Oyster Shells as Alternatives Macromineral for Synthetic Testosterone

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INTRODUCTION

Oyster is one of seafood produced in waters, especially in eastern Indonesia. During this time, oyster is known as aphrodisiac agents, an agent that can increase sexual appetite because it can remind testosterone levels and very high nutrient content of zinc, vitamin A iron, calcium, and selenium are also vitamins A and vitamin B12. Therefore, the oyster is known as the mineral’s potent testosterone-boosting abilities (Matsuda et al., 2003). Zinc is also very important, it can be used as a stimulant of enzymes, hormones and the immune system.

Due to the abundance of oysters in Indonesia, only meat of oyster is consumed, while the existing shells are never used to consume and just thrown away. Therefore, a research plan will be made on the use of oyster shell waste, as a precursor of testosterone in rat (Rattus norvegicus). Since many kinds of oyster, it would be compared among three kinds of oyster shell namely Kerang darah (Anadara granosa), Kerang hijau (Perna viridis) and Kerang keong (Telescopium telescopium).

Based on function, Zn inhibits aromatase enzyme which convert estradiol to testosterone as a consequence, testosterone levels will increase (Michell et al. 2012). The purpose of this study was to determine the highest content of Zn among the three types of oyster shell; 2. To measure testosterone levels in rat after given shell powder containing highest Zn.

MATERIAL AND METHODS

Identification of Oyster Shells.

Oyster which derived from Lombok Island and Samas beach were identified at the Faculty of Biology Universitas Gadjah Mada (UGM). To simplify the process, all shells will be made in powder, and tested on levels of Zn, Ferro, Calcium, Magnesium using ICP. All procedures are carried out at the Integrated Research and Testing Laboratory UGM.

Laboratory Animal. Male rats, age 1.5 months were used in the study. Animals were divided into 4 groups, and each of animal were given by 0.18 mg/200 g of oyster shell of Anadara granosa, 0.09 mg/200 g of oyster shell, 1 mL of Na-CMC solvent and 1 mL of pure Zn. To determine the beginning of changes the testosterone levels, whole blood sampling were obtained through the vein of infraorbital then animals sacrificed serially on the day 9, -30 and -50. All the research procedures have been approved by the LPPT Research Ethics Committee with No 00023/04/LPPT/IV/2018

Hormone Assay. Whole blood were made serum by centrifugation with a speed of 3000 rpm for 15 minutes. The obtained serum was frozen at -8°C until hormone assay was performed. Assay hormone procedure was done at Laboratory of Physiology, Faculty of Veterinary Medicine UGM.

RESULT AND DISCUSSION

Content of Zn, Mg, Ca, Na, Fe and K in Shell of Three Types of Oyster.

Table 1 showed that Anadara granosa has the highest content of micromineral especially for Zn, Mg, Fe and K levels compared to the other two types. Zinc and Mg are microminerals that serve to increase testosterone. Sir (2016) stated that Zinc and Magnesium are two minerals that have been studied for their potential role in boosting free testosterone levels. Mg to be positively associated with testosterone by increasing of Sex Hormone Binding Globulin (SHBG) blocking. It is uncompetitive inhibition of Mg on T-SHBG bonds, testosterone affinity to SHBG is altered, resulting in more bioactive Testosterone into bloodstream. Chang et al (2016) Ttestosterone chelates Mg2+, but not Ca2+ or Zn2+ and also explored the cation-induced signal shift effects of Tes in the presence of Mg2+, Ca2+, or Zn2+.

Many kinds mechanism of Zinc to stimulate Testosterone. Michell et al. (2012) reported mechanism of zinc protection can be through an increase of SHI concentration. Kumar et al. (2012); Sedigh et al. (2014) stated that zinc can affect level of FSH and LH so that level of testosterone will increase, and it would be predicted Zinc has a blocker effect on aromatase enzyme which convert Testosterone to Estrogen.
Level of Blood Testosterone

Testosterone is the most important hormone in causing libido. In this study it appears that *Anadara granusa* powder has a very good effect in increasing testosterone levels. Figure 1 shows that after giving *Anadara granusa*, testosterone levels was increased gradually especially on day 30. Furthermore, testosterone levels decreased on day 50, except in group 1 (0.18 mg / 200 g) which was consistent in elevated. Level testosterone on all of animals during 50 days were as follow: group I (0.18 mg/200 g BW) from day 0, day 9, day 30 and day 50 was 1.215, 2.153, 4.375, 7.094 ng/mL; group II (0.09 mg/200 g BW): 2.403, 1.248, 3.860, 3.541 ng/mL; group III (Na-CMC): 0.779, 1.992, 4.123, 2.186 ng/mL; group IV (Zinc): 0.367, 2.230, 4.577, 2.892 ng/mL.

Zinc (Zn) and magnesium (Mg) may enhance levels of Insulin-like Growth Factor-I (IGF-1) and zinc, in particular, may contribute to elevating serum testosterone. Zinc worked as an inhibitor aromatase, enzyme that convert estradiol to testosterone (Cinar et al. 2017).

<table>
<thead>
<tr>
<th>Shell of oyster</th>
<th>Zn (mg/kg)</th>
<th>Mg (mg/kg)</th>
<th>Ca (mg/DL)</th>
<th>Na (mg/kg)</th>
<th>Fe (mg/kg)</th>
<th>K (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Anadara granusa</em></td>
<td>61.55</td>
<td>1666.09</td>
<td>41.4</td>
<td>9262.98</td>
<td>600.54</td>
<td>369.29</td>
</tr>
<tr>
<td><em>Perna viridis</em></td>
<td>2.78</td>
<td>141.37</td>
<td>55.58</td>
<td>8385.29</td>
<td>3.99</td>
<td>174.23</td>
</tr>
<tr>
<td><em>Telescopium telescopium</em></td>
<td>3.93</td>
<td>151.23</td>
<td>47.15</td>
<td>7793.41</td>
<td>8.5</td>
<td>164.91</td>
</tr>
</tbody>
</table>

Table 1. The Content Macromineral of Shell Oyster

In a study conducted on a similar previous issue, it is asserted that ZMA (a synthesis of zinc, magnesium And vitamin) which is thought to increase the testosterone levels (Cinar et al. 2017). It would be concluded that oyster shell of *Anadara granusa* has potential effect for increasing of Testosterone.