

Letter to Editor

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Correlation between secreted aspartyl proteinase-5 (SAP-5) levels and spermatozoa motility in the vagina of candidiasis rat

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Spermatozoa detection and motility assessment in the vaginal cavity are important biological indicators used in forensic investigations of sexual intercourse. The persistence and motility of spermatozoa in the vagina may help estimate the approximate timing of sexual intercourse during medicolegal examinations^[1]. However, the vaginal microenvironment can be influenced by several physiological and pathological factors, including infections that may alter sperm survival and motility.

Vulvovaginal candidiasis is one of the most common vaginal infections affecting women of reproductive age. It is estimated that approximately 75%–80% of women experience vulvovaginal candidiasis at least once during their lifetime^[2]. Infection caused by *Candida* (*C.*) *albicans* can significantly alter the vaginal microenvironment through the secretion of several virulence factors, including secreted aspartyl proteinases (SAPs). These enzymes play a crucial role in epithelial adhesion, invasion, and tissue damage during infection^[3]. Among them, SAP-5 is known to contribute to mucosal invasion and inflammatory responses in vaginal candidiasis^[4].

Inflammatory processes and biochemical alterations during candidiasis may potentially affect sperm viability and motility. Previous studies have shown that *Candida* species and their secreted metabolites may impair sperm membrane integrity, mitochondrial function, and flagellar movement, ultimately reducing sperm motility^[5]. However, the relationship between SAP-5 levels and sperm motility within the vaginal environment has not been widely investigated. Therefore, this study aimed to evaluate the correlation between SAP-5 levels and spermatozoa motility in a rat model of vaginal candidiasis.

Female Wistar rats (*Rattus norvegicus*) were divided into two groups: a normal control group and a vaginal candidiasis model group ($n=16$ per group). Vaginal candidiasis was induced by inoculating *C. albicans* blastospores into the vaginal lumen following estradiol pretreatment to facilitate fungal colonization. Infection was confirmed microscopically by the presence of pseudohyphae using potassium hydroxide examination.

Semen samples were obtained from male rats and introduced into the vaginal canal of female rats through controlled vaginal insemination. Vaginal swabs were collected to evaluate spermatozoa motility. Motility was assessed microscopically by measuring the duration during which motile spermatozoa remained detectable in the vaginal environment. Vaginal lavage fluid was collected to measure SAP-5 levels using enzyme-linked immunosorbent assay.

The results showed significant differences between groups. In the normal vaginal environment, spermatozoa remained motile for approximately three minutes after insemination. In contrast, in the candidiasis model group, sperm motility persisted for only around two minutes. Median SAP-5 levels were markedly higher in the candidiasis group compared with the normal group (21.524 ng/mL *vs.* 0.307 ng/mL). Meanwhile, the median duration of sperm motility was significantly shorter in the candidiasis group (1 minutes *vs.* 3 minutes). Statistical analysis using the Mann–Whitney test demonstrated that both differences were significant ($P<0.001$).

Correlation analysis using Spearman's test revealed a strong negative correlation between SAP-5 levels and spermatozoa motility ($r=-0.668$, $P<0.001$). Higher SAP-5 concentrations were associated with decreased sperm motility within the vaginal environment.

Several biological mechanisms may explain this finding.

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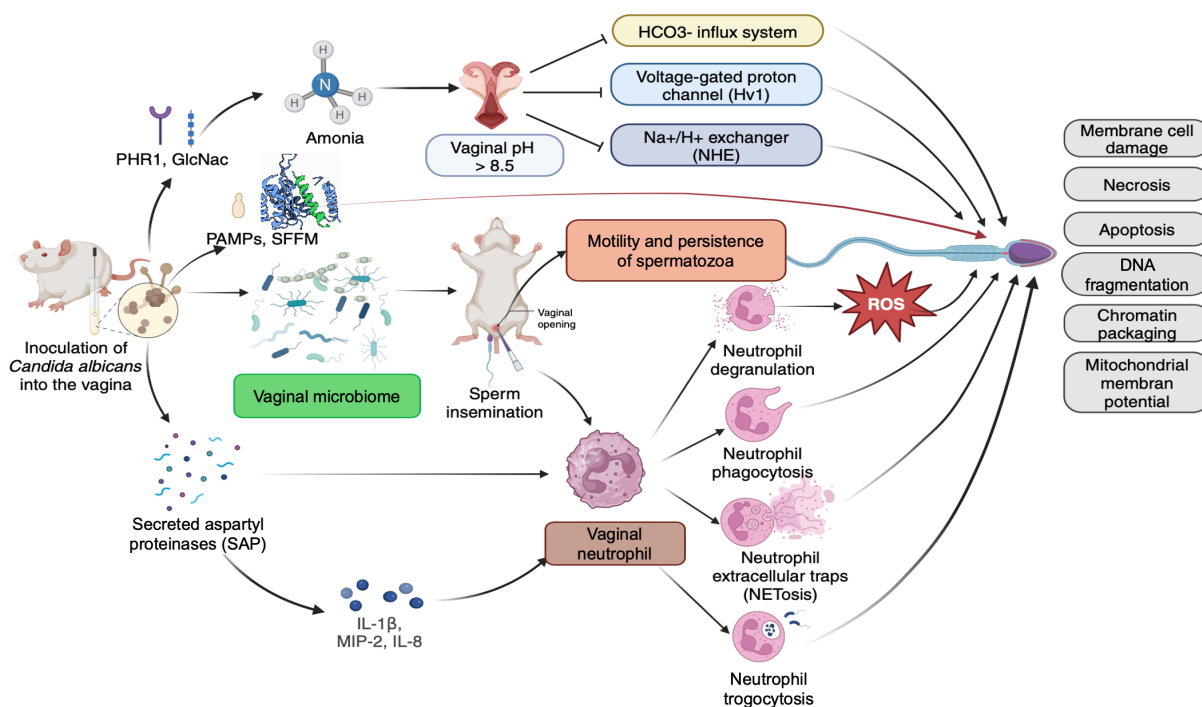


Figure 1. Proposed mechanism spermatozoa motility in the vagina candidiasis rat[9]. PHR1: pH-responsive genes 1, PAMPs: pathogen-associated molecular patterns, GlcNac: *N*-acetylglucosamine, ROS: reactive oxygen species, SFFM: soluble factors of fungal metabolism..

During vaginal candidiasis, *C. albicans* secretes virulence factors including SAP enzymes and candidalysin, which activate epithelial inflammatory responses and stimulate neutrophil recruitment[3]. Activated neutrophils may release neutrophil extracellular traps (NETs) and cytotoxic molecules such as myeloperoxidase and elastase that can damage sperm membranes and impair motility[6].

Furthermore, candidiasis may alter vaginal pH and biochemical conditions surrounding spermatozoa. Sperm cells exhibit optimal motility within a relatively narrow pH range of approximately 7.2–7.8[7]. Alterations in vaginal pH and inflammatory mediators may disrupt mitochondrial activity and adenosine triphosphate (ATP) production in sperm cells, leading to decreased flagellar movement and reduced motility[8].

These findings may have important implications in forensic medicine. In sexual assault investigations, sperm motility is sometimes used as an indicator to estimate the timing of sexual intercourse. Vaginal infections such as candidiasis may accelerate the decline of sperm motility, potentially affecting the accuracy of medicolegal interpretations.

The proposed biological mechanism underlying this relationship is illustrated in Figure 1. These findings support previous evidence that virulence factors of *C. albicans*, including secreted aspartyl proteinases, can disrupt the vaginal microenvironment and potentially impair sperm function and viability.

In conclusion, this study demonstrated a significant negative correlation between SAP-5 levels and spermatozoa motility in the vagina of rats with candidiasis. Elevated SAP-5 levels were

associated with a shorter duration of sperm motility, suggesting that vaginal candidiasis may influence sperm persistence within the vaginal environment.

Conflict of interest statement

The author has no competing interests to declare.

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Author' contributions

Raja Al Fath Widya Iswara contributed to study design, data collection, analysis, manuscript drafting, and final approval of the manuscript.

Ethical statement

The research has received an ethical review and information about passing the ethical review from the Research Ethics Committee of the Faculty of Medicine, Universitas Indonesia/RSUPN dr.

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