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**IDENTIFICATION OF HAZARDOUS CHEMICAL
AND MICROBES CONTAMINATION IN FOODS
OF STREET VENDORS**

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Abstract

This study aimed at identifying chemical and microorganism contamination in foods of street vendors around Institut Agama Islam (IAIN) Syekh Nurjati Cirebon. The samples are meatball, cilok, grilled fish cake, nuggets, rolade, sauce, crackers, and iced water drinks. The sample tests are formalin test, borax test, Rodhamine B test, Methanyl Yellow test, and Coliform & Escherichia coli MPN test. The results showed that some food samples like meatball, cilok, grilled fish cake, nuggets, and rolade were positive of formalin & borax contaminated. The iced water drinks are contaminated by Coliform & E. coli. The other samples like sauce and crackers were negative of Rhodamine B & Methanyl Yellow contaminated. In conclusion, according to this study, the foods of street vendors at IAIN Cirebon are not yet safe to be consumed.

Keywords: *Hazardous chemical, microbes, food street safety.*

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The fulfillment of quality and safe/healthy food contained in Law No.18 of 2012 is the fundamental right of a citizen in Indonesia. Healthy food is an important issue today because of various foods sold at open street. The results of the study in 2011 by the Food and Drug Supervisory Agency (BPOM) revealed an extraordinary incidence of 163 cases of food poisoning. One reason is the addition of preservatives, dyes, and also the potential for harmful microbial contamination (Rizki, 2016).

The coloring and preservatives allowed by BPOM RI are particular food coloring. However, the price of food coloring and chemicals is considered quite expensive for small producers. Hazardous textile coloring material that is often used is Rhodamine B & Methanyl Yellow, while dangerous preservatives that are commonly used are formalin & borax. This use causes food poisoning followed by acute pain, vomiting, nervous system depression, and blood circulation failure (Isran et al., 2016).

Formalin and borax abuse have been researched and indicated positively in some foods such as fish, shrimp, noodles, bread, rice cake, meatballs, cilok, tofu and others (Hastuti, 2016; Kusumawati, 2004; Pane et al, 2013; Putra, 2009; Rinto & Utama, 2009; Sultan, et al., 2013; Suryadi & Kurniadi, 2014; Triastuti, et al., 2013; Tumbel, 2012). In this study, the samples were grilled fish cake, rolade, nuggets, meatballs (formalin), cilok, and wet yellow noodles (borax).

Rhodamine B and Methanyl Yellow dyes are indicated in canteen snacks, ground red chillies, sauces, chili sauce, skewer meatball sauce and lipstick (Irawan & Ani 2016; Taufik et al. 2016; Sajiman et al., 2016; La Ifu, 2016; Hernawan, 2017; Situmorang et al., 2015; Azhari, 2017; Rusmalina & Anindhita, 2015). In this study, the samples studied were from sauces (Rhodamine B) and crackers (Methanyl Yellow).

One indicator of safe/healthy food is free from biological hazards (BPOM RI, 2012). Natural hazards such as bacteria can produce toxins that can cause disease (FAO, 2006). Malicious microbiological contaminants can originate from *Coliform* and *E. coli*, 2002). If these bacteria levels increase above average, they will cause digestive diseases such as acute diarrhea and fever. If it is not immediately treated, it will cause death (Kumala & Indriani, 2008; Zein et al., 2004). This research was conducted by Yusuf (2004) in the Darmaga TPB dormitory, food samples containing *E. coli* and was declared not eligible. Lettuce was examined in Bogor market containing *Salmonella*, which included pathogenic bacteria (Agustin, 2004). Also, market snacks and stalls in Jakarta contain pathogenic bacteria (Aminah et al., 2005). The samples tested for *Coliform* and *E. coli* by MPN. In this study, MPN was a mixture of water and ice. The use of this MPN method can reveal the existence of *E. coli* and *Coliform* contamination (Nurjannah & Novita, 2018).

Research on the identification of chemicals and harmful microbial

Table 1. Qualitative test results of formalin and borax.

| Food Sample/Street Vendors | Formalin Test | Borax Test |
|----------------------------|---------------|------------|
| Grilled fish cake/A | Positive | X |
| Rolade/A | Positive | X |
| Nugget/A | Positive | X |
| Meatball/B | Positive | X |
| Meatball /C | X | Negative |
| Yellow Noodle/C | X | Negative |
| Cilok/D | X | Positive |
| Cilok/E | X | Negative |

Notes: X: Undone

Table 2. Qualitative test result of *Rodhamine B* & *Methanyl Yellow*.

| Food Sample/Street Vendors | <i>Rodhamine B</i> | <i>Methanyl Yellow</i> |
|----------------------------|--------------------|------------------------|
| Sauce/A | Negative | X |
| Sauce /B | Negative | X |
| Sauce /C | Negative | X |
| Sauce /D | Negative | X |
| Sauce /E | Negative | X |
| crackers/F | X | Negative |
| crackers/G | X | Negative |

Notes: X: Undone

durable. The effect of borax on body organs varies depending on the concentration of borax ingested into the body. In adults, a borax dose of 10-20 gr/kg body weight and children 5 g / kg body weight can cause poisoning & death. Under these doses can cause symptoms such as upper abdominal pain, headaches, skin diseases and shortness of breath and failure of blood circulation (Khamid, 2006).

Identification of *Rodhamine B* & *Methanyl Yellow*

Identification of *Rhodamine B* dye tested on the red sauce while *Methanyl Yellow* tested on yellow crackers. Identification of *Rhodamine B* in sauces has been examined by Kartini & Mukti (2017), Azmi et al., (2017), Longdong (2017), Muflihunna & Sajadah (2014), and Samosir et

al., (2018). Meanwhile, the identification of *Methanyl Yellow* in crackers has been examined by Rahayu & Mahmuda (2016), Murtiyanti (2013) and Rahayu & Mahmuda (2016). Presentation of data on identification of the use of these dyes is in Table 2.

The results of the identification of *Rhodamine B* in Table 2 state that all the sauce from the traders A, B, C, D, E did not contain *rhodamine B*. This dye is made from diethylaminophenol and phthalic anhydride which is very toxic to humans. These dyes are declared prohibited for food ingredients according to the Regulation of the Minister of Health of the Republic of Indonesia No.722 / Menkes / Per / IX / 1988 concerning dyes which are declared dangerous and prohibited in Indonesia.

contamination in foods of street vendors around IAIN Syekh Nurjati Cirebon has not been conducted. With the potential for food safety hazards, it is feared that there is a possibility that it will disrupt the health of people who consume snacks around IAIN Syekh Nurjati Cirebon. Health is a factor that greatly influences learning achievement (Riyani, 2015). Therefore, this study aims at identifying harmful microbial chemicals and contaminants in foods of street vendors. It is hoped that this research will become a reference source for the campus community, to sort out snacks that are guaranteed to be safe.

METHOD

Samples were taken from street vendors around IAIN Syekh Nurjati Cirebon in November 2018 and analyzed at the Regional Health Laboratory (Labkesda) in Cirebon City. This research is a qualitative and quantitative descriptive study. The parameters analyzed were formalin, borax, Rhodamine B, Methanyl Yellow, and Coliform & E. coli. Qualitative test for formalin using chromatofic acid, borax refers to SNI 01-2358-1991, Identification of synthetic coloring agents (Rhodamine B & Methanyl Yellow) using Paper Chromatography method according to SNI, 01-2895-1992. The microbiological examination uses the Most Probable Number Test method which consists of a presumptive test using the lactose broth medium, confirmative test using the brilliant green lactose broth medium. The sample consisted of meatballs, cilok,

yellow noodles, sauce, brains, nuggets, crackers, and ice cubes. All samples were selected from several street vendors. Data that has been analyzed is presented in the form of tables and narratives to discuss the results obtained.

FINDINGS AND DISCUSSION

Identification of Formalin and Borax

Formalin identification was tested in grilled fish cake snack, rolade, nuggets, meatballs, while identification of borax was tested in meatballs, cilok, and yellow noodles from meatballs. Formalin & borax used in these samples have been tested positively in various test sites (Fauziah, 2014; Harsojo & Kadir, 2013; Kartini & Mukti, 2017; Nopi-yanti, Krisnawati, & Heriani, 2018; Santi, 2018; Tubagus, 2013; Ulfa, 2015 ; Wariyah & Dewi, 2013; Warni, 2013; Yulizar, Wintarsih, & Amin, 2014).

The results of the identification of formalin and borax in Table 1 showed that all samples from trader A were declared unsafe for consumption because they contained formaldehyde. Formaldehyde can increase blood acidity, shortness of breath, hypothermia, coma, and death (Winarno, 1997).

Identification in the merchant *cilok* D sample contained positive borax, while the merchant C, and E samples did not contain borax. Addition of borax acid in the process of making meatballs/cilok can improve the structure and texture of meatballs/cilok to be more springy and

Tabel 3. Identification of total *Coliform* and *E.coli* bacterial contamination.

| Drinks Sample/Street Vendors | MPN Coliform/ Gram | MPN E.Coli/ Gram |
|--------------------------------|-----------------------|---------------------|
| Mixture of Water & Ice Cube/H | 33 | 33 |
| Mixture of Water & Ice Cube /I | 460 | 150 |
| Mixture of Water & Ice Cube /J | 240 | 93 |
| Mixture of Water & Ice Cube /K | 460 | 460 |
| Mixture of Water & Ice Cube /L | >2400 | >2400 |
| Mixture of Water & Ice Cube /M | >2400 | >2400 |
| Mixture of Water & Ice Cube /N | >2400 | >2400 |

The results of the Methanyl Yellow identification in table 2 show that the crackers of the F & G are negative of Methanyl Yellow. The use of Methanyl Yellow dye is often found in food products such as crackers, noodles, tofu, fried foods, cakes, and yellow snacks. Methanyl Yellow is often used by food traders because of its lower price and more attractive colors than food coloring. Methanyl Yellow is prohibited for food products because of the heavy metal content that can endanger health (Palar, 2008). This compound is an aromatic azo chemical compound that can cause tumors in various tissues of the liver, bladder, digestive tract, and skin tissue.

Identification of *Coliform* and *E. coli*

The samples tested came from a mixture of water & ice cubes at traders H, I, J, K, L, M, and N. Research on coliform bacteria contamination and *E. coli* on water & ice was tested by Nurjannah & Devi (2018), Hadi, et al., (2014), and Rifta et al., (2016). Data presentation on total contamination of Coliform bacteria and *E. coli* is found in table 3.

Coliform and *E. coli* MPN values from traders H, I, J, K, L, M, N did not meet the requirements of

Jasaboga sanitation hygiene number 1096 / MENKES / PER / VI / 2011 which was 0 / gram. This indicates that iced drinks in street vendors around IAIN Syekh Nurjati Cirebon are not safe for consumers. Contamination of *E. coli* bacteria is an indicator bacterium that is used to detect contamination by feces in water and detect the presence of intestinal pathogens. *E. coli* is a normal flora found in the digestive tract of animals and humans, but some *E. coli* serotypes can cause diarrhea in humans. The mixture of water & ice cubes around this campus are not safe to be consumed and a high chance to cause disease. This can cause people who drink it to suffer from diarrheal diseases. Diarrhea can cause heart rhythm disorders, and cerebral hemorrhage due to loss of electrolyte fluid (Herbowo & Firmansyah, 2016).

CONCLUSION

The results of identification of hazardous chemicals and microbial contamination in street vendors around IAIN Syekh Nurjati Cirebon were formalin and borax positive in some samples, Rhodamine B & Methanyl Yellow are negative in all

samples and *E. coli* & *Coliform* contamination in water mixtures and ice. Therefore, foods street vendors around IAIN Syekh Nurjati Cirebon are not yet safe to be consumed. Suggestions from the results of this study are expected to provide periodic guidance and counseling on food safety for street vendors around IAIN Syekh Nurjati Cirebon.

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REFERENCES

- BPOM RI] Badan Pengawas Obat dan Makanan Republik Indonesia. 2011. Laporan Kejadian Luar biasa. [Diakses pada]: <http://jdih.pom.go.id/showpdf.php?u=9DsKgrvFVFHPjpLGNjx%2FM%2FAsWDeWV0YMDKC4pZj7A44%3D>
- [BPOM RI] Badan Pengawas Obat dan Makanan Republik Indonesia. 2012. Masyarakat merupakan bagian penting dalam pengawasan pangan. *WartaPOM*. 15:5.
- [FAO] Food and Agriculture Organization. 2006. Food Safety Risk Analysis: A Guide for National Food Safety Authorities. Roma (IT): FAO.
- Agustin, D. S. (2004). Prevalensi Salmonella pada Selada Segar di Pasar Tradisional Daerah Bogor dan Evaluasi Prosedur Pengujiannya [Skripsi]. Bogor: Fakultas Teknologi Pertanian, Institut Pertanian Bogor
- Aminah, N. S., Mardiana, M., & Supraptini, S. (2005). Jenis Jamur dan Lalat yang ditemukan pada Makanan Jajanan dari Pasar dan Warung di Jakarta. *Media Penelitian Dan Pengembangan Kesehatan*, 15:11-16
- Azhari, A. (2017). Analisis Rhodamin B Cabai Giling di Pasar Segiri dengan metode Kromatografi Lapis Tipis. *Mahakam Medical Laboratory Technology Journal*, 1(1), 1–10.
- Azmi, U., Novita, M., & Sulaiman, I. (2017). Analisis Bahan Pewarna Sintetis Non Pangan Rhodamin B dan Methanyl Yellow pada Produk Saus Tomat dan Saus Cabe di Kota Banda Aceh. *Jurnal Ilmiah Mahasiswa Pertanian*, 2(3), 210–215.
- Dachlan, D. M., & Virani, D. (2017). Gambaran penggunaan zat pewarna, pemanis dan pengawet pada makanan jajanan di kota makassar [Skripsi]. Makassar: Fakultas Kesehatan Masyarakat, Universitas Hasanuddin
- Fauziah, R. R. (2014). Kajian Keamanan Pangan Bakso dan Cilok yang Berdar di Lingkungan Universitas Jember Ditinjau dari Kandungan Borax, Formalin dan TPC. *Jurnal Agrote-*

- knologi*, 8(1), 67–73.
- Hadi, B., Bahar, E., & Semiarti, R. (2014). Uji Bakteriologis Es Batu Rumah Tangga yang digunakan Penjual Minuman di Pasar Lubuk Buaya Kota Padang. *Jurnal Kesehatan Andalas*, 3(2), 119–122.
- Harsojo, H., & Kadir, I. (2013). Penggunaan formalin dan borax serta kontaminasi bakteri pada otak-otak. *J. Iptek Nuklir Ganendra*, 16(1), 9–17.
- Hastuti, S. (2016). Analisis kualitatif dan kuantitatif formaldehid pada ikan asin di Madura. *Agrointek*, 4(2), 132–137.
- Herbowo, H., & Firmansyah, A. (2016). Diare akibat infeksi parasit. *Sari Pediatri*, 4(4), 198–203.
- Hernawan, E. (2017). Analisis Zat Aditif Rhodamin B dan Methanil Yellow pada Makanan yang Dijual di Pasaran Kota Tasikmalaya Tahun 2016. *Jurnal Kesehatan Bakti Tunas Husada*, 17(1), 16–20.
- Irawan, I., & Ani, L. S. (2016). Prevalensi Kandungan Rhodamin B, Formalin, dan Borax pada Jajanan Kantin Serta Gambaran Pengetahuan Pedagang Kantin Di Sekolah Dasar Kecamatan Susut Kabupaten Bangli. *E-Jurnal Medika Udayana*, 5 (11):1-6
- Isran, Karimuna, L., & Sadimantara, M. S. (2016). Analisis Kandungan Zat Pengawet Natrium Benzoat Pada Saus Tomat Di Pasar Tradisional Andounohu Kota Kendari. *Sains Dan Teknologi Pangan*, 1(2), 131–135.
- Kartini, W., & Mukti, B. H. M. (2017). Uji Kandungan Rhodamin B dan Formalin Pada Jajanan Anak Di Sekolah Dasar Kota Banjarbaru. *Dinamika Kesehatan*, 8(1), 266–273.
- Khamid IR. 2006. Bahaya Borax Bagi Kesehatan. Jakarta (ID): Kompas
- Kumala, S., & Indriani, D. (2008). Efek Antibakteri Ekstrak Etanol Daun Cengkeh (*Eugenia aromatic L.*). *Jurnal Farmasi Indonesia*, 4(2), 82–87.
- Kusumawati, F. (2004). Penetapan Kadar Formalin yang digunakan sebagai Pengawet dalam Bakmi Basah di Pasar Wilayah Kota Surakarta. *Jurnal Penelitian Sains & Teknologi*, 5 (1)131-140
- La Ifu, A. (2016). Analisis Kandungan Rhodamin B Pada Sambal Botol Yang Diperdagangkan Dipasar Modern Kota Kendari (Studi Pada Hypermart dan Mall Mandonga). *Jurnal Sains Dan Teknologi Pangan*, 1(3), 240-245
- Longdong, G. (2017). Analisis Zat Pewarna Rhodamin B pada Saos Bakso Tusuk yang Beredar di Sekitar Kampus Universitas Sam Ratulangi Manado. *Pharmacon*, 6(4), 28–34.
- Muflihunna, A., & Sajadah, U. (2014). Analisis pewarna rhodamin B dalam saus tomat yang beredar di kota Makassar secara

- spektrofotometri UV-VIS. *As-Syifaa Jurnal Farmasi*, 6(2), 107–111.
- Murtiyanti, M. F. (2013). Identifikasi Penggunaan Zat Pewarna Pada Pembuatan Kerupuk dan Faktor Perilaku Produsen (Studi Pada Sentra Kerupuk di Desa Ngaluran Kec. Karanganyar Kab. Demak). *Unnes Journal of Public Health*, 2(1), 1–7.
- Nopiyanti, N., Krisnawati, Y., & Heriani, S. (2018). Studi Kasus Jajanan yang Mengandung Borax dan Formalin di Taman Kurma Kota Lubuklinggau. *Bioedusains: Jurnal Pendidikan Biologi Dan Sains*, 1(2), 115–125.
- Nurjannah, L., & Novita, D. A. (2018). Uji bakteri *Coliform* dan *Escherichia coli* pada air minum isi ulang dan air sumur di kabupaten Cirebon. *Jurnal Ilmu Alam Indonesia*, 1(1): 60-68
- Pane, I. S., Santi, D. N., & Chahaya, I. (2013). Analisis Kandungan Borax (NA₂B₄O₇ 10 H₂O) Pada Roti Tawar Yang Bermerek dan Tidak Bermerek yang Dijual di Kelurahan Padang Bulan Kota Medan Tahun 2012. *Lingkungan Dan Kesehatan Kerja*, 2(3), 1-8
- Putra, A. K. (2009). Formalin dan Borax pada Makanan. *Bandung: Institut Teknologi Bandung*.
- Rahayu, M., & Mahmuda, Y. I. (2016). Identifikasi Zat Pewarna Rhodamin B Dan Methanyl Yellow Pada Kerupuk Yang Dijual Di Pasar Beringharjo Yogyakarta Tahun 2016. *Jurnal Teknologi Laboratorium*, 5(2), 55–58.
- Rifta, R., Budiyono, B., & Darundiati, Y. H. (2016). Studi identifikasi keberadaan *Escherichia coli* pada es batu yang digunakan oleh pedagang warung makan di Tembalang. *Jurnal Kesehatan Masyarakat (e-Journal)*, 4(2), 176–185.
- Rinto, E. A., & Utama, S. B. (2009). Kajian Keamanan Pangan (Formalin, Garam Dan Mikrobial) Pada Ikan Sepat Asin Produksi Indralaya. *Jurnal Pembangunan Manusia Vol*, 8(2), 1-10
- Riyani, Y. (2015). Faktor-faktor yang Mempengaruhi Prestasi Belajar Mahasiswa (Studi pada mahasiswa Jurusan Akuntansi Politeknik Negeri Pontianak). *Ekos* 8(1):19-25
- Rizki, ken aria. (2016). *Penilaian lomba kantin sehat sekolah dasar di kota depok tahun 2015* [Skripsi]. Bogor: Fakultas Teknologi Pertanian, Institut Pertanian Bogor.
- Rusmalina, S., & Anindhita, M. A. (2015). Identifikasi Rhodamin B Dalam Saus Sambal Yang Beredar Di Kota Pekalongan. *Pena Jurnal Ilmu Pengetahuan Dan Teknologi*, 29(1).
- Sajiman, S., Nurhamidi, N., & Mahpolah, M. (2016). Kajian Bahan Berbahaya Formalin, Borax, Rhodamin B dan Me-

- thaly n Yellow pada Pangan Jajanan Anak Sekolah di Banjarbaru. *Jurnal Skala Kesehatan*, 6(1), 1-5
- Samosir, A. S., Bialangi, N., & Iyabu, H. (2018). Analisis Kandungan Rhodamin B Pada Saos Tomat Yang Beredar Di Pasar Sentral Kota Gorontalo Dengan Menggunakan Metode Kromatografi Lapis Tipis (KLT). *Jambura Journal of Educational Chemistry*, 13(1), 45–49.
- Santi, A. U. P. (2018). Analisis Kandungan Zat Pengawet Borax Pada Jajanan Sekolah di SDN Serua Indah 1 Kota Ciputat. *Jurnal Holistika*, 1(1), 57–62.
- Siagian, A. (2002). Mikroba patogen pada makanan dan sumber pencemarannya [Artikel]. Medan: Fakultas Kesehatan Masyarakat, Universitas Sumatera Utara
- Situmorang, H. R., Nurmaini, M. K. M., & Hasan, W. (2015). Higien Sanitasi serta Pemeriksaan Escherichia coli dan Rhodamin B pada Makanan Jajanan di Sekolah Dasar (SD) Kelurahan Timbang Deli Kecamatan Medan Amplas Tahun 2013. *Lingkungan Dan Kesehatan Kerja*, 3(2), 1-5
- Sultan, P., Sirajuddin, S., & Najamuddin, U. (2013). Analisis Kandungan Zat Pengawet Borax Pada Jajanan Bakso Di SDN Kompleks Mangkura Kota Makassar [Artikel]. Makassar: Fakultas Kesehatan Masyarakat, Universitas Hasanuddin
- Suryadi, H., & Kurniadi, M. (2014). Analisis Formalin dalam Sampel Ikan dan Udang Segar dari Pasar Muara Angke. *Pharmaceutical Sciences and Research (PSR)*, 7(3), 16-31
- Taufik, M., Rusdin Rauf, S. T. P., & Purwani, E. (2016). Identifikasi Rhodamin B Dan Persepsi Siswa Terhadap Jajanan Di Sekolah Dasar Sekitar Kampus UMS [Skripsi]. Surakarta: Fakultas Ilmu Kesehatan, Universitas Muhammadiyah Surakarta.
- Triastuti, E., Fatimawali, F., & Runtuwene, M. R. J. (2013). Analisis Borax pada Tahu yang diproduksi di Kota Manado. *Pharmacon*, 2(1), 69-74
- Tubagus, I. (2013). Identifikasi dan Penetapan Kadar Borax dalam Bakso Jajanan di Kota Manado. *Pharmacon*, 2(4), 142–148.
- Tumbel, M. (2012). Analisis Kandungan Borax dalam Mie Basah yang Beredar di Kota Makassar. *Chemica*, 11(1), 57–64.
- Ulfa, A. M. (2015). Identifikasi Borax pada Pempek dan Bakso Ikan secara Reaksi Nyala dan Reaksi Warna. *Jurnal Kesehatan Holistik*, 9(3), 151–157.
- Wariyah, C., & Dewi, S. H. C. (2013). Penggunaan Pengawet dan Pemanis Buatan pada Pangan Jajanan Anak Sekolah (PJAS) Di Wilayah Kabupaten Kulon Progo-DIY. *AgriTech*, 33(2), 146-153

- Warni, S. A. (2013). Analisis Borax Pada Bakso Daging Sapi C Dan D Yang Dijual Di Daerah Lakarsantri Surabaya Menggunakan Spektrofotometri. *Calyptra*, 2(2), 1–10.
- Winarno FG. 1997. Kimia Pangan Dan Gizi. Jakarta: Gramedia Pustaka Utama
- Yulizar, Y., Wintarsih, I., & Amin, A. A. (2014). Derajat Bahaya Penggunaan Air Abu, Borax Dan Formalin Pada Kuliner Mie Aceh Yang Beredar Di Kota X Provinsi Aceh Terhadap Manusia. *Journal of Natural Resources and Environmental Management*, 4(2), 145-151
- Yusuf, A. L. (2004). Studi Keamanan Mikrobiologis Makanan Di Kantin Asrama Putri Tingkat Persiapan Bersama Institut Pertanian Bogor [Skripsi]. Bogor: Fakultas Pertanian, Institut Pertanian Bogor
- Zein, U., Sagala, K. H., & Ginting, J. (2004). Diare akut disebabkan bakteri [Artikel]. Medan: *Fakultas Kedokteran, Universitas Sumatera Utara*.