen in Muara Angke where groundwater quality data is indeed bad. Heavy metals can also be found in marine fish as the main ingredient in processed salted fish. The Kompas R & D (2017) states that the Jakarta Bay is one of the world's bays that has marine pollution, which resulted in some of the marine products being polluted including the fish. In Wahyuningsih's research (2015) it was found that there was contamination of lead (Pb) and cadmium (Cd) in a number of fishes in Jakarta Bay. In the study of Fitri, et al (2015) and Riani (2010) it was proven that several types of fishes contain elements of mercury (Hg).

Although from these studies it is said that it is still below the threshold according to Minister of Health Regulation 492 of 2010 but if contacted repeatedly it is not impossible to cause contact dermatitis in salted fish processors.

Coastal areas are low-lying areas that result in the air temperature being hotter than other plains. The main factors that influence the onset of contact dermatitis is temperature (Djuanda, 2017). According to the Indonesian Meteorology and Climatology Agency (BMKG), the temperature in North Jakarta reaches 24-33˚C with an average temperature of Muara Angke is 27.7˚C. In Ferdinand's research, 2013 it was proven that the temperature was related to the incidence of contact dermatitis in tofu makers, otherwise humidity is also one of the factors that influence the emergence of contact dermatitis (Djuanda, 2017) The Tanjung Priok Maritime Meteorological Station for the North Jakarta region in 2013 recorded that the high temperature of 35.4˚C and a maximum humidity of 97% can affect the symptoms of contact dermatitis.

Based on the the majority of fish processors are salted fish processors, the researchers wanted to examine environmental factors related to the incidence of suspected contact dermatitis in the processing of salted fish in the Muara Angke Traditional Fisheries Processing Area (PHPT) North Jakarta in 2018.

2 METHODS

2.1 Research Design

The research conducted was observational analytic of salted fish processors in the PHPT area which the dependent variable and independent data are observed at the same time period. The researcher will take data using a modified questionnaire from validated sources.

2.2 Samples and Population

The population of this study was the salted fish processor in the Muara Angke PHPT area with 112 samples from 56 where every processing house represented by two respondents. The inclusion criteria for this study were willing to be sampled, at least become processors about 1 year, working without using personal protective equipment rubber gloves and shoes and with ages from 18 to 64 years.

2.3. Data Collection

The primary data used was taken through research questionnaires as an instrument that have been tested for validity and reliability. Questionnaires to determine whether the respondent is suspected of contact dermatitis (will be examined

by a doctor at the Pluit Health Center). We also doing a direct assessment of temperature and humidity with a thermal hygrometer.

3 RESULT AND DISCUSSION

3.1 Respondent Characteristics

Table 1: Respondent Characteristics

Characteristi	Amoun	Percentage (%)
Gender		
Men	79	70,5
Women	33	29,5
Age		
< 20 years	3	2,7
21-30 years	45	40,2
31-40 years	47	42,0
41-50 years	16	14,3
>50 year	1	0,9

Based on the table above, male sex is 79 (70.5%), more than female respondents. The highest age of respondents which had the age range of 31-40 years was at 47 (42.0%).

3.2 Univariate Analysis

Table.2: Distribution of Suspected Contact Dermatitis in Traditional Fishery Processing Area PHPT Muara Angke

	n	%
Suspected Contact	60	53,6
Dermatitis	52	46,4
Total	112	100

The results of the primary data that have been examined by doctors of the Pluit Health Center show that as many as 60 salted fish processors were suspected of contact dermatitis with a percentage of 53.6% while as many as 52 salted fish processors were not suspected contact dermatitis with a percentage of 46.4%.

Table 3: Distribution of Groundwater in Traditional Fishery Processing Area PHPT Muara Angke

	n	%
Ground water	46	82,1
No ground water	10	17,9
Total	56	100

Table 4: Distribution duration of contact in Traditional Fishery Processing Area PHPT Muara Angke

Duration of contact	Total	%
>5 hours	30	26,8
5-10 hours	30	26,8
> 10 hours	52	46,4
Total	112	100

There were 30 processors (26.8%) with a contract duration of more than 5 hours, followed by 30 processors (26.8%) with a contact length of 5-10 hours and as many as 52 processors (46.4%) with a contract duration of more than 10 hours in a day.

Table 5: Distribution of contact frequency in Traditional Fishery Processing Area PHPT Muara Angke.

Contact frequency	Total	%
>5 times	16	14,3
5-10 times	41	36,6
> 10 times	55	49,1
Total	112	100

There were 16 processors (14.3%) with contact frequency <5 times, 41 (36.6%) processors with contact frequency 5-10 times, and 55 processors (49.1%) with contact frequency more than 10 times a day.

Table 6: Distribution temperatures in Traditional Fishery Processing Area PHPT Muara Angke

	N	%	Mean (˚C)	Min (˚C)	Max (˚C)
opt temp	20	35,7			
No opt temp	36	64,3	30.01	25.0	33.2
Total	56	100			

There are 20 salted fish processing houses with optimal temperatures with a percentage of 35.7% and 36 processing houses with not optimal temperatures with a percentage of 64.3%. The average temperature is 30,014˚C with a minimum temperature of 25,0˚C and a maximum temperature of 33,2˚C.

Table 7: Distribution of humidity in Traditional Fishery Processing Area PHPT Muara Angke

	n	%	Mean (%)	Min (%)	Max (%)
Opt humidity	42	75,0	74,25	60,0	97,0
No opt humidity	14	25,0			
Total	56	100			

The results of the bivariate Chi-Square analysis showed a p-value of 0.396 (p> 0.05) which indicated that there was no association between the use of groundwater as a water source with suspected contact dermatitis in salted fish processors in the PHPT area.

3.3 Bivariate Analysis

Table 8: Association between Groundwater source and Suspected Contact Dermatitis in Traditional Fishery Processing Area Muara Angke

Cases					
Groundwater source	**Suspected Contact Dermatitis**		**No Suspected Contact Dermatitis Kontak**		***P Value***
	n	%	n	%	
Groundwater source	51	45,5	41	36,6	0,396
No Groundwater source	9	8,0	11	9,8	
Total	60	53,6	52	43,4	

The results of the bivariate Chi-Square analysis showed a p-value of 0.396 (p> 0.05) which indicated that there was no association between the use of groundwater as a water source with suspected contact dermatitis in salted fish processors in the PHPT area.

Table 9: Association between duration of contact and Suspected Contact Dermatitis in Traditional Fishery Processing Area PHPT Muara Angke

Cases					
Duration of contact	**Suspected Contact Dermatitis**		**No Suspected Contact Dermatitis**		***P Value***
	n	**%**	**n**	**%**	
>5 hours	8	7,1	22	19,6	0,000
5-10 hours	10	8,9	20	17,9	
	42	37,5	10	8,9	
Total	60	53,6	52	46,4	

Bivariate Chi-Square analysis showed a p-value of 0,000 (p <0.05) which mean there was an association between the duration of contact with suspected contact dermatitis in salted fish processors.

Table 10: Association between Frequency of contact and Suspected Contact Dermatitis in Traditional Fishery Processing Area PHPT Muara Angke

Cases					
Contact frequency	**Suspected Contact Dermatitis**		**No SuspectedContact Dermatitis**		***P Value***
	n	%	N	%	
>5 times	4	3,6	12	10,7	0,000
5-10 times	15	13,4	26	23,2	
> 10 times	41	36,6	14	12,5	
Total	60	53,6	52	46,4	

Table 9 shows the value of p-value of 0,000 (p <0.05) which indicates that there is an association between the frequency of contact with suspected contact dermatitis in salted fish processors.

Table 11: Association between house temperature and Suspected Contact Dermatitis in Traditional Fishery Processing Area PHPT Muara Angke

Cases					
Processing house temp	**Suspected Contact Dermatitis**		**No SuspectEd Contact Dermatitis Kontak**		***P Value***
	n	**%**	**n**	**%**	
Optimal temp No Optimal temperature	14 46	12,5 41,1	26 26	23,2 23,2	0,003
Total	60	53,6	52	46,4	

Table 10 shows the p-value of 0.003 (p <0.05) which indicates that there is an association between the processing house temperature and suspected contact dermatitis in salted fish processors in the Muara Angke PHPT Area.'

Table 12: Association between humidity and Suspected Contact Dermatitis in Traditional Fishery Processing Area PHPT Muara Angke

Cases					
humidity processing house	**Suspected Contact Dermatitis**		**No Suspect Contact Dermatitis**		***P Value***
	n	**%**	**n**	**%**	
Optimal humidity No Optimal humidity	47 13	42,0 11,6	39 13	34,8 11,6	0,677
Total	60	53,6	52	46,4	

The results of the bivariate Chi-Square analysis showed a p-value of 0.677 (p> 0.05) which indicated that there was no association between the humidity of the processing house with suspected contact dermatitis in salted fish processing in the PHPT Muara Angke Region.

3.4 Multivariate Analysis

Table 13: Duration of contact, Frequency o f c ontact, temperature against Suspected Contact Dermatitis

	Coefficient	**P Value**	**OR**
Duration	2,012	0,001	7,482
contact	1,830	0,001	6,236
Frequen	1,319	0,012	3,739
c contact	-2,756	0,000	0,064
temperature			
Constant			

In the multivariate analysis of logistic regression, the results obtained with the smallest p-value is 0.001 (p <0.005) in the variables duration of contact and frequency of contact. The Duration of contact Odds Ratio values was the highest with 7,482 which means that salted fish processors with a contact time of> 10 hours 7,482 times were more at risk of being suspected of contact dermatitis than salted fish processing with a contract duration of 5-10 hours. Based on the above, it can be concluded that the duration of the contact is the variable that most influences the occurrence of suspected contact dermatitis in salted fish processors.

4 DISCUSSION

4.1 Characteristics Analysis of Respondent

Based on research conducted on salted fish processors in the Muara Angke Traditional Fisheries Processing Area in 2018 there were 79 (70.5%) male respondents and 33 (29.5%) female respondents. Although Makrantonaki, et al. (2012) stated that male skin is much thicker than a woman's skin which causes women to be more susceptible to contact dermatitis but this is due to more overall male workers in the Muara Angke Traditional Fisheries Processing Area.

In the analysis of the characteristics of the respondent's age, the most were ages with a range of 31-40 years which amounted to 47 with a percentage of 42%. Based on researchers' observations this can be due to younger age workers who prefer other jobs such as an online motorcycle or online taxi, etc. Given that work, as a fish processor is included as heavy labor, is also the cause of fish processors being above the age of 40 years less.

4.2 Univariate Analysis

Contact dermatitis is dermatitis caused by a substance that attaches to the skin. Two types of contact dermatitis are known, namely irritant contact dermatitis and allergic contact dermatitis. Both can be acute or chronic (Djuanda, 2017). Suspect contact dermatitis itself is a person suspected of having contact dermatitis. The results of this univariate analysis showed that 60 respondents (53.6%) were suspected of contact dermatitis and 52 (46.4%) were not suspected of contact dermatitis. This is in accordance with the publication of the 2007 RISKESDAS which stated that there were 80.3 cases of dermatitis per 1000 residents in the North Jakarta area. Although North Jakarta is not the region with the most dermatitis in Jakarta, in publications conducted by the Floating Hospital Dr. Lie from 631 patients in Muara Angke on March 16, 2014, it was noted that dermatitis was the second most common disease after ARI. Also added to the number of potential environmental factors of contact dermatitis that researchers observed in the processing of salted fish in the Muara Angke Traditional Fisheries Processing Area can be one of the causes of the many processes that are suspected of contact dermatitis.

In the study, it was found that the source of water used for processing salted fish is mostly derived from groundwater. From the results of the analysis, 46 (82.1%) processing houses used groundwater sources while only 10 (17.9) processing houses used other water sources. This is in accordance with the second survey that researchers conducted on April 20, 2018, that most fish processors still use a lot of groundwater as their source of water due to lack of costs and the ability to use PAM Jaya water flow. And PAM Jaya has not been able to meet the needs of clean and evenly distributed water (Saniti, 2012).

The highest number of respondents was at the contact length of more than 10 hours as many as 52 (46.4%). In variable frequency analysis contact 55 processors (49.1%) with contact frequency more than 10 times a day. A large number of respondents with long contact duration and frequent contact frequency due to a long and frequent treatment process in a day. This makes the two variables potentially a factor associated with suspected contact dermatitis.

The temperature and humidity of the processing room have an inversely proportional state. At room temperature analysis 36 (64.3%) the processing house with temperature is not optimal. The average temperature is 30,014˚C with a minimum temperature of 25,0˚C and a maximum temperature of 33,2˚C. While only 14 (25.0%) processing houses with humidity are not optimal with an average humidity of 74.25% as well as a minimum humidity of 60.0% and maximum humidity of 97.0%. This is due to the condition of processing houses that cannot withstand the temperature of hot air from outside caused by building materials that still use plywood boards as the main material for processing houses. Meanwhile, the dominant temperature of the room's hot air causes the humidity of the room is quite optimal even though there are some processing houses that have moisture below the value due to the heat of the home processing temperature. These two variables can also be the main factors causing contact dermatitis in salted fish processors.

4.3 Bivariate Analysis

Bivariate Chi-square analysis showed that there was no significant association between groundwater sources and the incidence of suspected contact dermatitis with p-value = 0.396 (p> 0.05). This is not in line with the research of Jesika et al. (2016) where the type of dug well water source (groundwater) affects the incidence of dermatitis in Kedungrandu Village, Banyumas. It can be due to the different frequency of contact of each fish processor to groundwater sources so that there are several salted fish processors which, although using groundwater as a source of water, do not show symptoms of contact dermatitis. As stated by Djuanda (2017) that contact dermatitis can occur due to repeated contact with weak irritants, one of which is water.

Duration of contact is the duration of contact with an irritant/allergen in hours/days (Djuanda, 2017). The Chi-square analysis performed showed a significant relationship between contact duration an\d the incidence of suspected contact dermatitis with a p-value = 0,000 (p <0.05). This result is in accordance with the theory of Djuanda (2017) where contact time is one of the factors causing contact dermatitis. This result is also in line with Yuliandra's (2013) study of fresh fish traders, which found a significant relationship between the duration of contact with the incidence of contact dermatitis. This might mean that there is a long contact with the substance in the form of heavy metals that exist in marine fish which, although below the threshold, but with prolonged contact will make it takes longer - even if in a small amount for a long period of time it will enter into the skin and cause inflammation so

that the length of contact with the suspected incidence of contact dermatitis has a significant relationship.

The results of bivariate Chi-Square analysis showed a p-value of 0,000 (p <0.05) which indicated that there was a relationship between the frequency of contact with suspected contact dermatitis in salted fish processors. These results are in accordance with Djuanda's theory (2017) where frequencies will often induce sensitization to the skin so that if the worker is sensitized even if only a small amount of substance is exposed, it can cause contact dermatitis. Other studies also show that the frequency of contact is related to contact dermatitis as in Ferdinand's study (2012) conducted on tofu makers in the Ciputat region. Just like contact time, the frequent frequency of marine fish suspected of being contaminated with heavy metals can cause contact dermatitis in salted fish processors even though the amount of the ingredients is small. High-frequency contact can emerge the sensitization phase to the substance on the skin, causing allergic contact dermatitis.

In this temperature variable, the results of the bivariate Chi-Square analysis show a p-value of 0.003 (p <0.05) which indicates that there is a relationship between the processing house temperature and suspected contact dermatitis in salted fish processors. Only 20 salted fish processing houses have optimal temperatures with a percentage of 35.7%. The average temperature is 30,014˚C where according to Permenkes (2002) about healthy industrial site requirements the optimum temperature ranges from 18-30 ˚C. This result is in accordance with the theory of Djuanda (2017) where the temperature is also affecting contact dermatitis. Frosch (2006) also states that temperatures that are not optimal can facilitate the entry of substances from the environment into the skin. In Ferdian's (2012) study the temperature also became one of the variables that had a relationship with the incidence of contact dermatitis in the custodians of Kaasan Ciputat. The less optimal room temperature is probably caused by processing house buildings that are only made of plywood and wood so that it is less able to maintain the temperature of the room from coastal attacks of hot air.

The results of bivariate Chi-Square analysis showed a p-value of 0.677 (p> 0.05) which indicated that there was no relationship between processing house moisture and suspected contact dermatitis in salted fish processors. This is due to the fact that most of the processing house moisture is in the optimal humidity range, which is 65% - 90% (Peremenkes, 2002). Only 14 processing houses with humidity were not optimal with a percentage of 25.0%. With an average humidity of 74.25% which is still within the optimal humidity range. This optimal humidity is likely to be affected by hot weather which causes moisture to be maintained.

4.4 Multivariate Analysis

From the multivariate analysis of logistic regression, the results obtained with the smallest p-value is 0.001 (p <0.005) in the variable length of contact and contact frequency. The contact length Odds Ratio values were the highest with 7,482 which means that salted fish processors with a contact time> 10 hours 7,482 times were more at risk of being suspected of contact dermatitis than salted fish processors with a contract duration of 5-10 hours. Based on the above, it can be concluded that contact length is the variable that most influences the occurrence of suspected contact dermatitis. This result is in accordance with the theory of Djuanda (2017) where contact time is one of the factors causing contact dermatitis. The presence of seawater pollution makes some types of marine fish contaminated with heavy metals. As in Wahyuningsih's research (2015), it was found that there was contamination of Lead (Pb) and Cadmium (Cd) metals in a number of fish in Jakarta Bay. In the study of Fitri, et al (2015) and Riani (2010) it was proven that several types of fish contain elements of Mercury (Hg). Even though these studies are said to be still below the threshold according to Minister of Health Regulation 492 of 2010. The substance in the form of heavy metals that exist in marine fish even though it is below the threshold, but with prolonged contact, it can create a substance which, although in small amounts, will enter the skin and cause inflammation so that the contact duration of suspected contact dermatitis has a significant relationship. The sensitizing phase can occur along with the length of contact with the heavy metal, causing allergic contact dermatitis (Frosch et al., 2006). The nature of marine fish that has sharp scales can also make physical trauma to fish processors so that heavy metal substances present in fish can enter and make inflammation of the skin for a long time so contact dermatitis occurs.

5 CONCLUSION

Suspected Contact Dermatitis at traditional salted fish processors in Muara Angke increases with

duration of contact, frequency of contact and house temperature, but decreases with groundwater source and humidity.

REFERENCES

American Academy of Dermatology 2014, *Basic Science of The Skin,* USA, diakses 20 Oktober 2017 http://www.aad.org/File%20Library/ Main%20navigation/Education/ %20Derm%20Curriculum/PDFs/Bai c-Science-of-the-Skin.pdf

Afifah, A 2012, *Faktor-Faktor Yang Berhubungan Dengan Terjadinya Dermatitis Kontak Akibat Kerja Pada Karyawan Binatu,* FK Universitas Diponegoro, Semarang

Arikunto, S 2010, *Prosedur Penelitian: Suatu Pendekatan Prakte,* Rineka Cipta, Jakarta

Badan Meteorologi dan Klimatologi Indonesia (BMKG) Cuaca Harian, diakses 20 Juni 2018 www.bmkg.go.id/cuaca/prakiraancua caindonesia.bmkg?Prov=07&NamaP rov=DKI520Jakarta

Badan Pusat Statistik Nasional (BPS), 2018, *Tenaga Kerja: Deskripsi Usia Produktif,* diakses 14 Juli 2018 www.bps.go.id/subjects/6/tenaga-kerja.html

Beltrani, V, Bernstein, I, Cohen, DE, Fonacier, L 2006, An Alergic Asthma Immunol. *Contact Dermatitis A Practice Parameter*

Chandra, B 2005, *Pengantar Kesehatan Lingkungan,* Buku Kedokteran EGC, Jakarta

Chew, AL & Maibach, HI 2006, *Irritant Dermatitis,* Spinger, San Francissco

Cohen, DE 1999, Occupational Dermatosis, *Handbok of Occupational Safety and Health*

Djunda, A 2017, *Ilmu Penyakit Kulit dan Kelamin,* FK Universitas Indonesia, Jakarta

DoctorShare 2014, *Press Release Pelayanan Medis doctorShare Peringatan 1 Tahun RSA dr Lie Dharmawan, diakses 20 Agustus 2017* http://www.doctorshare.org/en/index .php/download/2014/03/17/2/press- release-pelayanan-medis- doctorshare-peringatan-1-tahun- karya-rsa-dr-lie-dharmawan.html

Ferdian, R 2012, *Faktor- Faktor yang Berhubungan Dengan Kejadian Dermatitis Kontak Pada Pekerja Pembuat Tahu di Wilayah Kecamatan Ciputat dan Ciputat Timur,* Fakultas Kedokteran dan Ilmu Kesehatan Universitas Islam Negri Syarif Hidayatullah, Jakarta

Fitri, B, Lestari, Fahmi 2015, Bioakumulasi Merkuri Dalam Daging Dan Hati Ikan Pari Dari Teluk Jakarta, *Oseanologi Dan Limnologi,* Volume 41, hal. 233,

Frosch, PJ, Menne, T, Lepoittevin, JP 2006,*Contact Dermatitis,* Springer Science & Business Media, San Francissco

Health and Safety Authority 2009, *Guidelines on Occupational Dermatitis* diakses 15 Oktober 2017 http://www.hsa.ie/eng/Publications_a nd_Forms/Publication/Occupational_Health/Guidelines_on_Occupational_Dermatitis.html

Hendrayana, H 2002, *Intrusi Air Asin Ke Dalam Akuifer Di Daratan,* Departemen Teknik Geologi Fakultas Teknik, Universitas Gadjah Mada, Yogyakarta

Hudyono 2002, Dermatosis Akibat Kerja, *Majalah Kedokteran Indonesia* hal 16-22, Jakarta

Jesika, P, Hilal, N, Khomsatun 2016, *Hubungan Jenis Sumber Air dan Personal Hygene Dengan Kejadian Penyakit Dermatitis di Desa Kedungrandu Kecamatan Patikraja Kabupaten Banyumas Tahun 2016*

Kementrian Energi dan Sumber Daya Mineral Republik Indonesia, 2017, *Badan Geologi: Jakarta Alami Krisis Air Bersih,* diakses 21 November 2017 https://www.esdm.go.id/id/berita- unit/badan-geologi/badan-geologi- jakarta-alami-krisis-air-bersih-

Kementrian Kesehatan RI 2002 Nomor 1405/Menkes/SK/XI/2002 Tentang *Persyaratan Kesehatan Lingkungan Kerja Perkantoran Dan Industri*

Kementrian Kesehatan RI, 2010 Permenkes No. 492 Tahun, Persyaratan Kualitas Air Minum

Kementrian Kesehatan RI, 2007 *Riset Kesehatan Dasar Tahun 2007*

Kementrian Kesehatan RI, 2010 *Riset Kesehatan Dasar Tahun 2010*

Linauskiene, K, Malinauskiene, L, Blaziene, A 2017, *Metals Are Important Contact Sensitizers: An Experience from Lithuania.* Vilnius: Clinic of Infectious and Chest Disease, Dermatovenereology and Allergology, Centre of Pulmonology and Allergology, Vilnius University.

Litbang Kompas 2017, *Kontribusi Plastik Indonesia Pada Laut Dunia*, Harian Kompas 11 September 2017

Mahler, V 2017, *Pubmed: Skin Diseases Assosiated With Environmental* diakses 25 Januari 2018 https://www.ncbi.nlm.nih.gov/m/pubmed/28516256/

Mathias, CG 1989, *Contact Dermatitis and Workers' Compensation: Criteria For Establishing Occupational Causation And Aggravation,* JAm Acad Dermatol

Makrantonaki, E, Bekouv V, Zouboulis, CC 2012, *NCBI: Dermato- Endocrinology (Genetics and Skin Aging)* diakses 15 November 2017 www.ncbi.nlm.nih.gov/pmc/articles/PMC3583889/

Notoatmodjo 2013, *Kesehatan Masyarakat Ilmu dan Seni,* Rineka Cipta, Jakarta

Nuraga, W, Lestari, F, Kurniwidjaya, LM 2008, Dermatitis Kontak Pada Pekerja Yang Terpajan Dengan Bahan Kimia Di Perusahaan Industri Otomotif Kawasan Industri Cibitung Jawa Barat, *Makara. Kesehatan,* vol 12 no 2, hal. 63-69.

Permanawati,Y, Zuraida, R, Ibrahim, A 2013, Kandungan Logam Berat (Cu, Pb, Zn, Cd dan Cr) Dalam Air dan Sedimen Di Perairan Teluk Jakarta. *Jurnal Geologi Kelautan,*vol. 11, no. 1, hlm 9-16

Riani, E 2010, Kontaminasi Merkuri (Hg) Dalam Organ Tubuh Ikan Petek (Leioganathus equulus) di Perairan

Ancol, Teluk Jakarta. *Jurnal Teknik Lingkungan,* vol. 11 no. 2, hlm. 313-322

Safeguards 2000, *Occupational Dermatitis,* Government of South Australia. Departement for Adsministrative and Information.

Safriyanti 2016, *Hubungan Personal Hygine, Lama Kontak dan Riwayat Penyakit Kulit dengan Kejadian Dermatitis Kontak pada Petani Rumput Laut di Desa Akuni Kecamatan Tinanggea Kabupaten Konawe Selatan Tahun 2016,* Universitas Haluoleo, Kendari

San Jose Medical Center 2012, *Dr. Peter Charm Contact Dermatitis Quetionnaire,* San Jose Medical Center

Saniti, D 2012, Penentuan Alternatif Sistem Penyediaan Air bersih Berkelanjutan Di Wilayah Pesisir Muara Angke, *Jurnal Perencanaan Wilayah dan Kota,* Institut Teknologi Bandung, Bandung, diakses 27 November 2018 //http://journals.itb.ac.id?index.php/jpkw/article/view/4126

Santoso 2010, *Statistik Non Parametrik Konsep dan Aplikasi Dengan SPSS,* Media Komputindo, Jakarta

SIDATIK: Sistem Informasi Diseminasi Data dan Statistik Kleutan Dan Perikanan 2016, *Angka Konsumsi Ikan 2010-2015,* diakses 25 Januari 2018 http://statistik.kkp.go.id/sidatik-dev/index.php?m=3&id=2

Standar Nasional Indonesia 2009, *Batas Maksimum Cemaran Logam Berat Dalam Pangan*. Badan Standarisasi Nasional, Jakarta

Sulaksmono 2006, *Keuntungan dan Kerugian Patch Test (Uji Tempel) Dalam Upaya Menegakan Diagnosa Penyakit Kulit Akibat Kerja (Occupational Dermatosis),* Bagian Kesehatan dan Keselamatan Kerja Fakultas Kesehatan Masyarakat Universitas Airlangga.

Taylor, JS, Sood, A, Amado, A 2008, Occupational Skin Disease due to Irritants and Allergens. In: *Fitzpatrick's Dermatology In General Medicine,* Mc Graw Hill Medical, New York hlm. 2067-2073

Tobing, Imran SL 2005, *Dampak Sampah Terhadap Kesehatan Lingkungan dan Manusia,* Fakultas Biologi Universitas Nasional, Jakarta

Wahyuningsih, T, Rumanta, M, Nurdin, G 2014. *Pencemaran Pb dan Cd pada Hasil Perikanan Laut Tangkapan Nelayan di Sekitar Teluk Jakarta.*

Program Studi Pendidikan Boiogi FKIP UNiversitas Terbuka, Jakarta

Wardani 2017. Faktor-Faktor yang Berhubungan dengan Kejadian Dermatitis Kontak Akibat Kerja pada Pekerja Proyek Depot Pengisian Pesawat Udara Bandara Juanda Periode Mei 2017, Fakultas Kedokteran Universitas

Pembangunan Nasional "Veteran" Jakarta, Jakarta WHO South-East Asia, 2018. *Environmental Health,* diakses 25 Januari 2018 http://www.searo.who.int/topics/environmental_health/en/

Yuliandra, R., 2016. *Faktor-Faktor Yang Berhubungan Dengan Penyakit Dermatitis Kontak Iritan Pada Pedagang Ikan Segar di Pasar Inpres IV Pasar Raya Kota Padang,* Universitas Andalas, Padang, Sumatera Barat