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ANALYSIS of ENVIRONMENTAL CONDITIONS, LEVELS of CHROMIUM (Cr) AIR AND ALBUMIN URINE LEVELS of WORKERS in the METAL COATING HOME INDUSTRY in the DISTRICT of CANDI SIDOARJO

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ABSTRACT-- *Background of the electroplating process involves several chemicals such as chromium. Chromium plating workers are at high risk of chromium exposure. Air is one of the environmental components that have an important position for human needs. Research objectives analyze the environmental conditions, levels of chromium (CR) air and albumin urine levels of workers in the home industry of metal plating in the district of Candi Sidoarjo. The research method is a descriptive observational study by designing a crosssectional build with a sample number of 12 workers. The rate of chromium in the air is taken using EPAM 500 and then analyzed by the laboratory with atomic Absorption spectrophotometry (SSA). Environmental conditions (temperature and humidity) using Thermhygrometer. The rate of Albumin in Urine uses the method of ImmunoturBidimetric assay. Analysis of descriptive data analysis using coefficient contingency to know the strong relationship between variables. Results study, the result of the cross-tabulation show that workers with chromium levels exceeding the normal value of most are at workers working in the working environment with a rate of chromium in the air amounted to 0.01 mg/m3. The most positive albumin levels are in the non-production part of the cross-tabulation results showing a very strong connection to the temperature and humidity variables with chromium levels in the air with a coefficient contingency value of 0.707. Workers in the home industry of metal plating as much as 25% or 3 out of 12 workers have a positive rate of albumin, this indicated has occurred damage to kidney function. As much as (17%) or 1 out of 6 workers with normal and positive urine rate for albumin and as much as (33%) or 2 of 6 workers with chromium levels of urine exceeds the normal and positive limits of urine albumin levels. The study concludes that workers who have the most positive levels of albumin exist in nonproduction parts. Temperature and humidity have a strong relationship with the rate of chromium in air. It needs exhaust fan as supporting ventilation so that the air exchange can be faster and give plants around the industry so that the temperature is cool. Monitoring with home industry owners, local governments on the*

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management of waste produced. Besides, there is an alternative to separate the chrome from industrial waste using adsorption method.

Keyword--*environmental condition, air chromium, albumin levels, metal lining*

I INTRODUCTION

The industrial sector has begun to be noticed by the Government of the Republic of Indonesia. The Indonesian government has begun planning strategic efforts to improve the competitiveness of the industry, one of which is the chemical and metal industry sectors. The chemical industry is closely related to the productive economy, such as clothing, food, and board as well as the provision of downstream industrial raw materials such as electronics and automotive, while the metal industry continues to be strengthened by the hilarity of mineralbased mining industries that can increase the movement of national Economy (1)

One example of the metal industry sector that can impact public health is the metal coating industry. Process in the metal coating industry that has the risk of disruption to the health of one of them is the process of chromium electroplating on the final working part. This process is carried out by the melting chromium chromate that is shaped solids in a body that contains water using electromagnet conduction. Thus, the melting of chromium sticks to the metal surface. Then, the metal can be in contact with workers and can cause skin irritation on the worker (2)

One of the elements used in the metal coating process is chromium. Chromium (CR) is an element of heavy metal toxic to humans. Such toxic effects, the emergence of carcinogenic, immune system disorders, nerve composition disorders, impaired renal function, skin irritation and effects of respiratory. (3). the entry of chromium in humans can be through inhalation, ingestion and skin contact. Exposure to chromium on a potential work environment comes from air and skin (4).

Chromium plating workers have a higher risk of being exposed to chromium through inhalation. Its effect can lead to increased levels of chromium in blood and urine. Based on the statistical data issued by the BPS in 2015, the micro and small industrial companies increased by 42% in the last 15 years (5). The micro-industry, which is usually known as the home industry, is an industry consisting of 5-19 workers (6).

Air is one of the environmental components that have an important position for human needs. The presence of heavy metals in the air is very harmful to health because it has a longterm level of toxicity that is in the environment (7). Environmental conditions in the work area can affect the toxicity levels of heavy metals such as ventilation, temperature and humidity as well as the levels of chromium in the air impacting the health of workers.

Chromium toxicity in the air is also influenced by several environmental factors, namely temperature, humidity, air ventilation and airflow speed. The presence of ventilation affects the concentration of chromium in the air in the working environment. The wider the ventilation then the particulate/gas will be easier to release into the outside air so that chromium levels can be lower.

Low temperatures can cause pollutants in the atmosphere to be trapped and not spread, while high temperatures will accelerate the chemical reaction of the temperature changes in the air pollutants that cause particles to last longer in the air so that chances are sucked by the worker. The humidity in the abnormal working

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environment, exceeding or less than the threshold value, affects the quality of air in the area. Airflow velocity affects air movements and air change in a room.

II METHOD

The study used a descriptive observational method because researchers only observe directly and do not give specific treatment to the researched object as well as researchers only describe the condition of the research object. The design builds of research used in this study is cross-sectional due to measurements of chromium levels in the air and environmental conditions including temperature, humidity, ventilation and outside buildings performed at a certain time.

Dependent variables of this research are the levels of chromium in air urine, while for independent variables is external factors of the environment include levels of chromium in the air, ventilation, temperature, humidity, and the area of industrial buildings.

Data collection regarding environmental factors of chromium levels in the air is conducted by taking the air samples of the working environment by using EPAM 5000 subsequently tested using SSA (atomic absorption spectrophotometry) by the laboratory to find out Levels of chromium in air. Variable the wide of ventilation and buildings of data collection carried out with observation and in-depth interviews to the industry owners, as well as the measurement of temperature and humidity using thermohygrometer. The rate of Albumin in Urine used the method of ImmunoturBidimetric assay.

The Data obtained from the Measurement and laboratory test results are analyzed descriptively without calculation. Descriptive analysis aims to illustrate the distribution of each variable. Data on the measurement of chromium levels in air and urine compared with the threshold value based on the Ministry of Health Minister of Republic Indonesia number 70, 2016 for chromium levels in air and regulation of the Minister of Health number 11405, 2002 for temperature measurement, humidity and ventilation area.

III RESULTS AND DISCUSSION

ENVIRONMENTAL CONDITIONS IN METAL COATING INDUSTRY WORKING AREA

Environmental factors observed in this study include ventilation area, building area, temperature, and moisture work environment. The Home industry consists of 2 areas for production (coating and flushing) and non-production (polishing and drying) where each area is approximately 5 m x 10 m.

Table 1: Result of temperature and humidity measurement in metal coating industry working area in Sidoarjo

Measurement Location	Measurement Result	Maximum Limitation of

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	Temperature (^oC)	Humidity (%)	Temperature and Humidity according to Ministry of Health Regulation 1405, 2002
Production Room (off)	27,1	72	temperature: 18-30^oC humidity: 65–95%
Production Room	35	57	
Non-Production Room (off)	28,3	69	
Non-Production Room	35,7	54	

The measurements results on production and non-production area when the work activity has not been held stated the temperature and room does not exceed the provisions stipulated by the Ministry of Health regulation No. 1405, 2002 i.e. temperature 18-300 C and humidity 65 – 95%. While production activities take place, the temperature in the production and the non-production area exceeds the stipulated limit.

In line with the research of Bhakti, et al. (2016), which shows the average ambient temperature of 30.40C and humidity 78.7%, ministry of health regulation categorized that the temperature is high and the humidity is normal.

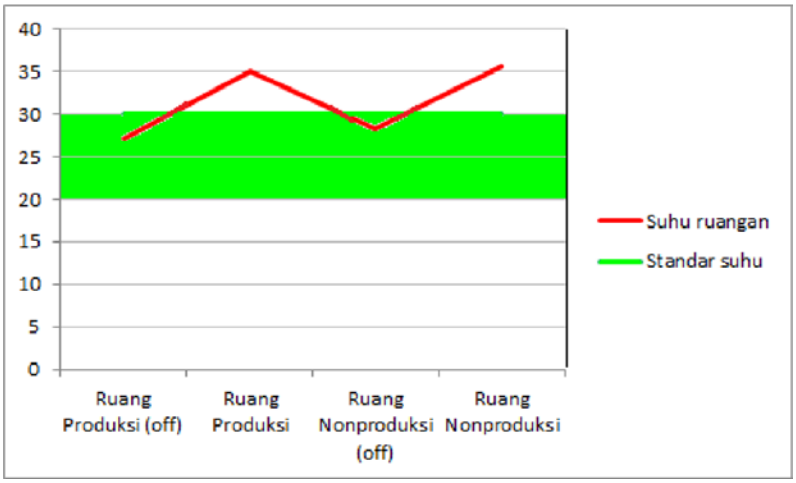

Figure 1: Temperature measurement result in working area of metal coating industry in Sidoarjo

The temperature in the working area can affect working climate conditions and worker's physical condition. The humidity will affect air temperature, working climate, pollutants, and the level of comfort of the workers. This is in line with the theory that temperature and humidity factors are the physical environmental factors that affect the working climate (8)

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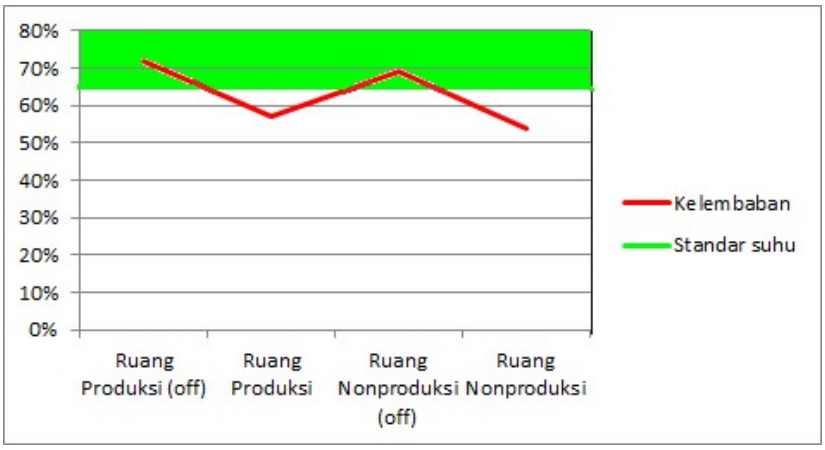

Figure 2: Humidity Measurement Result in Working Area of Metal Coating Industry InSidoarjo

The humidity in the abnormal working area, exceeding or less than the threshold value, affects the quality of air in the area. According to the decree of the Minister of Health RI No.

1405, the year 2002 mentioning the humidity of the working environment is 65 – 95%.

The building has 8 windows with a window of 90 x 60 cm and two doors that are always open during the activity. So that the broad ventilation requirements of 10% of the floor area are fulfilled and the air circulation inside can still occur. In line with Hana EkaResearch (2017), where chromium content in the low working environment due to the affected exhaust fan. Especially, the ventilation can move the air contaminated by fume (9).

CHROMIUM LEVELS IN AIR

Measurement and testing of chromium levels in the air are conducted to determine the levels of chromium in the air work environment of the metal plating home industry. The measurements were assisted by the laboratory officers of UNAIR FKM using EPAM 5000, then analysis conducted by the health and safety UPT with the following analysis results:

Table 2: Results of measuring and testing of laboratory chromium levels in the air

Measurement Location	Measurement Result of Chromium Levels in the Air (mg/m^3)	Maximum Limitation of Chromium in the air based on *PMK* No 70 year 2016
Production Room (off)	0,00	0,05
Production Room	0,01	
Polishing Room (off)	0,00	
Polishing Room	0,005	

The measurement results showed the rate of chromium in the air of working area in that home industry does not exceed the maximum limit applied by the Minister of Health regulation No. 70 the year 2016 with a limit of

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0.05 mg/m3. Measurement on production and nonproduction area when the work activity has not been held the test results showed that there is no detected chromium in the air. While the production of chromium in the production area is worth 0.01 mg/m3 and in the polishing area is worth 0.005 mg/m3. The rate is still in the safe category. The rate of chromium in the non-production area is lower because there is no process directly related to chromium.

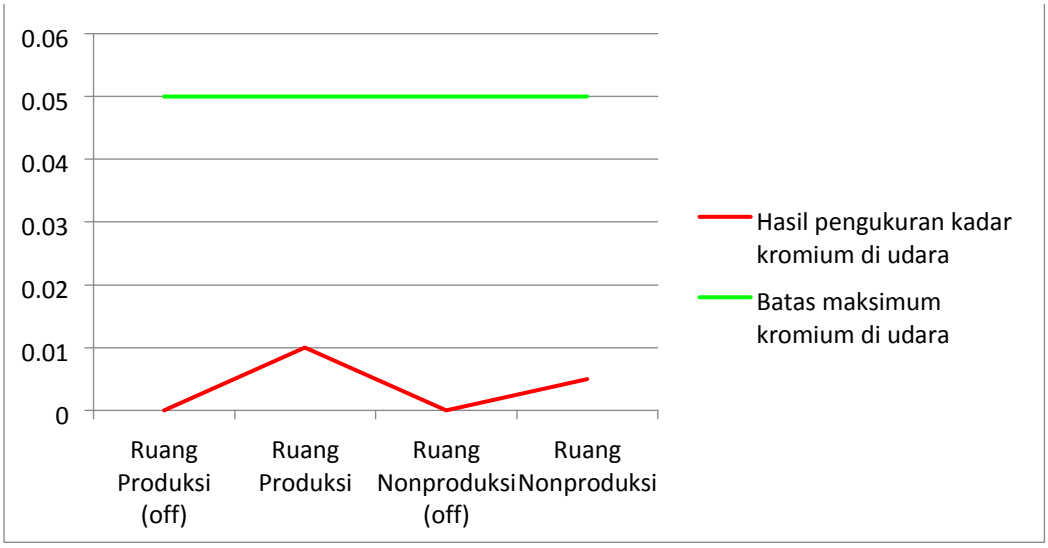

Figure 3: Measurement Result of Chromium in the air in Working Area of Metal Coating Industry in Sidoarjo

Chromium measurements are carried out in both areas. The measurements were conducted by researchers assisted by the FKM UNAIR Laboratory officers by using EPAM 5000 that had been given filters to filter chromium. The measurements are done 2 times before and when the activity lasts every 30 minutes each. Measurements in production areas are carried out next to chromium tubs.

According to the respondent, when the orders increase then the respondent must increase the working hours until the night. Although the rate of chromium in the air at the workplace is low, the risk of chromium exposure persists and should be wary of respondents. This is because the impact of the exposure of chromium in the working air will be faster respiratory distress. This is by the study, that the workers exposed to chromium (VI) and chromic acid average 2-200 μg/m3 for 8 hours a day, suffered damage to the mucous septum on the worker's nose. And the exposure of chromium (VI) with a concentration of more than 2-200 mg/m3 resulted in nasal irritation, mucosal ulceration andatrophy and perforated septum (Assem, et al, 2007). A study of 5 individuals that exposure via aerosol potassium dichromate containing chromium (VI) amounting to 0035 mg/ml-1 resulted in a reduction in the volume of forced expirations, erythema of the face, nasal congestion, cough and wheeze. It is to be considered for business owners not to harm workers from the health status (10)

RELATION of ENVIRONMENTAL CONDITIONS WITH CHROMIUM IN AIR

Relationship temperature with chromium in air

Temperature measurement. Performed at 4 points along with the method of chromium in the air, cross-tabulation results as follows:

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Table 3: Cross Tabulation between temperature and chromium level in the air

Variable	Chromium Level in the Air					
	0,00 mg/m^3		0,01 mg/m^3		0,005 mg/m^3	
	N	%	N	%	N	%
Temperature						
Fulfill	2	100,0	0	0,0	0	0,0
Not Fulfill	0	0,0	1	50,0	1	50,0

Cross tabulation indicates that when the level of chromium in the industrial air is worth 0.00 mg/m3, the temperature in the area fulfilled the threshold value. This condition occurs when the measurement is performed when the production activity has not occurred. Chromium levels are worth 0.01 mg/m3 which occurs in the production area when the activity occurs, the temperature in the room does not fulfil the threshold value. Similarly, the rate of chromium in the air in non-production areas is worth 0.005 mg/m3 of temperature does not fulfil the threshold value. The relation between the temperature variable and the chromium variable in the air of metal plating Home Industry with the value of coefficient contingency of 0.707 which means the level of relationship between those variables is a very strong category.

The Connection between Humidity with Chromium in the Air

Humidity measurement Performed at 4 points along with the method of chromium in the air, cross-tabulation results as follows:

Table 4: Cross-tabulation between humidity and chromium content in the air

Variable	Chromium Level in the Air					
	0,00 mg/m^3		0,01 mg/m^3		0,005 mg/m^3	
	N	%	N	%	N	%
Humidity						
Fulfill	2	100,0	0	0,0	0	0,0
Not Fulfill	0	0,0	1	50,0	1	50,0

Cross tabulation indicates that when the level of chromium in an industrial air is worth 0.00 mg/m3, the humidity in the area meets the threshold value. This condition occurs when the measurement is performed when the production activity has not occurred. Chromium levels are worth 0.01 mg/m3 which occurs in the production area of the activity, the humidity in the room does not meet the threshold value. Similarly, the rate of chromium in the air in nonproduction areas is worth 0.005 mg/m3 humidity does not meet the threshold value. The relation between humidity variables with chromium variables in the air of metal plating Home Industry is with a value of coefficient contingency 0.707 which means the level of relationship between variables is a very strong category.

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Relation between Ventilation with Chromium In The Air

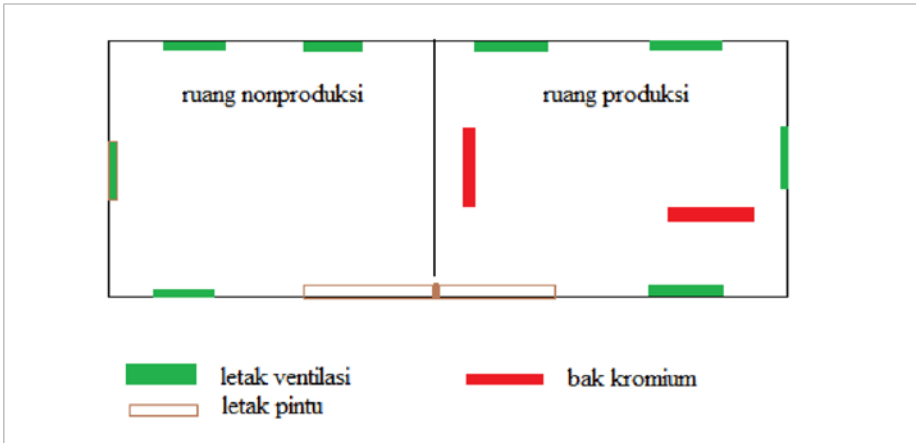

Figure 4: Blueprint area and ventilation of working environmental in coating metal industry in Sidoarjo

The building has 8 windows with a window of 90 x 60 cm and two doors that are always open during the activity. So that the broad ventilation requirements of 10% of the floor area are fulfilled and the air circulation of inside the area can still occur.

The workers in metal plating using chromium, have a risk of being exposed by chromium. Due to when chromium exposure is inhalation, that may sniff is chromium in the form of smoke, dust and aerosols. The respiratory path is the main organ target of chromium exposure. Adverse health effects (12).

Sudarsana Research (2013) showed that there were 15 people (50%) With impaired renal function, and there is a relationship between exposure of chromium with impaired renal function in the worker, the higher level of chrome in the urine higher creatinine levels in serum (13).

LEVEL OF CHROMIUM AND URINE ALBUMIN ON WORKER

Table 5: Measurement Result of Chromium and Albumin Level on Worker in Metal Coating of Home Industry in Candi Sidoarjo

No.	**Part**	**Chromium Level in Urine** (µg/*L*)	**Standart Quality**	**Category of Chromium Level**	**Kadar Albumin di Urin3**	**Standard Quality**
1.	Non-Production	6,5	Agency for Toxic Substances and Disease Registry year 2012 determine level standard of chromium in urine 0,24-	Exceed Standard Level	Positive	Negative
2.	Non-Production	6,7		Exceed Standard Level	Negative	
3.	Non-Production	0,7		Normal	Negative	
4.	Non-Production	0,4		Normal	Negative	
5.	Non-Production	0,4		Normal	Positive	

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6.	Non-Production	0,5	1,8 µg/*L*	Normal	Negative
7.	Non-Production	0,5		Normal	Negative
8.	Production	6,6		Exceed Standard Level	Negative
9.	Production	6,5		Exceed Standard Level	Negative
10.	Production	4		Exceed Standard Level	Negative
11.	Production	7,1		Exceed Standard Level	Positive
12.	Production	7,3		Exceed Standard Level	Negative
13.	Production	8,6		Exceed Standard Level	Negative
14.	Production	0,6		Normal	Negative
15.	Production	0,5		Normal	Negative

According to the table above, it can be known that workers who have chromium levels in the urine exceed normal value (> 1.8 µg/L) i.e. workers who work in the production section of 75% and workers who have positive albumin in urine are the worker in non-production parts. All workers in this metal coating industry are male genders. All workers in the industry have the same uptime that is 8 hours a day on Monday-Saturday. The table shows workers who have levels of chromium and albumin exceeding normal numbers are mostly workers in the production consisting of coating and rinsing activities.

Starting from the raw material that has been formed into the finished material according to the needs. Furthermore, the process of smoothing to flatten and soften the surface of the material so that there is no small cracks or uneven surfaces. The rust is removed with a solution of HCl. Specimens of iron or steel to be coated are used as the cathode (-), while the chromium lining the workpiece is used as an anode (+). Both electrodes are in an electrolyte solution and connected with one direct current power of DC Power Supply (3). In the final stage used ordinary freshwater, such as water wells to remove the rest of the coating process. The product

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is drying and ready to use.

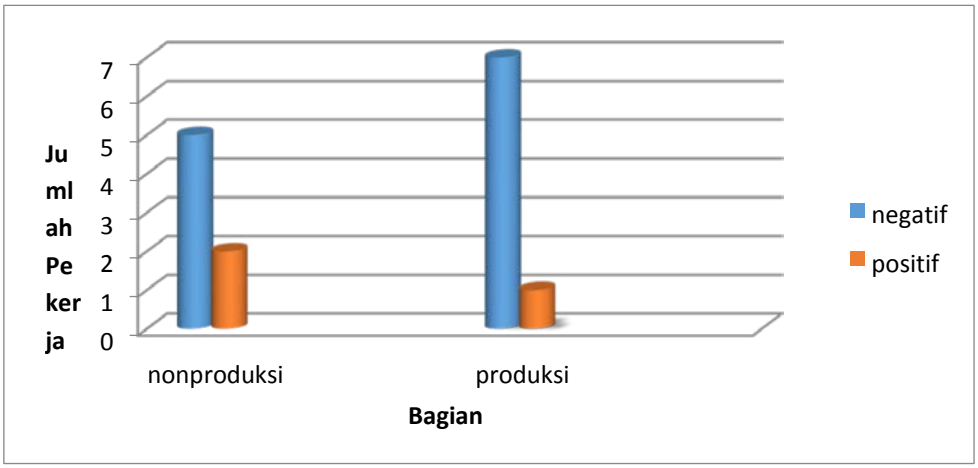

Figure 5: Distribution of albumin level in urine of worker based on the part

The figure above showed that the highest level of positive albumin is in the nonproduction part. The lining process causes the cesspool either liquid or gas that can enter the human body by inhalation, ingestion and skin contact. In that room, there are some of the electroplating tubs, the swollen air in that tub pasted to the air when the production process occurs .one of the danger that should be wary while the production process occurs is fume. The fume that exists while lining consist of metal oxide. Fume formed when metal vapor is condensation and oxidation fume is a solid particle that comes from welding consumable that is based metal and layer that covering (11). The existence of ventilation will affect the level of chromium in the inside working area. The wider of ventilation and put the cover in the tub of chromium lining can decrease the level of the shelf.

RELATION BETWEEN CHROMIUM LEVEL AND ALBUMIN IN URIN

Table 6: Cross Tabulation between Chromium and Albumin in Urine

Chromium in Urine	**Albumin Level in Urine**			
	Negative		**Positive**	
	n	**%**	**n**	**%**
Normal	6	85,7 75	1	14,3 25
Exceed Normal Level	6		2	

Cross-tabulation result shoed that the worker who has level chromium in urine exceeds the normal limit and positive albumin are 2 worker that is 25%. The relation of level chromium in urine with the level of albumin in the urine is gotten from coefficient contingency value as much 0.132 that categorized strong-weak connectivity.

Chromium in the air of working are in-home industry either in production and nonproduction part is 100% not exceed the maximum limit that is applied by the regulation of Ministry of Health number 70, 2016 with limitation 0.05mg/m3. This condition different from chromium condition of the worker, 75% exceeds normal limitation in production part 28.6 in non-production part. This thing should remain that the lining process of

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metal as the base of chromium consists of polishing the grindstone, polishing the nickel liquid, polishing in chromium tub, rinsing with water drying.

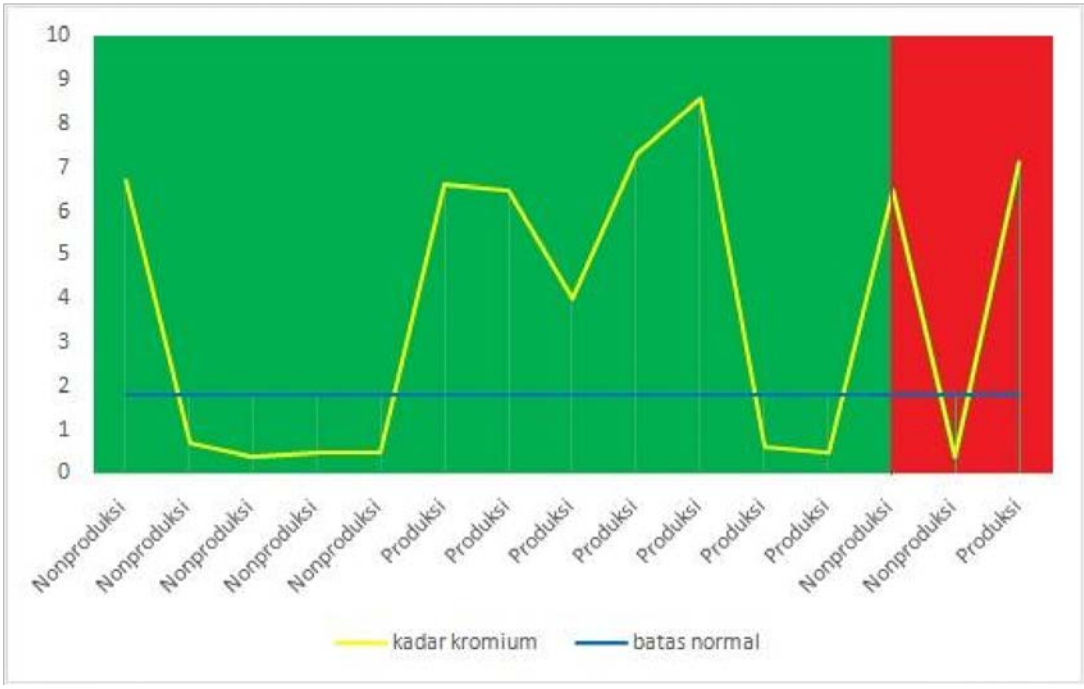

Figure 6: Result of measurement of Chromium and Albumin levels in worker Urine in metal coating industry working environment Sidoarjo

Workers in the home industry of metal plating as much as 25% or 3 out of 12 workers have a positive rate of albumin, this indicated has occurred damage to kidney function. As much as (17%) or 1 out of 6 workers with normal and positive urine rate for albumin and as much as (33%) or 2 of 6 workers with chromium levels of urine exceeds the normal and positive limits of urine albumin levels. The absorption of chromium into the blood and excreted in the kidneys in the urine causes acute tubular necrosis to renal failure established in the presence of albumin in the urine. However, the presence of albumin in the urine can be influenced by other factors such as drug consumption, infection, and inflammation. To reduce the level of albumin in the urine can be done in various ways, one of which is well-hydrated that is the habit of consuming good water.

The connection of chromium in the air with chromium and Albumin in worker Urine

Table 7: Cross-tabulation of chromium levels in the air with chromium and albumin in the urine

Chromium Level	Chromium in Urine				Albumin in Urine			
	Normal		Exceed Normal Value		Negative		Positive	
	n	%	n	%	n	%	n	%
0,01	2	25,0	6	75,0	7	85,7	1	14,3
0,005	5	71,4	2	28,6	5	75,0	2	25,0
Total	7	46,7	8	53,3	12	80,0	3	20,0

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The result of cross-tabulation indicates that chromium that exceeds normal value is most on workers who work in a working environment with a chromium content in the air amounted to 0.01 mg/m3. While for the working environment with the air chromium content of 0.005 mg/m3, most workers have normal levels of urine chromium. The rate of chromium in the air amounted to 0.01 mg/m3 more than 6 workers with the level of chromium urine exceeds the normal value limit of the workers' production includes coating and flushing with the urine levels of chromium is at a range of 6-8 μg/L. In a working environment with a rate of chromium in air 0.005 mg/m3, as much as 2 workers with the rate of chromium urine exceed the normal value limit of the workers in the polishing section with a chromium content of 6.5 and 6.7 μg/L.

The relation of chromium in the air with chromium levels in urine is obtained coefficient contingency value of 0.421 which is a strong moderate relationship. While the relation of chromium in the air with albumin levels in urine obtained coefficient contingency value of 0.197 which is a strong-weak relationship.

In a working environment with chromium levels in the air amounted to 0.01 mg/m3 the process of metal coating and flushing/washing. While the working environment with chromium levels in the air amounted to 0.005 mg/m3 occurs polishing process and areas for drying and inspection of the final product. This indicates that the working environment with a rate of 0.01 mg/m3 is the coating (platting) and flushing rate of chromium workers higher than the workers in the working environment 0.005 mg/m3 in polishing and drying part.

In line with the research of Islam and Hartono (2016) which describes the workers in the area of direct exposure to the level of chromium on urine is higher than in the areas that are not directly exposed (14). Therefore, it can show workers who are in areas that have higher levels of chromium will increase the risk of chromium's exposure. So the levels of chromium in urine and albumin can increase.

The waste of a metal coating process that formed as an air or chromium dust-like particles in the solution so that the chromium interfere with or even corrodes the skin, mucous membranes of the eye and respiratory tract (spraying chromic acid can cause serious eye lesions). At intense exposure to chromate, particulates can cause pulmonary oedema. It is an important intake mode because it can cause health effects when inhaling chromium (VI). While inhaling chromium (VI) the oxidant enters through the nose causes irritating, because the solubility in the water is greater than chromium (III) so that it is easily soluble in the lungs, from the lung is transferred to the blood. In the lungs 53 – 85% Chromium (VI) is cleaned by absorption into the blood and excreted in the kidneys through urine (15).

In the process of metal lining, the process of dyeing into chromium fluid occurs. Metal objects are dipped in chromium fluid for about 5-7 seconds using a long hook that serves to dip objects into a chromium body. So that workers are exposed to chromium waste resulting from the metal coating process.

Besides, high exposure can be caused by splashes, touching chromium-contaminated surfaces, dyeing hands in planting, and tasting (oral) chromium material for the proper composition of the material in the coating (13). Chromium mobility depends on sorption characteristics of the soil including clay content, iron oxide content, and the amount of organic matter present. Chromium can be transported by surface runoff to surface waters in its soluble or precipitated form. Soluble and un-adsorb chromium complexes can leach from soil into groundwater. The leachability of chromium (VI) increases as soil pH increases. Most of the chromium released into natural waters is particle-associated, however, and is ultimately deposited into the sediment (16).

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Observations to workers in the industry showed that there is still some use of APD masks and gloves are not good. 6 workers are not disciplined in the use of masks. While the use of APD gloves 4 workers are not disciplined in the usage of gloves. Application of APD is less good this can be the cause of high levels of chromium in the urine. Rochmatika's Research (2011) shows that there is a correlation between the uses of Personal protective equipment (APD) with chromium levels in worker urine. So if workers do not use the APD well and complete will arise risk to health disorders due to the exposure of chromium (17).

Health effects of exposure to chromium (VI): Chromium (VI) is absorbed faster and easier than the Oder valances through history, skin, and digestion. It is reduced to chromium (III) inside the body (18, 19). Bronchi are the first organ in the body affected, followed by kidney, liver, skin and Immunity System (19). Like other heavy metals, Cr is accumulated in Kidneyafter absorption. The Severe exposure to Cr (VI) and its accumulation in the kidney result in renal cryptonephric disorders (20). The accumulation of chromium in proximal cryptonephric of kidney leads to toxic effects on adjacent cells (21). Some international organizations such as IARC (22 – 24), EPA (25), and WHO (12) have proved the direct carcinogenicity of chromium (VI) in lung cancer. Besides, occupational exposure to Cr induces other effects such as the skin hyperesthesia, nasal septal perforation (26 – 28), contact dermatitis (29.30), respiratory system allergy, liver, and renal effects (26, 30, 31), Occupational Asthma (32.33), Cardiovascular effects (34), DNA mutation (35.36), and carcinogenic effects (31,37 – 40). Besides, there is evidence for accumulation of chromium in placenta (41), reproductive system disorder (42), chromosome aberrations (36, 43, 44), and further damages to a body organ.

DECREASED CHROMIUM LEVELS IN WATER

There is an alternative to separating the chrome from industrial waste using adsorption method. This is a very promising method to process industrial exhaust, especially because of its low price and high absorption capacity. Some studies have been conducted by scientists to utilize biomaterials as chrome metal adsorbent ions among them using seaweed, guava bark, banana bark and Ecklonia sp., and sour fruit seed, Tamarindus Indica.

The ability of the adsorption of chrome metal ions by the mixture of adsorbent gods and Clay will decline as the contact time increases. This is because adsorbent has suffered saturation. The absorption of metal ions is increased by increasing the high packing in the adsorption column and the small flow rate (45).

IV CONCLUSIONS AND SUGGESTIONS

The metal coating industry uses chromium as one of the materials in the coating process. This chromium can cause health effects that can enter the body through inhalation, skin and oral. The level of chromium in the air home industry as the process of metal coating in the production area of 0.01 mg/m3 and polishing area of 0.005 mg/m3. None exceeds the specified threshold value (NAB). Environmental factors in the working environment at the time of production exceeds the maximum limit stipulated by the Minister of Health regulation No. 70 the year 2016 that is 35,70C and 350C. Albumin levels in urine are the most positive value in non-production parts. The results of the cross-tabulation showed that workers with chromium levels exceeding the normal value are workers who work in the working environment with a rate of chromium in the air amounted to 0.01 mg/m3. Workers in the home industry of metal plating as much as 25% or 3 out of 12 workers have a positive rate of

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albumin, this indicated has occurred damage to kidney function. As much as (17%) or 1 out of 6 workers with normal and positive urine rate for albumin and as much as (33%) or 2 of 6 workers with chromium levels of urine exceeds the normal and positive limits of urine albumin levels.

Researchers suggest the need for the exhaust fan to support ventilation so that air exchanges can be faster and take some plants around the industry to avoid heat. The owner of the industry is assisted by the District government can monitor the waste generated by the content of chromium in the air environments. Besides, there is an alternative to separate the chrome from industrial waste using adsorption method.

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