Oviduct specific glycoprotein expression in goats (*Capra aegagrus*) testes and ovaries

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Abstract. The OVGP have important rule in male reproduction to improve physiological and membrane fluidity and helps increase calcium ions into membranes that stimulate membrane bonding with intracellular cAMP thus enhancing the integrity of intact membranes of spermatozoa. In female reproduction, OVGP have important rule to support fertilization. In pig and cow, there have been found where was the expression of OVGP in ovarium and it have been used in vitro fertilization. This study was conducted to determine the expression of OVGP in local goat (*Capra aegagrus*) testis and ovarium. The testes and ovaries that used in this study was taken from slaughterhouse with maximum time three hours from organs harvesting. Observation of OVGP expression in the testis and ovarium was done by immunohistochemical method. The results showed that OVGP expression in goat testes was seen in the base cells of seminiferous tubules of spermatogonium, spermatocyte cells and in interstitial cells or leydig cells, on the other hand OVGP expression showed in follicle tertier and corpus luteum of ovarium. Based on these results it can be concluded that there is an expression of OVGP in local goat testis and ovarium that have important rules of male and female reproduction.

1. Introduction
Local goats (*Capra aegagrus*) is Indonesian domestic goats that need more attentions for the existence, there for many researchers doing their research in reproductions of *Capra aegagrus*. Oviduct Specific Glycoprotein (OVGP) is glycoprotein that have both rule in male and female goat reproduction. Oviduct Specific Glycoprotein (OVGP) is a glycoprotein that secreted by epithelial cell in ampulla and isthmus of oviduct. The glycoprotein family was identified in oviduct fluid are Oviduct Secretory glycoprotein (pOSP), oestrus-associated glycoprotein (EAP), oviduct specific, oestrus-associated glycoprotein (EGP), oviduct glycoprotein (sOP92), oviductin, MUC-9, glycoprotein GP 215 and oviduct Specific glycoprotein (OVGP) or overall referred to as oviduct-specific, oestrogen-dependent glycoproteins (OGPs). OGPs with molecular weight and different carbohydrate content are released by the oviduct secretory epithelium in all mammals except mice and horses. Differences in OGPs expression in the infundibulum, ampulla and isthmus have also been demonstrated. OGPs appear to be regulated by estrogen, or estrogen-related, but there are differences between species. One common universal character of OGPs is its relation to the pellucida zone and perivitelline space of oocytes and embryos with the exception of the mouse pellucid zone [1].
OVGP found as a band of SDS-PAGE result of local goats (*Capra aegragus*) oviduct fluid, it was about 55-65 kDa. This result was confirming with Western Blot in 65 kDa [2]. In pigs, OVGP appears in zone of pellucida, perivitellin space, and plasma membrane of oocyte (taken from oviduc in vivo) and embryo [3]. OVGP that added in pig and cow oocyte in maturation process (in vitro) can improved the defense of zone of pellucida from proteolytic, it was also reduce polyspermy so the fertilization rate will be higher [4]. It was showed that OVGP that added in in vitro fertilization can reduce polyspermy in pig oocyte.

Oviduct-specific glycoprotein (OVGP) is related to the pellucida zone also localized to the perivitellin space [1]. Its presence in the perivitellin space may be related to the mechanism of the polyspermi block (Vitelin Block). Oviduct-specific glycoprotein (OVGP) which is secreted by oviduct epithelial cells is suggest have a role in prefertilization events such as spermatozoa capacitation, spermatozoa bonds with pelucidic zones, and spermatozoa penetration into eggs [5]. Some expression of OVGP found outside the oviduct there are in epididimis, testes and ovary but not in the uterus, cervix, vagina, seminal vesicles and prostate gland [6]. However, an important rule of OVGP in both male and female local goat’s reproduction need to be confirm. This research conduct to show the OVGP expression in male and female gonads.

2. Materials and Methods
Local goat ovaries and testes are taken from the waste of reproductive organs of female and male goats in slaughter houses with maximum time three hours from organs harvesting. The ovaries and testes are inserted in a cooling box with PBS and ice gel, then brought to the laboratory.

In the laboratory the ovaries and testes process into immunohistochemical procedure with primary antibodies Oviduct Specific Glycoprotein (OVGP1) and secondary antibodies goat-anti rabbit IgG H&L (HRP). The expression of OVGP in ovaries and testes are observed in light microscope with 400 magnifications.

3. Result and Discussion
This research done to determine location of OVGP expression both in male gonad (testes) and female gonad (ovary) in local goats (*Capra aegragus*). The result show that in local goat testes the expression of OVGP can be found in spermatocyte, spermatogonia and leydig cells of seminiferus tube (Figure 1). In local goat ovaries, the result show that the OVPG expressions appears in granulosa, teca interna and teca externa cells of tertiary follicles (Figure 2) and granulosa lutein and teca lutein cells of corpus luteum (Figure 3).

![Figure 1. Expression of OVGP on local goat testes. (a) spermatocyte cells, (b) spermatogonia cells, (c) leydig cells.](image-url)
The results of immunohistochemistry of local goat testes indicate that OVGP can be found and expressed in cells in the seminiferous tubules. Lahery founded expression of OVGP in base cell of seminiferus tubules [6]. The result of Oviduct Specific Glycoprotein (OVGP) expressed in spermatagonia, spermatocyte and leydig cells of testes showed that OVGP have important role in spermatogenesis. Spermatogenesis is an active process of sperm formation in the testes. The stages of spermatogenesis consist of two stages: spermatocytogenesis and spermiogenesis. At the stage of spermatositogenesis there is formation of spermatocytes from spermatogonium which divides mitosis. Splitting spermatogonium produces two spermatogonia. Spermatogonia then divides in mitosis to produce two primary spermatocytes. Primary spermatocytes divide by mitosis produce two secondary spermatocytes.

OVGP expression seen in spermatagonia and spermatocytes cells indicates that OVGP is thought to play a role in spermatocytogenesis along with follicle stimulating hormone (FSH) to increase cleavage activity while the expression seen in leydig cells shows that OVGP also plays a role along with testosterone produced by cells leydig in the process of spermatogenesis.

Figure 2. Expression of OVGP on tertiary follicles of local goat ovary. (a) granulosa cells, (b) teca interna cells, (c) teca eksterna cells.

Figure 3. Expression of OVGP on corpus luteum of local goat ovary. (a) granulosa lutein cells, (b) teca lutein cells.
The results of immunohistochemistry of local goat ovary indicate that OVGP can be found and expressed in granulosa, teca interna, teca externa cells on tertiary follicles and granulosa lutein, teca lutein cells on corpus luteum. This result linear with Laheri, that OVGP in ovaries was detected in the surface of epithelium, granulosa cells in the follicles and corpus luteum [6]. However, from the results of Laheri's research, it was shown that OVGP was not expressed in the theca cells, and large parts of ovarian stroma, but in this result we can see that the OVGP was expressed in theca cells too.

From the explanation above it is possible that OVGP in the ovaries plays a role in helping the process of folliculogenesis, oogenesis, and the process of maintaining pregnancy. The granulosa cells in the follicles are physically not only tasked around the developing oocytes, but they are also produce the estrogen hormone whose function begins to prepare for fertilisation and pregnancy. The greater the size of the follicle, there will be more amount of estrogen produced [7].

4. Conclusion
Based on these results it can be concluded that the expression of OVGP in local goat testes are in spermatogonia, spermatocyte, and leydig cells. In female local goat reproduction, the expression in ovary are in granulosa, theca interna and theca externa cells.

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