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Increasing the Knowledge of High School Biology Teachers on the Preservation of *Pediculus humanus capitis* in Preparat Glass

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Abstract: *Pediculus humanus capitis* (head lice) is an obligate ectoparasite. Preparation of specimens is a procedure carried out to accurately preserve, identify, and analyze head lice. The Palangka Raya Biology Teachers Forum (MGMP) has collaborated with the Community Service Team of the Biology Study Program. This activity aims to improve high school Biology teachers' skills in preserving *Pediculus humanus capitis* (morphological observation and identification). This provides a solution to make school laboratory practicals more attractive, as preserved specimens can be stored and used long-term. The activity was offline at the PPIIG Building Laboratory, Palangka Raya University, in August 2023. The activity included lectures, discussions, training, and pre-test and post-test evaluation. The evaluation results show an increase in scores after the training, with an average pre-test score of 50.00 increasing to 80.33 in the post-test. It can be concluded that participants' knowledge increased after attending this training.
Keywords: identification; palangka raya biology teachers forum; *Pediculus humanus capitis*; preparat

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INTRODUCTION

One common ectoparasite found attacking the human body is *Pediculus humanus capitis*, found on the human head. Infection with *P. humanus capitis* is called head lice infestation. This ectoparasite is obligate, meaning its entire life stages depend on sucking the blood of its host (human) (Farshad & Jane, 2000; Phadungsaksawasdi et al., 2021). The morphological aspects and behavior of head lice sensory structures play a role in the host's response (Insaurralde et al., 2019). Additionally, this ectoparasite easily spreads from one person to another through physical contact and sharing of personal items. Head lice infestation is common in school children (González-Hilamo et al., 2022; Liao et al., 2019). Synthetic chemical pediculicides during head lice treatment only kill adult lice but not lice eggs, which can cause side effects in humans and genetic resistance in head lice (Yingklang et al., 2022).

In diagnosing the disease, morphological observation and identification of ectoparasites are required. Permanent preparation of *P. humanus capitis* specimens facilitates morphological observation and identification, and these preserved specimens can be used for other purposes (Hadi & Soviana, 2010). The training began with coordination with the chairman of the Palangka Raya High School Biology Teachers Forum. The community service team offered solutions for interesting Biology teaching and practicals, especially for studying the phylum Arthropoda. This training aimed to enhance the knowledge and skills of high school Biology teachers regarding *P. humanus capitis* in the form of prepared glass. Additionally, this training activity is expected to be applied when teachers conduct Arthropoda phylum practicals for school students. Thus, students also acquire skills in preparing specimens and observing the morphology of *P. humanus capitis.*

METHOD

This community service activity was conducted on Monday, August 21, 2023, at the 2nd Floor Laboratory of the PPIIG UPR. The method we used in implementing this community service consisted of three stages (Panjaitan et al., 2023), namely: in the first stage, the community service team coordinated with the High School Biology Teachers Forum chairman to offer solutions to the partners' problem needs. The second stage includes implementing activities, starting from filling out pre-tests, presenting material by the community service team, and having discussion sessions. The third stage is the preservation training of *P. humanus capitis* in preparation glass, followed by post-tests and questionnaire filling.

The success indicators and achievement of this training were analyzed descriptively from the measurement results of pre-test and post-test scores and the enthusiasm and participation of all participants.

RESULTS AND DISCUSSION

The training activity on the preservation of *Pediculus humanus capitis* continues the training on introducing, identifying, and controlling *P. humanus capitis* in high school Biology teachers throughout Palangka Raya (as described in a separate article). This training activity aimed to enhance teachers' knowledge and skills regarding preserving *P. humanus capitis* in prepared glass. The training began with coordination between the High School Biology Teachers Forum (MGMP) chairman and the community service team, allowing 13 high schools in Palangka Raya to participate. The schools involved included SMAN 1 Palangka Raya, SMAN 2 Palangka Raya, SMAN 4 Palangka Raya, SMAN 5 Palangka Raya, SMAN 7 Palangka Raya, SMAS PGRI 2 Palangka Raya, and SLBN 1 Palangka Raya. The training consisted of two stages: material presentation and training on preparing head lice specimens, which took place at the Microbiology Laboratory of the Center for Science and Innovation Development (PPIIG), Palangka Raya University, conducted by the community service team.

Efficient and effective control of head lice can be achieved through proper identification techniques, starting with collecting head lice samples, preservation, identification, and disease diagnosis. Different ectoparasites have different biological characteristics, so the sampling technique must be adjusted accordingly. Sampling techniques for head lice (*P. humanus capitis*) can be done using a head lice comb or manually by direct collection from the infected person's head. The obtained samples must then be handled properly

immediately or stored temporarily and for a longer period. Thus, the collection team must be competent to properly preserve the head lice specimens to prevent damage. Some ectoparasite specimens can be preserved in various collection forms, such as wet and dry collections, which can be made into prepared glass. In this training, teachers were provided with materials and training on preserving head lice in preparation glass, which is the appropriate preservation and identification technique for head lice, mites, and fleas (Hadi & Soviana, 2010).

After the material presentation by the community service team, a discussion session was opened. During the discussion, several questions were raised by the participants, including, "How long does a head lice preparation last?" The durability of the preparation depends on storage factors, especially temperature and humidity (Benyahia et al., 2021). "Can we conduct the practical without graded alcohol, considering the lack of materials in schools?" It is possible to use alcohol from *tapai* water (Fadilah *et al*., 2020; Hayati, 2018). “Can KOH 10% be replaced with NaOH, and is the treatment the same?" KOH 10% can be replaced with NaOH 10% with the same treatment (Hidayati *et al*., 2021). "Can the clearing solution be replaced with other alternative solutions?" In the clearing stage, acetic acid and xylene can be replaced with clove oil, citronella oil, or pure coconut oil (Fani, 2018; Faridah *et al*., 2019; Sofyanita & Azahra, 2023). "How do we perform the fixation stage using heating?" Pour or distilled water into a glass beaker and place the test tube containing KOH 10% and *P. humanus capitis* samples into the glass beaker. Place the glass beaker on a hotplate at 70°C for 30 minutes. "How do we differentiate between male and female lice?" The difference between male and female head lice lies in their genitalia, where the male head lice have genitalia shaped like the letter V. In contrast, the female head lice have genitalia that appear like the letter V inverted.

Figure 1 The participants undergoing the stages of preserving *Pediculus humanus capitis* specimens in preparation glass

After the Q&A session between the presenter and participants, a training session on making preparation glass was conducted (Figure 1). The morphology of head lice can be observed through the preparations to diagnose diseases. The permanent preparation process begins with fixation using KOH, which can also be done using NaOH to thin the exoskeleton of head lice. The next step is dehydration to remove water molecules from the lice's body, then clearing using xylene or toluene solutions. The final step is tissue mounting (Iswara & Nuroini, 2017). The next step involves guidance from the community service team and biology students for teachers to observe the morphology of head lice under a microscope, as seen in Figures 2 and 3.

Figure 2 Morphological observation of *P. humanus capitis* resulting from the preparation glass made by training participants.

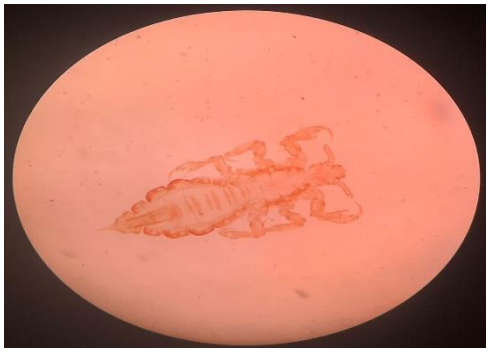

Figure 3 Morphology of *P. humanus capitis* resulting from the glass preparation made by training participants

Based on the analysis of pre-test and post-test results, there was an increase in the average score from 50 to 80.33, as shown in Figure 4.

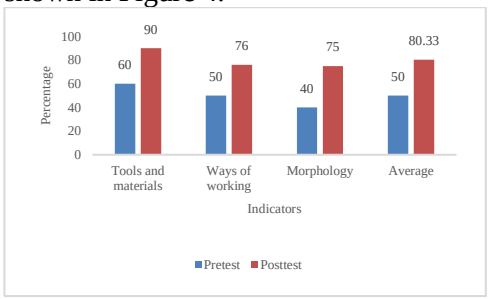

Figure 4 Pre-test and post-test scores

The pre-test and post-test scores indicate that 90% of participants already knew the tools and materials and their functions in making *P. humanus capitis* preparations. In comparison, 10% knew the tools and materials but could not differentiate the functions of materials in each preparation stage. 76% of participants already knew the stages of the preparation process, including fixation, dehydration, clearing, and mounting, while 24% were still unclear about the preparation stages. 75% already knew the morphology of *P. humanus capitis* and could differentiate between male and female *P. humanus capitis*. In comparison, 25% were still confused about the differences in morphology between male and female *P. humanus capitis*. Overall, the post-test results, with an average 80.33 (satisfactory) score, indicate that the training objectives were successfully achieved.

Furthermore, the feedback the MGMP Biology chairman provided during the training is presented in Figure 5. Teachers play a role in transferring knowledge and skills to students in schools, so the implementation of this training can be applied during Biology practicals on Arthropoda.

Figure 5 Presentation of feedback from participants during the training represented by the MGMP Biology chairman

CONCLUSION

The participants joining this training showed enthusiasm and positive responses during the training. The improvement in participants' knowledge is evidenced by the pre-test and post-test results, with an average pre-test score of 50.00 increasing to 80.33 in the post-test results. Training participants are willing to implement the results of this training with students in schools during practicals, hoping that students will have the skills to preserve head lice specimens in prepared glass.

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