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SURABAYA

CHAPTER I BACKGROUND

1.1 Background

Poliovirus (PV), an enterovirus belonging to the Picornaviridae family is composed of an RNA genome and a protein capsid. The genome is a single-stranded positive-sense RNA genome that is about 7500 nucleotides in length. The viral particle is around 30 nm in diameter with icosahedral symmetry. Because of its short genome and its simple composition—only RNA and a non-enveloped icosahedral protein coat that embodies it, poliovirus is broadly viewed as the simplest significant virus (Koch and Koch, 2009).

Poliovirus is the etiological agent of poliomyelitis, an acute paralytic disease. This disease results from lower motor neuron damage and is characterized by asymmetric persisting weakness (flaccid paralysis) (Baicus, 2012).

According to WHO (2005) on 6 June 2005, four new polio cases were affirmed in Indonesia. One of the four new cases is from the indistingushable area from the list case (Sukabumi district. On 2 May 2005, the global research center in Mumbai, India, confirmed a wild poliovirus type 1 isolate, from an acute flaccid paralysis (AFP) case identified by the national surveillance system in Giri Jaya village, Sukabumi District, West Java, Indonesia. The case, an 18-month old child who was previously un-immunized, had onset of paralysis on 13 March 2005.

The cataclysm gave rise to an act of eradicating attempt called Global Polio Eradication Initiative, which was initiated by World Health Assembly in 1988. The programme has seen noteworthy improvement and figured out how to be effectively interfering eith the transmission of all wild poliovirus (WPV) serotypes in all countries but Afghanistan, Pakistan, Nigeria (Tebbens *et al.*, 2015). As per January 2017 in Afghanistan and Pakistan, 1 case of WPV was affirmed by WHO and 9 others reported from other sources (WHO, 2017). This triumph was due to the effective use of inexpensive and easily administered live-attenuated oral poliovirus vaccine (OPV) (Jorba, 2016).

OPV contains attenuated polioviruses that can viabily replicate in the intestine, yet sigmificantly less able to enter the central nervous system (CNS) than WPV (WHO, 2016). OPV mayt require several doses to induce immunity, but provides long-term protection against paralytic disease (Jorba, 2016).

So as to accomplish Polio-Free World, wild poliovirus in African and Eastern Mediterranian regions as mentioned before must be fully eradicated. OPV necessity remains a priority, hence OPV vaccine production that is safe and in consistance with standard given is exceptionally required. In this study, the effect of attenuated poliovirus which going to be made into vaccine towards leukocyte differential count. Comparing the pre-treatment and post-treatment data alongside the newly made attenuated virus with attenuated virus that is standarised by WHO.

The agreement that has been assigned based on World Health Organization (WHO), a material or substances that will be used for the

therapeutics and medicine purpose for animal or human medicines have to go through the test stage preclinical trials and clinical trials. Preclinical trials are a test to determine the safety and efficacy of the truth of scientific test substances carried through toxicity and activities test, while the clinical trials conducted through four phases of testing including monitoring drug side effect (Meles, 2010).

White blood cells (WBCs), also called leukocytes or leucocytes, are the cells of the immune system that are involved in protecting the body against both infectious disease and foreign invaders. All white blood cells are createdand derived from multipotent cells in the bone marrow known as hematopoietic stem cells. Leukocytes are found throughout the body, including the blood and lymphatic system (Maton *et al.*, 1997).

Types of leukocyte can be characterized in standard ways. Two sets of broadest classifications order them either by structure (granulocytes or agranulocytes) or by cell division heredity (myeloid cells or lymphoid cells). These broadest classifications can be additionally isolated into the five main types: neutrophils, eosinophils, basophils, lymphocytes, and monocytes. These types are recognized by their physical and function(Le-Fleur, 2008).

The white blood cell count (WBC) is used as part of a full complete blood count (CBC) to: Screen for a wide range of diseases and conditions, help diagnose an infection or inflammatory process; it also may be used to determine the presence of other diseases that affect WBCs such as allergies, leukemia or

immune disorders, to name a few, monitor the conditions such as those named above; monitor the body's response to various treatments and/or to monitor bone marrow function; some treatments, such as radiation and chemotherapy, are known to affect white cells and may be monitored using WBC counts.

1.2 Research of Problem

Based on the explanation above, the research problems are as following:

1. How is the effect of injected attenuated poliovirus toward leukocyte count of *Macaca fascicularis*?
2. Is there any difference between leukocyte count of OPV2 vaccine and WHO Reference virus?
3. How is the effect of injected poliovirus toward lymphocyte count *Macaca fascicularis*?
4. Is there any difference between lymphocyte count of OPV2 vaccine and WHO Reference virus?
5. How is the effect of injected poliovirus toward monocyte count of *Macaca fascicularis*?
6. Is there any difference between monocyte count of OPV2 vaccine and WHO Reference virus?
7. How is the effect of injected poliovirus toward granulocyte count *Macaca fascicularis*?
8. Is there any difference between granulocyte count of OPV2 vaccine and WHO Reference virus?

1.3 Theoritical Base

Leukocytes are the effector cells of the immune system and course all through the circulatory system and lymphatic system. An infection or a physical injury results in an inflammatory response, which initiated increased production of leukocytes for setling the injury or infection. Because of this association between leukocytes and inflammatory response, leukocytes count is a valuable metric for diagnosis and prognosis of several diseases.Leukocytes count has been found to be an indicator of viral infection(Chung *et al.*, 2015).

Long-tailed macaque (Macaca fascicularis) have anatomically and physiologically to humans (Roth *et al.*, 2004).The similarity makes long tailed-monkeys are often used as experimental animals (Mansjoer, 1996).

Based on research of Akiko *et al.* (2002), oral transmission of poliovirus is restricted to humans and certain primate species. The receptor of poliovirus in human is CD155 on the gastrointestinal and lymphoid tissue, human susceptible with this virus, different with primates (rhesus macaque) that resistant.

1.4 Aims of the Research

To analyze the leukocyte differential count such as lymphcyte, monocyte and granulocyte count of long-tailed macaque (*Macaca fascicularis*) which experimentally infected with 0.1ml formulation of poliovirus (OPV2 vaccine and WHO Reference poliovirus).

1.5 Outcomes of the Research

1. To analyze the influence of WHO Reference poliovirus and OPV2 vaccine on the leukocyte of *Macaca fascicularis.*.
2. To analyze the effect of WHO Reference poliovirus and OPV2 vaccine administration in leukocyte.
3. To analyze the influence of WHO Reference poliovirus and OPV2 vaccine on the lymphocyte of *Macaca fascicularis.*
4. To analyze the effect WHO Reference poliovirus and OPV2 administration in lymphocyte.
5. To analyze the influence of WHO Reference poliovirus and OPV2 vaccine on the monocyte of *Macaca fascicularis.*
6. To analyze the effect of WHO Reference poliovirus and OPV2 administration in monocyte.
7. To analyze the influence of WHO Reference poliovirus and OPV2 vaccine on the granulocyte of *Macaca fascicularis.*
8. To analyze the effect of WHO Reference poliovirus and OPV2 administration in granulocyte.

1.6 Hypothesis

1. WHO Reference poliovirus and OPV2 vaccine administration lead to increase the level of leukocyte.
2. WHO Reference poliovirus and OPV2 have similar effect in leukocyte.

3. WHO Reference poliovirus and OPV2 vaccine administration lead to increase the level of lymphocyte.
4. WHO Reference poliovirus and OPV2 have similar effect in lymphocyte.
5. WHO Reference poliovirus and OPV2 vaccine administration lead to increase the level of monocyte.
6. WHO Reference poliovirus and OPV2 have similar effect in monocyte.
7. WHO Reference poliovirus and OPV2 vaccine administration lead to increase the level of granulocyte.
8. WHO Reference poliovirus and OPV2 have similar effect in granulocyte.