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Penambahan Selenium pada Medium Kapasitas In Vitro terhadap Parameter Kinematika Spermatozoa Kambing
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

PENAMBAHAN SELENIUM PADA MEDIUM KAPASITASI *IN VITRO* TERHADAP PARAMETER KINEMATIKA SPERMATOZOA KAMBING

INTISARI

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Penelitian ini bertujuan untuk mengevaluasi pengaruh suplementasi selenium (Se) dalam medium kapasitasi terhadap parameter kinematika spermatozoa dan integritas tudung akrosom spermatozoa kambing selama proses kapasitasi secara *in vitro*. Penelitian menggunakan *semen* beku kambing Saanen yang berasal dari Balai Inseminasi Buatan (BIB) Lembang. Semen beku di-*thawing* pada suhu 37°C selama 30 detik, kemudian dilakukan washing untuk memisahkan spermatozoa dari pengencer dan sisa krioprotektan. Selanjutnya, spermatozoa diinkubasi dalam tiga media kapasitasi, yaitu tanpa penambahan Se sebagai kontrol (T0), penambahan Se sebesar 5 ppm (T1), dan penambahan Se sebesar 10 ppm (T2). Proses kapasitasi dilakukan selama dua dan tiga jam pada suhu 39°C dengan atmosfer 5% CO_2. Parameter kinematika spermatozoa dianalisis menggunakan sistem *Computer Assisted Sperm Analysis* (CASA), meliputi *curvilinear velocity* (VCL), *straight-line velocity* (VSL), *average path velocity* (VAP), *linearity* (LIN), *straightness* (STR), *wobble* (WOB), *amplitude of lateral head displacement* (ALH), dan *beat cross frequency* (BCF), sedangkan integritas tudung akrosom diamati menggunakan pewarnaan Giemsa. Data dianalisis menggunakan *One-Way Analysis of Variance* (ANOVA) dan dilanjutkan *dengan Duncan's Multiple Range Test* (DMRT) pada taraf signifikansi $p<0,05$. Hasil penelitian menunjukkan bahwa penambahan Se meningkatkan parameter kinematika spermatozoa, yaitu VCL, VSL, VAP, STR, WOB, dan BCF dibandingkan kontrol ($p<0,05$). Peningkatan parameter tersebut menunjukkan adanya perubahan karakteristik motilitas yang berkaitan dengan proses kapasitasi dan kecenderungan menuju hiperaktivasi. Meskipun demikian, nilai ALH dan LIN belum menunjukkan pola perubahan yang secara khas mencerminkan hiperaktivasi spermatozoa. Selain itu, penambahan Se meningkatkan persentase integritas tudung akrosom secara signifikan ($p<0,05$) dari 56,74±3,86% pada kontrol menjadi 83,60±2,11% dan 89,03±1,41% pada perlakuan Se 5 ppm dan 10 ppm. Berdasarkan hasil penelitian ini, dapat disimpulkan bahwa suplementasi Se dalam medium kapasitasi mempertahankan karakteristik kinematika spermatozoa dan integritas tudung akrosom, sehingga mendukung proses kapasitasi spermatozoa kambing secara *in vitro*.

Kata kunci: Hiperaktivasi, Integritas akrosom, Kinematika spermatozoa, Selenium

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EFFECTS OF SELENIUM SUPPLEMENTATION ON SPERM KINEMATIC TRAITS DURING *IN VITRO* CAPACITATION IN GOATS

ABSTRACT

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This study aimed to evaluate the effect of selenium (Se) supplementation in the capacitation medium on sperm kinematic parameters and acrosomal cap integrity of goat spermatozoa during the *in vitro* capacitation process. Frozen-thawed semen from Saanen bucks obtained from the Lembang Artificial Insemination Center (BIB Lembang) was used in this study. The semen was thawed at 37°C for 30 seconds and subsequently washed to separate spermatozoa from the extender and residual cryoprotectants. The spermatozoa were then incubated in three capacitation media: a control medium without Se supplementation (T0), a medium supplemented with 5 ppm Se (T1), and a medium supplemented with 10 ppm Se (T2). Capacitation was performed for two and three hours at 39°C under an atmosphere of 5% CO_2. Sperm kinematic parameters were evaluated using a Computer-Assisted Sperm Analysis (CASA) system, including curvilinear velocity (VCL), straight-line velocity (VSL), average path velocity (VAP), linearity (LIN), straightness (STR), wobble (WOB), amplitude of lateral head displacement (ALH), and beat cross frequency (BCF). Acrosomal cap integrity was assessed using Giemsa staining. Data were analyzed using one-way analysis of variance (ANOVA), followed by Duncan's Multiple Range Test (DMRT) at a significance level of $p<0.05$. The results showed that Se supplementation significantly increased sperm kinematic parameters, including VCL, VSL, VAP, STR, WOB, and BCF, compared with the control group ($p<0.05$). The improvement in these parameters indicates changes in sperm motility characteristics associated with the capacitation process and a tendency toward hyperactivation. However, ALH and LIN did not exhibit the characteristic changes typically associated with sperm hyperactivation. In addition, Se supplementation significantly increased the percentage of intact acrosomal caps ($p<0.05$), from 56.74±3.86% in the control group to 83.60±2.11% and 89.03±1.41% in the 5 ppm and 10 ppm Se-treated groups, respectively. In conclusion, Se supplementation in the capacitation medium maintained sperm kinematic characteristics and acrosomal cap integrity, thereby supporting the *in vitro* capacitation process of goat spermatozoa.

Keywords: Acrosomal integrity, Hyperactivation, Selenium, Sperm kinematic