

Mercury Identification Training and Safe Cosmetics Education for Babunnajah Vocational School Students

Pelatihan Identifikasi Merkuri dan Edukasi Kosmetik Aman bagi Siswa SMK Babunnajah

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Abstract

The use of unsafe cosmetics among adolescents, particularly those containing mercury, remains a significant public health concern. This community service program aimed to enhance students' knowledge at SMK Babunnajah through training in mercury identification and education on the safe use of cosmetics. The activity employed interactive lectures, group discussions, and hands-on mercury testing using simple reagent kits. An evaluation was conducted using pre-test and post-test questionnaires with 40 students. The results showed a substantial improvement in knowledge levels, with 70% of participants categorised as having high knowledge before the training, increasing to 100% afterwards. All knowledge indicators showed improvement, particularly in understanding product legality and the risks of mercury exposure. This training proved effective in fostering critical awareness and selective behaviour regarding cosmetic use. The program is recommended for replication in other vocational schools as a preventive measure against the use of illegal and harmful cosmetic products.

Keywords: *cosmetic education, mercury identification, training, adolescents, vocational school*

Abstrak

Penggunaan kosmetik yang tidak aman di kalangan remaja, khususnya yang mengandung merkuri, masih menjadi masalah serius yang dapat berdampak pada kesehatan. Kegiatan pengabdian ini bertujuan untuk meningkatkan pengetahuan siswa SMK Babunnajah mengenai keamanan kosmetik melalui pelatihan identifikasi merkuri dan edukasi kosmetik aman. Metode pelaksanaan meliputi ceramah interaktif, diskusi, dan praktik uji merkuri menggunakan reagen sederhana. Evaluasi dilakukan melalui pre-test dan post-test terhadap 40 peserta. Hasil menunjukkan peningkatan signifikan dalam tingkat pengetahuan, dari 70% peserta berada pada kategori tinggi sebelum pelatihan menjadi 100% setelah pelatihan. Seluruh indikator pengetahuan mengalami peningkatan, terutama pada pemahaman tentang legalitas dan bahaya merkuri. Pelatihan ini efektif dalam membentuk kesadaran kritis dan sikap selektif terhadap penggunaan kosmetik. Kegiatan ini direkomendasikan untuk direplikasi secara berkala di sekolah menengah kejuruan sebagai langkah preventif terhadap penggunaan kosmetik ilegal.

Kata kunci: *edukasi kosmetik, identifikasi merkuri, pelatihan, remaja, SMK*

1. INTRODUCTION

The use of cosmetics has become an integral part of people's lifestyles, especially among teenagers and students. However, not all users understand the dangers of hazardous ingredients in cosmetics, such as mercury. Mercury is often found in skin-lightening products because of its fast effect, although it is prohibited due to its toxic effects on human health and the environment (Mohammed et al., 2021). As a result, there are still many illegal cosmetic products circulating freely on the market and widely used by teenagers without sufficient understanding.

The dangers of mercury in cosmetics not only cause skin irritation, but also damage organs such as the kidneys and nervous system, as well as harming the reproductive system and fetal development (Lamakaratea et al., 2022). According to BPOM, from 2021 to 2023, hundreds of cosmetic products containing mercury were still found to be marketed online and offline without official distribution permits (Badan Pengawas Obat dan Makanan Republik Indonesia, 2023b). This highlights the importance of educating the public, particularly young age groups, about identifying safe cosmetic products.

Vocational High School (SMK) students, especially those majoring in pharmacy and nursing, are a strategic group that needs to be equipped with an understanding of cosmetic safety. Knowledge is not only beneficial for oneself, but can also act as an educational agent in the surrounding environment. Based on research by Adjeng et al. (2023), providing interactive-based training can improve students' understanding of the proper use of cosmetics, which before the counseling was 43.3% increasing to 76.7%, and knowing hazardous cosmetic ingredients was 36.7% to 93.3% (Adjeng et al., 2023).

Mercury identification training in cosmetics is one form of effective intervention. This method involves introducing the physical characteristics of products containing mercury, using rapid tests such as test kits, and educating students on how to read labels and the legality of products. With a hands-on approach, students can better understand how to recognize hazardous cosmetics and choose safe and legal products (Lestari et al., 2024).

This community service program aims to enhance the knowledge of vocational high school students about safe cosmetics through training on mercury identification. This activity is expected to encourage changes in the behavior of consuming cosmetics that are wiser and safer and strengthen the role of the younger generation in disseminating evidence-based health information in their social environment.

With the increasing awareness and knowledge of students through this training, it is expected that there will be a decrease in the use of illegal cosmetics and an increase in demand for products that have been registered and guaranteed to be safe. This effort is in line with the BPOM national program in realizing a society that is aware of safe cosmetics and the use of products following statutory provisions (Badan Pengawas Obat dan Makanan Republik Indonesia, 2023a).

2. METHOD

This community service activity was carried out at SMK Babunnajah Pandeglang on Saturday, June 14, 2025, and was aimed at increasing students' knowledge about safe and legal cosmetics, as well as providing basic skills in identifying mercury content in cosmetic products. The approach used was participatory education and practice-based training, with implementation methods including: (1) providing educational materials through interactive lectures and discussions, (2) demonstrations and direct practice of mercury identification using simple test reagents, and (3) evaluating participants' knowledge before and after training.

All participants participated in a series of activities over the course of one day, which consisted of three main stages. First, a safe cosmetics education session was delivered through an interactive lecture with visual media. Second, a practical training session was conducted on mercury identification using a reagent-based test kit that detects the presence of mercury through color changes. Participants were divided into small groups, and each tested a product brought from home or the surrounding environment. Third, a discussion of the test results and a question-and-answer session were held to strengthen understanding and clarification of field findings.

The success of the activity was measured using pre-test and post-test instruments, which consisted of multiple-choice questions with 15 questions. This instrument was designed to measure participants' conceptual knowledge related to regulatory aspects, characteristics of safe

cosmetics, mercury hazards, and critical attitudes in choosing products. The scores obtained from the pre-test and post-test were compared using Paired Sample t-Test statistical analysis to determine the significance of changes in participants' knowledge quantitatively. The level of achievement in the success of community service was determined by one main indicator: the increase in the knowledge level category from pre-test to post-test. The minimum target is 80% of participants in the "high" category in the post-test.

3. RESULTS AND DISCUSSION

The mercury identification training and safe cosmetics education activities were held on Saturday, June 14, 2025 at SMK Babunnajah, Pandeglang Regency, Banten. The participants of the activity were 40 students from the Pharmacy and Nursing departments, all of whom were 38 female students and 2 students in grades X and XI. The activity was designed to last for one full day and was divided into several structured sessions, starting with a pretest to measure participants' initial knowledge, followed by the provision of educational materials on safe and legal cosmetics, and practical training on how to identify mercury content in cosmetic products using a simple test kit. Furthermore, group discussion sessions, case studies, posttests, and activity evaluations were carried out. The training methods used were interactive and applicable, so that students not only understood the concepts theoretically but were also able to apply them in direct practice. The material presented included the dangers of hazardous materials such as mercury, how to recognize illegal cosmetics, reporting procedures to BPOM, and techniques for examining suspicious cosmetics. The implementation of this activity was adjusted to the needs of vocational students in the health sector, so that they could become agents of change in the use and dissemination of information related to safe cosmetics in their environment.



Figure 1. Implementation of Community Service Activities



Figure 2. Education and Training Activities for Mercury Inspection in Cosmetic Products

The mercury checking training session is the core of the activity, where students are taught directly how to identify mercury content in cosmetics using a chemical reagent-based mercury tester. Each student is given the opportunity to bring a sample of cosmetics that they own or that are widely circulated in the surrounding community. This training begins with a demonstration by the facilitator, then students practice on their own under supervision.

The results of this session showed that 3 out of 40 cosmetic samples tested were indicated positive for mercury, especially in facial whitening products without a distribution permit. This

finding strengthens the BPOM report (2023) which states that facial whitening products are one of the cosmetic groups with the highest level of abuse of hazardous materials (Biro Kerja Sama dan Hubungan Masyarakat, 2025).

The active participation of students during the practical session showed the participants' interest and concern for this issue. Participants were also given an understanding that simple mercury detection can be done as an initial step to avoid the use of hazardous products. Education like this is important to be carried out continuously considering the rampant circulation of illegal cosmetics that are often claimed to be "natural" but contain heavy metals such as mercury and hydroquinone (Widiyastuti et al., 2022).

Table 1. Characteristics of Female and Male Students of Babunnajah Pandeglang Vocational School

No	Characteristics	Frequency	Percentage
1	Sex		
	Female	38	95%
	Male	2	5%
	Total	40	100%
3	Age		
	15 Years	1	2,5%
	16 Years	14	35%
	17 Years	24	60%
	18 Years	1	2,5%
	Total	40	100%

The participants in this training activity were 40 female students from the Pharmacy and Nursing majors at SMK Babunnajah, all of whom were in grades X and XI. Based on the characteristics data, the majority of female participants were aged between 15 and 18 years (average age 16.7 years), which corresponds to the late adolescent age group—a developmental phase that is particularly vulnerable to social influences, including those related to cosmetic consumption. Most of the participants came from rural areas in Pandeglang Regency, with a lower to middle socioeconomic background. This information is essential to consider because factors of access to information and purchasing power greatly influence the choice of cosmetic products used by teenagers (Lubis et al., 2024).

These characteristics suggest a knowledge and practice gap in the use of cosmetics among adolescents. Based on research by Zumarthana et al. (2024), the adolescent group is a population that is very vulnerable to exposure to illegal cosmetics due to the influence of beauty trends and a lack of product literacy (Zumarthana et al., 2024). Therefore, educational intervention in the school environment is very strategic as a form of early prevention.

The evaluation of the activity was conducted by comparing the participants' level of knowledge before and after the training using pre-test and post-test instruments consisting of 15 multiple-choice questions. The questions were developed based on the material presented, which included the definition of cosmetics according to BPOM regulations, types and functions of cosmetics, principles of selecting safe cosmetics, the dangers of hazardous materials such as mercury, and how to verify product legality through the official BPOM platform. The purpose of this evaluation was to measure the extent to which the training contributed to increasing safe cosmetic literacy among SMK Babunnajah students.

The evaluation results showed that most participants had good initial knowledge on several fundamental aspects. As seen in Table 2, indicators related to the definition of cosmetics (question 1), how to check legality through the BPOM website (question 5), and general understanding of BPOM's duties (question 4) had obtained high pre-test scores (95–100%). However, there were still misconceptions on essential indicators, such as understanding the claim of "instant effect as an indicator of safe cosmetics," which was answered correctly by only 15% of

participants in the pre-test. After the training, there was a sharp increase to 90%, indicating that the training was successful in correcting common myths circulating among teenagers.

Table 2. Distribution of Participants' Correct Answers Based on Each Question

No	Statement	Pre-Test (%)	Post-Test (%)
1	Cosmetics are materials or preparations used on the outside of the body, such as the epidermis, hair, nails, lips, and external genital organs, according to BPOM No. 32 of 2021.	95	97,5
2	Examples of cosmetics include powder, lipstick, mascara, soap, shampoo, lotion, and perfume.	82,5	97,5
3	The primary function of cosmetics is to enhance appearance.	75	95
4	BPOM supervises production/distribution facilities, inspects cosmetic manufacturing methods, takes samples, and conducts laboratory tests.	100	100
5	To check the legality of cosmetics, we can use the site https://cekbpom.pom.go.id or the BPOM Mobile application.	100	100
6	Safe cosmetics should be chosen without considering the user's skin condition.	97,5	100
7	Illegal products may contain harmful ingredients such as mercury, hydroquinone, textile dyes, and retinoic acid.	80	100
8	Legal cosmetic packaging does not require whole labeling.	62,5	100
9	It is often better to buy products without packaging or from unofficial sellers, as the prices are generally cheaper.	80	95
10	For teenagers, it is best to choose products based on their skin type and use those labeled 'non-comedogenic' or 'hypoallergenic'.	87,5	100
11	Consultation with a doctor or healthcare professional is not necessary when choosing cosmetics.	70	92,5
12	This type of acne in teenagers is only caused by the use of cosmetics.	95	92,5
13	Cosmetics can be stored closed and in a clean and cool place.	80	100
14	Before buying cosmetics, it is essential to verify their legality and safety.	82,5	100
15	One of the characteristics of safe and legal cosmetics is that the effects are instant and comfortable.	15	90

The increase in scores occurred across almost all indicators. Several indicators even showed an absolute increase towards 100%, such as understanding of packaging labels (question 8), awareness of illegal products and hazardous content (question 7), and a cautious attitude before making a purchase (question 14). This confirms that the training provided was successful in providing new insights and strengthening previously undeveloped or inaccurate understanding. The interactive learning approach, accompanied by direct mercury checking practices, most likely contributed to these significant changes. To provide a more comprehensive picture of changes in participants' knowledge levels, participants were grouped based on their total score of correct answers. The knowledge level categories were divided into three: low (10 - 55), medium (56 - 74), and high (75 - 100)(Notoatmodjo, 2018).

Table 2. Grouping of Participants' Knowledge Levels

Knowledge Category	Range Score	Number of Pre-Test Participants	Number of Post-Test Participants
Low	10 - 55	1 (2,5%)	0
Medium	56 - 74	11 (25,5%)	0
High	75 - 100	28 (70%)	40 (100%)
p-Value			0,001

The data in Table 3 shows that before the training, there were still participants with low (2.5%) and medium (25.5%) levels of knowledge. After the training, all participants successfully moved to the high category, indicating the extraordinary effectiveness of this activity. Not only was there an increase in individual scores, but there was a collective transformation that suggested that this activity was inclusive, reaching participants with diverse knowledge backgrounds. This also shows that the training delivery methods used (interactive lectures, group discussions, and mercury testing practices) were able to reach the various learning styles of the participants. To determine the statistical significance of the difference between pre-test and post-test scores, a paired sample t-test was conducted. The test results showed a p-value of 0.001, which was below the significance threshold ($\alpha = 0,05$). This indicates a substantial difference in knowledge scores before and after the training.

Statistically, the very low p-value indicates that the increase did not occur by chance, but was a direct effect of the training intervention provided. In addition, the data also shows that this training was effective in reaching all participants without exception, including participants who were previously in the low knowledge category. The transfer of 100% of participants to the high knowledge category reflects the success of the systematically designed training approach, with BPOM regulation-based materials, mercury test simulations, and discussions of illegal cosmetic cases that are relevant to the daily lives of teenagers. Thus, the statistical analysis not only shows success in terms of numbers, but also supports the importance of implementing educational training in vocational school environments as a preventive strategy to build critical awareness of the dangers of unsafe cosmetics.

Thus, the evaluation of this activity shows that mercury identification training and safe cosmetic education not only succeeded in significantly increasing participants' knowledge, but also succeeded in forming critical awareness and selective attitudes towards cosmetic products among vocational high school students. This activity has strategic value to be replicated on a wider scale, especially among teenagers who are a group of active cosmetic users but are vulnerable to exposure to illegal products.

4. CONCLUSION

1. Mercury identification training and education on legal and safe cosmetics succeeded in significantly increasing the knowledge of SMK Babunnajah students, as evidenced by the increase in the average percentage of correct answers and the movement of all participants (100%) to the high level of knowledge category in the post-test.
2. Statistical tests using the Paired Sample t-Test produced a p value = 0.001, which indicates that the difference in knowledge scores before and after training was statistically very significant.
3. The advantages of this activity lie in its interactive and applicable delivery method, which combines participatory lectures, discussions, and direct mercury testing practices relevant to the needs of SMK students majoring in Pharmacy and Nursing.
4. This activity also succeeded in correcting common misconceptions among teenagers, such as the assumption that instant effects are a characteristic of safe cosmetics. It encouraged participants to be more critical of the legality and safety of the products they use.
5. Limitations of the activity include its limited time coverage (only one day), the absence of a long-term evaluation of behavioral changes, and the exclusion of external stakeholders, such as parents or the surrounding community.
6. Future activity development can be directed at ongoing training that includes topics on other hazardous materials in cosmetics (such as hydroquinone and retinoic acid), collaboration with healthcare workers, and integration of this education into the formal school curriculum.

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REFERENCES

- Adjeng, A. N. T., Koedoes, Y. A., Ali, N. F. M., Palogan, A. N. A., & Damayanti, E. (2023). Edukasi Bahan dan Penggunaan Kosmetik yang Aman di Desa Suka Banjar Gedong Tataan Kabupaten Pesawaran. *Jurnal Kreativitas Pengabdian Kepada Masyarakat (PKM)*, 6(1), 89–102. <https://doi.org/10.33024/jkpm.v6i1.8041>
- Badan Pengawas Obat dan Makanan Republik Indonesia. (2023a). *Regulasi Profil Layanan CekBPOM Kinerja Informasi Publik Reformasi Birokrasi Pengaduan ID Tingkatkan Kesadaran Dan Peran Aktif Masyarakat Dalam Menggunakan Obat dan Kosmetik Aman*. Badan Pengawas Obat Dan Makanan. <https://www.pom.go.id/berita/Tingkatkan-Kesadaran-Dan-Peran-Aktif-Masyarakat-Dalam-Menggunakan-Obat-dan-Kosmetik-Aman>
- Badan Pengawas Obat dan Makanan Republik Indonesia. (2023b). *Temuan Obat Tradisional dan Suplemen Kesehatan Mengandung BKO serta Kosmetik Mengandung Bahan Dilarang/Berbahaya Tahun 2023*. Badan Pengawas Obat Dan Makanan. <https://www.pom.go.id/siaran-pers/temuan-obat-tradisional-dan-suplemen-kesehatan-mengandung-bko-serta-kosmetik-mengandung-bahan-dilarang-berbahaya-tahun-2023-2>
- Biro Kerja Sama dan Hubungan Masyarakat. (2025). *Regulasi Profil Layanan CekBPOM Kinerja Informasi Publik Reformasi Birokrasi Pengaduan ID Kepala BPOM Rilis Daftar Kosmetik Mengandung Bahan Berbahaya dan atau Dilarang Hasil Intensifikasi Pengawasan di Awal Tahun 2025*. Badan Pengawas Obat Dan Makanan. <https://www.pom.go.id/siaran-pers/kepala-bpom-rilis-daftar-kosmetik-mengandung-bahan-berbahaya-dan-atau-dilarang-hasil-intensifikasi-pengawasan-di-awal-tahun-2025>
- Lamakaratea, S., Banne, Y., Nahora, E. M., Wullura, A. C., & Sapiun, D. S. R. Z. (2022). Gangguan Kesehatan Akibat Merkuri Dalam Kosmetika. *Jurnal Poltekkes Kemenkes Manado*, 1(2), 505–517.
- Lestari, Y. P. I., As-Shiddiq, H., Mi'rajunnisa, Kamalia, N., Saputra, M. A. B., Zahra, R., & Munawwarah, S. (2024). Edukasi Wajah Berseri Tanpa Merkuri Dan Cara Mengecek Nomor BPOM pada Siswa-Siswi SMP Negeri 2 Alalak. *Jurnal Pengabdian Masyarakat Bangsa*, 1(12), 3557–3565.
- Lubis, R., Nabila, P., Nasution, N., Azzahra Lathifah, Hasraful, & Andina Fadillah. (2024). Evolusi Remaja Usia 17-19 Tahun: Analisis Pertumbuhan Dan Perkembangannya. *Jurnal Review Pendidikan Dan Pengajaran*, 7(3), 7899–7907.
- Mohammed, A. H., Blebil, A., Dujaili, J., & Hassan, B. A. R. (2021). Perception and attitude of adults toward cosmetic products amid COVID-19 pandemic in Malaysia. *Journal of Cosmetic Dermatology*, 20(7), 1992–2000. <https://doi.org/10.1111/jocd.14147>
- Notoatmodjo. (2018). *Konsep Pengetahuan, dan Sikap*. Rineka Cipta.
- Zumarthana, A. S., Oktaviani, N. K. D., Imelda, V. P., Putri, M. A., Kartikasari, Y., Sari, P. F., Candraningsih, T. E., Rasyada, N. A., Ozora, M. H., Idayati, D. I., Kurniawan, T. T. A., & Yuda, A. (2024). Pengetahuan dan Perilaku terkait Penggunaan Produk Pemutih Kulit pada Remaja Putri di Indonesia. *Jurnal Farmasi Komunitas*, 11(1), 22–29. <https://doi.org/10.20473/jfk.v11i1.54484>