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# The Appearance of Trigger Substance of Body Resistance in Bivalves against Covid-19 Pandemic

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***Abstract:***
***Background****: Covid-19 is a disease caused by the Corona virus named SARS-Cov-2 which has cost the lives of many people. Even though nowadays have found vaccine, yet it still needs to do prevention in other ways namely, by consuming food which can boost the human immune system. Some of these ingredients are contained in Bivalves.*
***Materials and Methods****: Therefore, the purpose of this study is to find out the Bivalves species and the trigger substance of body resistance which contained in it, with the result that the society can utilize and consume Bivalves as one of the preventions of infected to the virus. Bivalves sample withdrawal took place in the mangrove ecosystem in Aceh province. This study used the survey method which combining two transect methods, namely line transect and degree transect methods. After the sample is obtained, further the analysis of nutrition in Baristand Laboratory by using AAS (Atomic Absorption Spectrophotometer) equipment. The result obtained revealed that all kinds of Bivalves contain zinc, iron, and magnesium.*
***Results****: However, the level in each species is different. The highest amount of zinc, iron and magnesium in each is found in Polymesoda expansa about 99.01 mg/kg, Meretrix lusoria with the amount of iron about 102.37 mg/kg, and magnesium 185,8009 mg/kg. Whereas, the lowest content levels of zinc, iron, and magnesium in each found in Polymesoda erosa with 4.05 mg/kg, Meretrix casta with iron level about 3.60 mg/kg, and Gafrarium tumidum with magnesium level about 21.29 mg/kg.*
***Conclusion:*** *Meretrix casta is the most adequate species to meet the daily needs of zinc, iron and magnesium to increase body resistance in the face of the Covid-19 pandemic.*
***Key Word****: Covid-19, contain for body resistance, Bivalves*

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## I. Introduction

An outbreak that occurs simultaneously over a large geographic area is called a pandemic[1]. The current pandemic is the Covid-19 pandemic, which is caused by a new type of corona virus called SARS-CoV-2. The Covid-19 outbreak was first discovered in Wuhan City, Hubei Province, China in December 2019[2]. Cases of the Covid-19 pandemic have spread very far and as of April 23, 2020, more than 2,000,000 cases of Covid-19 have been reported in more than 210 countries and regions, this covid 19 pandemic resulted in more than 195.755 people dying[3].

This condition requires us to take preventive steps, although at this time vaccines have been found, preventive measures must still be carried out, one of which is by eating foods that can Cases of the Covid-19 pandemic have spread very far and as of April 23, 2020, more than 2,000,000 cases of Covid-19 have been reported in more than 210 countries and regions, this covid 19 pandemic resulted in more than 195.755 people dying[3].

This condition requires us to take preventive steps, although at this time vaccines have been found, preventive measures must still be carried out, one of which is by eating foods that can enhance the immune system[4]. Several micronutrients contained in food have a role in improving the immune system such as vitamins and minerals due to their role as antioxidants. These micronutrients include vitamin A, vitamin C, vitamin D, vitamin E, vitamin B6, vitamin B12, selenium, iron and zinc[5]. Some of the nutrients that can improve the immune system have been found in Bivalves including *Anadara granosa, Perna viridis, Donax cuneatus* and *Meretrix meretrix*[67].

Bivalves are rich in vitamin A, and vitamin B1. Bivalves are also rich in minerals, the highest mineral content is iron (28 mg/100 g) and selenium (64 mg/100 g). Iron is useful for the formation of red blood cells in the body, thereby reducing the risk of low blood pressure, and preventing anemia, while selenium can ward off free radicals that cause various diseases such as cancer and others[8].

One of the habitats that Bivalves can live in is the mangrove ecosystem area[9]. The mangrove ecosystem is one of the ecosystems in coastal areas as a habitat for aquatic biota[10]. Mangrove ecosystems as feeding grounds contribute to habitat complexity and macrofauna diversity such as crustaceans, molluscs and Bivalves[11]. The results of research that has been carried out in the Manggrove Ecosystem Area, Kuta Raja District, Banda Aceh City, found 16 species of Bivalves consisting of 6 orders, namely the Order Arcoida, Cardiida, Mytiloida, Ostreoida, Pterioida and Veneroida[12].

Based on the results of the literature study, it is known that data or references regarding the presence of substances that trigger body resistance in Bivalves facing the Covid-19 pandemic are still minimal. The lack of related research on this matter is an obstacle for further research. Therefore, it is important to know the study of Bivalvia ecology and identify the presence of ingredients that trigger the body's resistance to face the Covid-19 pandemic.

## II. Material And Methods

**Study Design:** This study uses a survey method, namely to directly identify the species of Bivalvia in the Mangrove Ecosystem, Kuta Raja District, Banda Aceh City. Meanwhile, the method used to measure the immune-triggering substances contained in Bivalvia is using the Atomic Absorption Spectrophotometer.

**Study Location**: The research location is in the waters of the Aceh Province which includes the Mangrove Ecosystem, District Kuta Raja, Banda Aceh City, Aceh Jaya, Bireuen and Aceh Singkil. This location was chosen because it is a large habitat for Bivalves, so this location allows for a high level of Bivalves diversity. This will support the amount of data that will be obtained for the immune-triggering substances found in Bivalves. To identification of the immune-inducing substances contained in Bivalves was carried out at the Laboratory of the Research and Industrial Standardization Institute in Banda Aceh.

**Study Duration:** Research activities begin with field preparation and preliminary at the location. Time of field data collection which includes (1) observation of habitats (biological and ecological) suitable for the life of Bivalves, (2) sampling of Bivalves in the Mangrove Ecosystem Area of Kutaraja District, Banda Aceh City, and (3) identification of Bivalves and substances that trigger body resistance contained therein. This research component will be observed from December 2020 to Juny 2021.

**Procedure methodology**

This research is a survey research. Data collection is carried out in this study begins with the determination of stations and observation points by purposive sampling. The research area is set at 4 observation stations, each station is determined by 2 line transects with a transect length of 50 m x 10 m. Furthermore, Bivalves sampling was carried out at the lowest low tide and plots (squared plots) were made with a size of 1 m x 1 m following the transect line which was placed alternately with a distance of 10 meters. Samples were taken by destructive sampling with a depth of 20 cm[13]. The samples obtained were identified for the types at the Biology Education Laboratory, Faculty of Tarbiyah and Teacher Training UIN Ar-Raniry and analyzed substances that trigger body resistance contained in Bivalves at the Laboratory of the Research and Industrial Standardization Institute in Banda Aceh.The substances that trigger the body's resistance to be tested include zinc, iron and magnesium.

**Statistical analysis**

Analysis of the data used for the trigger material for body resistance is proximate analysis. Proximate analysis is an analysis carried out to determine the chemical composition of a material[14]. Analysis of minerals (zinc, iron and magnesium) used the following formula:

$$\text{Mineral Content} = \frac{Calat\ x\ Vpx\ Fp\ x\ 10000}{w}$$

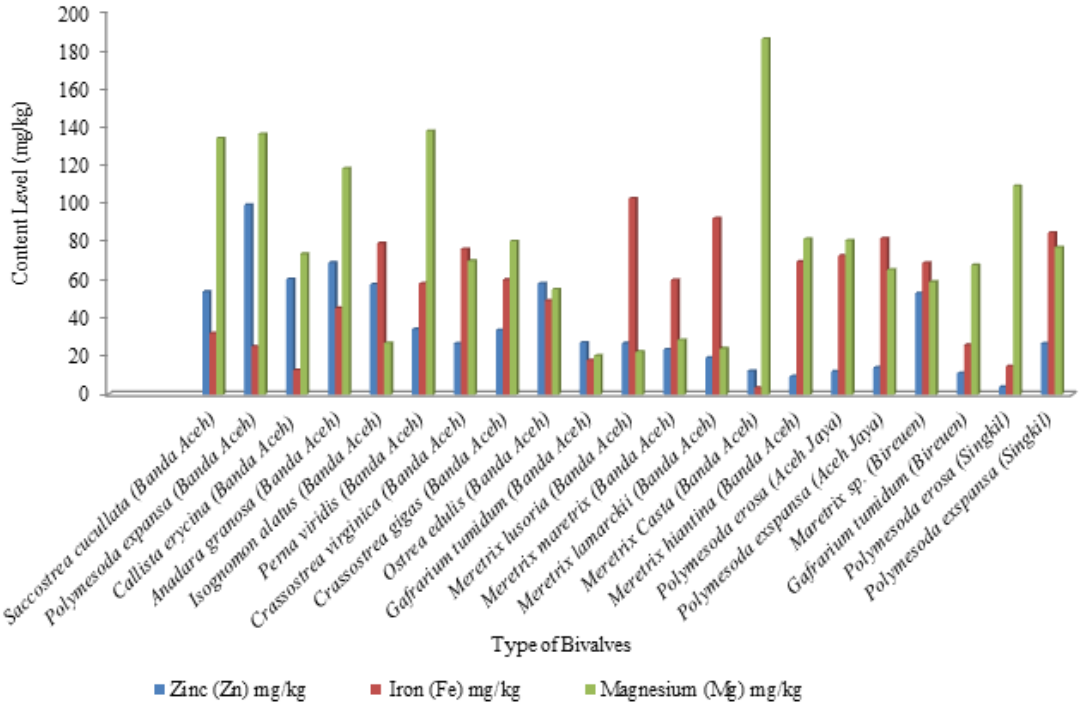
Description:
Calat = konsentrasi yang dibaca AAS (ppm)
Vp = dilution volume (L)
Fp = dilution factor
W = Sample Weight (mg)

## III. Result

This immune-boosting ingredient was tested on Bivalves by measuring levels of Iron, Zinc and Magnesium. These levels can be seen in Tabel no 1 below.

**Tabel no 1 :** Levels of Immune Substances in Bivalves to deal with the Covid-19 Pandemic.

| No | Nama Spesies | Zinc (Zn) mg/kg | Iron (Fe) mg/kg | Magnesium (Mg) mg/kg |
|---|---|---|---|---|
| 1 | *Saccostrea cucullata* (Banda Aceh) | 53.66 | 32.12 | 133.86 |
| 2 | *Polymesoda expansa* (Banda Aceh) | 99.01 | 25.13 | 136.05 |
| 3 | *Callista erycina* (Banda Aceh) | 60.22 | 12.75 | 73.40 |
| 4 | *Anadara granosa* (Banda Aceh) | 68.94 | 45.18 | 118.05 |
| 5 | *Isognomon alatus* (Banda Aceh) | 57.59 | 79.03 | 26.94 |
| 6 | *Perna viridis* (Banda Aceh) | 34.16 | 58.05 | 137.56 |
| 7 | *Crassostrea virginica* (Banda Aceh) | 26.66 | 75.99 | 69.84 |
| 8 | *Crassostrea gigas* (Banda Aceh) | 33.65 | 59.94 | 80.09 |
| 9 | *Ostrea edulis* (Banda Aceh) | 58.00 | 49.09 | 54.90 |
| 10 | *Gafrarium tumidum* (Banda Aceh) | 27.07 | 17.87 | 20.29 |
| 11 | *Meretrix lusoria* (Banda Aceh) | 26.81 | 102.37 | 22.34 |
| 12 | *Meretrix maretrix* (Banda Aceh) | 23.60 | 59.78 | 28.54 |
| 13 | *Meretrix lamarckii* (Banda Aceh) | 19.20 | 92.07 | 24.10 |
| 14 | *Meretrix Casta* (Banda Aceh) | 1223 | 3.60 | 185.80 |
| 15 | *Meretrix hiantina* (Banda Aceh) | 9.60 | 69.39 | 81.31 |
| 16 | *Polymesoda erosa* (Aceh Jaya) | 12.08 | 72.58 | 80.42 |
| 17 | *Polymesoda exspansa* (Aceh Jaya) | 14.07 | 81.57 | 65.30 |
| 18 | *Maretrix* sp. (Bireuen) | 52.93 | 68.79 | 58.86 |
| 19 | *Gafrarium tumidum* (Bireuen) | 11.25 | 25.91 | 67.59 |
| 20 | *Polymesoda erosa* (Singkil) | 4.05 | 14.82 | 108.93 |
| 21 | *Polymesoda exspansa* (Singkil) | 26.72 | 84.51 | 76.95 |




Based on Tablen no 1 above, it can be seen that all types of Bivalves contain zinc, iron and magnesium, but the levels of each type are different. The highest zinc content was found in *Polymesoda exspansa* species with levels of 99.01 mg/kg, while the lowest was found in *Polymesoda erosa* species with levels of 4.05 mg/kg. The highest iron content was found in *Meretrix lusoria* species with iron levels of 102.37 mg/kg and the lowest was found in *Meretrix casta* species with iron levels of 3.60 mg/kg. In addition, the highest magnesium content was found in *Polymesoda exspansa* with magnesium levels of 185.80 mg/kg, while the lowest magnesium

content was found in *Gafrarium tumidum* with magnesium levels of 21,2982 mg/kg. Previous research that has been done is to test the content of zinc, iron and magnesium in Bivalves of *Perna viridis, Donax cuneatus* and *Meretrix meretrix* types. *Perna viridis* contains zinc, iron and magnesium respectively 0.43± 0.07 g/g, 2.38±0.33 g/g and 37±1.7 g/g, *Donax cuneatus* 0.33±0 .06* g/g, 1.98±0.7 g/g and 31±1.3 g/g, while *Meretrix meretrix* 0.29± 0.04*µg/g, 1.75±0.6* g/g, and 29±0.9* g/g[7].

The levels of zinc, iron and magnesium that are needed by the human body every day of course have their own dose, the dose is also different for each age and gender. The water content can be seen in Table no 2 below.

**Table no 2 :** Levels of zinc, iron and magnesium content needed by the human body every day[15].

| Age | Gender | Content Level (mg/kg) | | |
|---|---|---|---|---|
| | | Zinc | Iron | Magnesium |
| 4-6 Years | Male | 6,0-9,2 | 7,3-10,6 | 171-267 |
| | Female | 5,3-8,9 | 6,8-10,6 | 166-267 |
| 7-9 Years | Male | 7,0-10,9 | 8,4-11,8 | 204-303 |
| | Female | 6,4-9,4 | 7,7-11,8 | 166-301 |
| 10-14 Years | Male | 7,0-14,6 | 9,2-19,4 | 200-503 |
| | Female | 6,1-13,9 | 7,7-14,8 | 181-429 |
| 15-18 Years | Male | 9,3-15,2 | 10,2-19,0 | 260-467 |
| | Female | 6,4-11,0 | 7,8-14,0 | 186-369 |
| 19-50 Years | Male | 8,8-14,6 | 10,6-26,9 | 256-465 |
| | Female | 6,7-10,7 | 8,2-22,2 | 192-372 |
| 51-70 Years | Male | 7,5-12,3 | 10,2-25,2 | 221-403 |
| | Female | 6,7-11,2 | 8,5-20,9 | 179-348 |

Based on the requirement for zinc, iron and magnesium content by the human body which is tabulated in Table no 2 and the results of the zinc, iron and magnesium content test in Bivalves, the type of Bivalvia is recommended to be consumed in order to increase body resistance in the face of the Covid-19 pandemic. 19 is *Meretrix casta*. *Meretrix casta* has levels of zinc, iron and magnesium respectively 12.23 mg/kg, 3.60 mg/kg, 185.80 mg/kg. In addition, based on the research results of *Meretrix casta* it is easy to find, because of the four stations only one station does not have *Meretrix casta* so *Meretrix casta* can be conserved and used long term by the community to increase body resistance in dealing with the Covid-19 pandemic.

Humans really need to consume zinc, iron and magnesium during the Covid-19 pandemic in accordance with the levels needed by the body, because Zinc is defined as one of the trace minerals or micronutrients of inorganic substances including those that play an important role in gene expression, protein synthesis, formation and development of cells that work in the immune system[16]. Zinc enhances the body's immunity by reducing the formation of inflammatory cytokines and reducing oxidative stress with its antioxidant effects[17].

The role of zinc in immune function includes the function of T cells and in the formation of antibodies by B cells, as well as non-specific defense. Another role of zinc is for protein synthesis which is a component in the formation of antibodies. Zinc also has a role in cytokine production, namely an increase in IL-2 production, after zinc supplementation in zinc-deficient people[18].

Zinc deficiency can inhibit the immune response and reduce pathogen resistance. Research that has been carried out has shown an increase in the concentration of zinc in cells due to its combination with chloroquine which enhances the antiviral effect of zinc against SARS-CoV-2. Likewise, zinc supplementation without chloroquine can have a similar effect as desired without damaging the side effects of chloroquine[19]. SARS-Cov-2 requires angiotensin converting enzyme 2 (ACE2) for entry into host cells and therefore ACE receptor modulation is considered for Covid-19 therapy. Decreased ACE2 activity has been demonstrated by observing the lungs of rats exposed to 100 g of zinc which resembles the total source of zinc in the human body[20,21]. Zinc is thought to have a role in the repair of mucociliary epithelial clearance dysfunction respiratory tract in Covid-19 based on its antioxidant and anti-inflammatory properties. Zinc also helps improve the barrier function of tight junction proteins, namely claudins[22]. Based on these findings, zinc supplementation can have a positive effect that can not only relieve symptoms of Covid-19, but also reduce the risk of infection with the virus.

Increased endurance after zinc supplementation has also been carried out by analyzing the effect of zinc supplementation on the immune response of HIV-infected patients. After zinc supplementation 15 mg/day for 12 months there was a significant increase in plasma CD4+ cell counts ($p=0.042$) indicating that there was an increase in the patient's immune response. Zinc supplementation of 30 mg/day for 3 months effectively ($p<0.05$) increased T cell proliferation in the elderly[23]. In this regard, zinc also plays a positive role in cases of infection[24]. Supplementation with a dose of 10-20 mg/day for 2-5 months can significantly reduce the morbidity of lower

respiratory tract infections ($p<0.05$). A dose of 5 mg and zinc supplementation for 12 months can even significantly reduce respiratory tract infections ($p<0.05$)[25,26,27,28].

Iron (Fe) is an important mineral that is most widely involved in cellular metabolism, cellular respiration, DNA synthesis, organism growth, body defense, ATP generation, cell survival, ferroptosis, and. Between 30% and 10% of body Fe is stored as ferritin (Ft) and hemosiderin in the liver, bone marrow, and muscle, respectively. In addition, Fe can be used in erythropoiesis according to the demands of the body[29].

The presence of Fe in the form of ions causes Fe to play a role in the process of cellular respiration, namely as a cofactor for enzymes involved in oxidation-reduction reactions. The activity of SOD (superoxide dismutase) and catalase depends on this Fe. Enzymatic antioxidants work by preventing the formation of new free radical compounds. Most of Fe In hemoglobin, hemoglobin in the blood carries oxygen from the lungs to all body tissues and brings back carbon dioxide from all cells to the lungs to be excreted by the body, besides that Fe also plays a role in immunity and the formation of lymphocyte cells[30]. It is important to know that Fe deficiency is a public health problem, the consequence of Fe deficiency that has been investigated the most is a disturbance in immune performance and function[29].

Sufficient intracellular Fe levels support corona virus replication, whereas iron deficiency interferes with viral transcription, translation, assembly, and exocytosis. Fe is stored in ferritin, which can carry up to 4500 Fe molecules in its core. Systemic inflammation is commonly associated with elevated ferritin levels. When inflammation occurs, cytokines stimulate ferritin and hepcidin synthesis, which regulate iron storage networks. The results showed that in Covid-19 patients there were high levels of ferritin. SARS-CoV-2 attacks one of the beta chains of hemoglobin, which causes the dissociation of Fe from heme, resulting in increased levels of Fe and free ferritin in the body. One of the other causes of inflammation caused by Covid-19 infection is that IL-6, IL-1β, and IFN-γ are overexpressed, leading to an increase in hepcidin. Hepcidin is the main iron regulating hormone, absorbs Fe in enterocytes and macrophages, increases intracellular ferritin levels and prevents iron efflux from storage through inhibition of Fe-exporting protein ferroportin[31].

Magnesium plays a key role in macro-antigen binding phage. Each unique T cell receptor (TCR) is capable of recognizing a specific antigen-MHC complex. Antigen Recognition by the TCR is the first signal in T cell activation. The T cell ignores the self-antigen-derived complex but triggers an immune response if the antigen fragment is derived from a foreign protein and the process is accompanied by a second signal, such as the presence of IL-2. Apart from that, magnesium plays a role in decreasing the number of monocytes, decreasing NK cell activity, increasing oxidative stress after strenuous exercise, increasing levels of cytokines such as IL-6, increasing inflammation and decreasing T-cell ratio[5].

Adequate supply of magnesium (Mg) is closely related to Covid-19. Magnesium deficiency is associated with chronic disease with low levels of inflammation and can worsen the course of patients infected with Covid-19, so that in Covid-19 patients, continuous monitoring of magnesium status and supplementation should be carried out. Magnesium plays an important role in lung function, such as anticholinergic, antihistamine, and anti-inflammatory and bronchodilating effects. This is the reason hypomagnesemia is associated with impaired lung function[32]. Lower magnesium concentrations are also associated with an increased incidence of exacerbations in chronic obstructive pulmonary disease (COPD). Based on these observations, it is reasonable to assume that magnesium deficiency will also worsen lung function in patients infected with Covid-19[33].

Viral infection of endothelial cells is also one of the evidences showing the severity of Covid-19 infection. Endothelial dysfunction with impaired endothelial-dependent vasodilation is also caused by magnesium deficiency. Oral magnesium supplementation was shown to increase flow-mediated dilatation as a marker of endothelial function in a meta-analysis of randomized controlled trials. Therefore, magnesium deficiency may exacerbate the course of Covid-19 by inducing endothelial dysfunction. In this context, it is worth mentioning that magnesium deficiency can increase the tendency to thrombosis. Thrombosis is a significant complication in Covid-19. Prolongation of the QT interval will increase the risk if there is a deficiency of mg which can be life-threatening and sudden cardiac death, for example, chloroquine, hydroxychloroquine, azithromycin, lopinavir, ritonavir[33].

## IV. Conclusion

The content of substances in Bivalves that can trigger to increase body resistance in the form of zinc, iron and magnesium are found in all types of Bivalves, but of all types of Bivalves, *Meretrix casta* is the most adequate species to meet the daily needs of zinc, iron and magnesium. to increase endurance in the face of the Covid-19 pandemic.

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