The Journal of Sex Research Vol. 30, No. 2, pp. 148–151 May 1993

Update on the Female Prostate and the Phenomenon of Female Ejaculation

Milan Zaviacic
Institute of Pathology, Comenius University Bratislava
Beverly Whipple
Rutgers College of Nursing

A review of research concerning the female prostate, a specific organ of the female urogenital system, is presented. This research focuses on clinical interest, anatomical structure, and histochemistry of the female prostate. Research concerning the phenomenon of female ejaculation is reviewed in terms of findings relevant to forensic medicine and sexuality. Further systematic research is needed to determine if the female prostate, the Gräfenberg spot, and female ejaculation are functionally connected.

As early as 1981, we, from Slovakia and the United States of America, were publishing research concerning the morphological and functional parameters of the female prostate, the small and mysterious organ of the female urogenital system, and the phenomenon of female ejaculation. Since 1672, when De Graaf postulated the existence of the female prostate in his book *De mulierum organis generationi inserventibus*, many researchers in the field of medicine and biology have investigated problems of the female prostate. For example, Rudolf Virchow (1821-1902), the well-known pathologist, recognized the existence of this organ and studied its pathology. Historically, there are also references to female ejaculation, beginning with Aristotle, who observed that women expel a fluid during orgasm (Ladas, Whipple, & Perry, 1982; Stifter, 1988). De Graaf (1672), in his *New Treatise Concerning the Generative Organs of Women*, described female fluid as "rushing out" with "impetus" and "in one gush." From a review of literature, Sevely and Bennett (1978) speculated that some women ejaculate, and the source of the ejaculate is the female prostate, a system of glands and ducts that surrounds the female urethra and develops from the same embryologic tissue as the male prostate.

The Female Prostate

The term "female prostate" was commonly used in the past and in the beginning of the 20th century. This term was derived not only from De Graaf's writings but also because the male and female prostate develop from the same embryonic tissue of the sinus urogenitalis (Longo, 1982). The female prostate has the same structural components as the male prostate, i.e., prostatic glands, ducts, and smooth muscles. In the female prostate there are numerous ducts; however, there are fewer glands than in the male prostate. In addition, the size of the prostate in the female is smaller than the prostate in the male (Zaviacic, 1985b, 1987b).

Diseases of the female prostate are less frequent than those of the male prostate and usually do not threaten the woman's life. A varied clinical picture of different diseases of the female prostate, resulting from pathology of this organ, were reported in the beginning of the 1950s (Huffman, 1951). Folsom and O'Brian (1943) reported cases of hypertrophy of the female prostate gland. More recently, carcinoma of the prostate paraurethral duct, which frequently affects men, has also been identified in women (Svanholm, Anderson, & Rohl, 1987; Zaviacic, Sidlo, Borovsky, & Kuderjava, 1992). The incidence of these disorders in women has not been addressed; however, it is assumed to be lower than in men. For example, myoadenomatous hyperplasia of the prostate affects approximately 80% of men over 80 years of age (Mostofi & Davis, 1985). Because of the lesser degree of pathology of the female prostate in comparison with the male, the female prostate has been considered only a rudimentary and an insignificant vestigial structure. This may be why the female prostate, under the official name of Skene's paraurethral glands and ducts, receives little attention in medical literature.

A great change in the understanding of the female prostate was brought about when Tepper, Jagirdar, Heath, and Geller (1984) and Pollen and Dreilinger (1984) demonstrated that the paraurethral glands, their content, and a part of the female uroepithelial cells reacted positively to the specific antigen of the male prostate (PSA) and to the specific prostatic acid phosphatase (PSAcP). In addition, these prostatic markers, widely used in diagnosing carcinoma of the male prostate and its metastases, were found in carcinoma of the female prostate (Svanholm, Anderson, & Rohl, 1987; Zaviacic et al.,

Address correspondence to: Milan Zaviacic, M.D., Ph.D., Dr. Sc., Comenius University Bratislava, Sasinkova 4, 811 08 Bratislava, Slovakia or Beverly Whipple, PhD, RN, FAAN, College of Nursing, Rutgers, The State University of NJ, 180 University Ave., Newark, NJ 07102.

1992). The nonvestigial concept of the female prostate as a functional organ was supported by the results of research (Zaviacic, 1984a, 1984b) in which the enzymatic parameters of the female prostate were demonstrated. It was also shown that the histoenzymatic parameters were comparable to those of the male prostate (Zaviacic, 1985a).

A difference in the enzymatic parameters of the prostate between fertile women and women after menopause suggested the possibility of hormonal dependence of this gland (Zaviacic, 1987a; Zaviacic, Porubsky, Vierik, & Holoman, 1989). Using histochemical silver methods, the presence of numerous argyrophil cells of the closed and open type was demonstrated not only in the female prostatic ducts but also in the glands, indicative of the endocrine and paracrine function of the female prostate within the female neuroendocrine system (Zaviacic, 1986a, 1986b, 1986c).

Reports demonstrating cross antigenicity (Pollen & Dreilinger, 1984; Tepper et al., 1984) between the male and female prostate and histochemical parameters demonstrating the exocrine (Zaviacic, 1984a, 1984b, 1985a) and endoparacrine function (Zaviacic, 1986a, 1986b, 1986c) of the female prostate challenge the opinion that the female prostate is an unimportant vestigial and rudimentary structure (Zaviacic et al., 1985; Zaviacic, 1987b). These reports provide convincing evidence that the female prostate is a small, functional organ that produces female prostatic secretion and possesses cells with neuroendocrine function, comparable to the male prostate.

Not all researchers agree with calling this tissue the female prostate. Alzate and Hoch (1986) claimed that it is confusing to call the Skene's glands the female prostate and later said that it was a matter of peripheral importance to them (Alzate & Hoch, 1988). Alzate more recently wrote that "although it has been long known that they (the Skene's ducts and glands) are embyrologically homologous with the male prostate, it should be pointed out that the existence of a well-developed and functional 'prostate' in a substantial proportion of women is highly unlikely because the development of prostatic tissue is normally dependent on testicular androgens" (Alzate, 1990, p. 139). Based on the similarities previously addressed, it seems inconsistent to use the term "prostate" for the tissue in the male and a different term "Skene's ducts and glands" for the same tissue in the female. Perhaps the anatomically correct term of prostate should be used rather than "female prostate" as the anatomically correct term of breasts is used when referring to "male breasts."

Female Ejaculation

From 1986 to 1990, the aim of the research program of Zaviacic and his colleagues was to establish how current knowledge about the female prostate is reflected in the area of medicine that may be involved with problems of the female prostate and its function. One area of investigation concerned female ejaculation.

An important contribution to the practice of forensic medicine and the demonstration of rape was the finding that the test used in forensic medicine to confirm the presence of acid phosphatase when identifying spermatic secretion lacking spermatozoa has no forensic value. In vitro produced spots from female ejaculate (Zaviacic, Oberucova, & Holoman, 1987; Zaviacic, Kokavec, Zaviacicova, Blazekova, & Holoman, 1987) and in vivo produced spots on female lingerie in the areas of contact with the genitalia demonstrate the same positivity of acid phosphatase as male secretions without spermatozoa (Zaviacic, Kokavec, Oberucova, Zaviacicova, & Holoman, 1988; Zaviacic et al., 1987). This suggests that not only the male but also the female prostate can release its contents via an ejaculatory mechanism and continual resting secretions. Similarly, as in the male, the onset of the female prostatic secretion precedes puberty (Zaviacic et al., 1988).

The finding that the fluid of urethral expulsions, the female ejaculate, contains components different from urine (Addiego et al., 1981; Belzer, Whipple, & Moger, 1984; Sensabaugh & Kahane, 1982; Zaviacic, Dolezalova, Holoman, Zaviacicova, Mikulecky, & Brazdil, 1988; Zaviacic et al., 1988; Zaviacic et al., 1984; Zaviacic, Zaviacicova, Komornik, Mikulecky, & Holoman, 1984) has relevance for sexuality and reproductive medicine. In two studies, the female ejaculate was significantly higher in prostatic acid phosphatase and significantly lower in urea and creatinine concentrations than urine specimens from the same women (Addiego et al., 1981; Belzer, Whipple, & Moger, 1984). The significance of this finding for the field of sexuality is that it has helped many women who felt that they may be urinating during sex to have the knowledge that the fluid they expel may be different from urine and a normal phenomenon that occurs during sexual response. In addition, fructose has been identified in female ejaculate (Zaviacic, Dolezalova, Holoman, Zaviacicova, Mikulecky, & Brazdil, 1988). Prior to this finding, fructose was considered to be present only in male ejaculate as a special energy source for the movement of spermatozoa. The fructose in the female ejaculate has the potential for providing an important function in the reproductive process, an additional energy source for spermatozoa mobility.

Perry and Whipple (1981) named a sensitive area felt through the anterior wall of the vagina about halfway between the back of the pubic bone and the cervix, along the course of the urethra, which swells when it is stimulated, the Gräfenberg spot or the G spot, after the obstetrician and gynecologist Ernst Gräfenberg. Gräfenberg (1950) described this zone of erogenous feeling and the expulsion of fluid that occurs simultaneously with orgasm

from stimulation of this area. However, Gräfenberg's original observations are contradicted by the finding that the response to G spot stimulation is differentiated; that is, in a small percentage of women, the expulsion of fluid from the urethra may occur during sexual arousal, not just during orgasm (Zaviacic, Zaviacicova, Holoman, & Molcan, 1988). Zaviacic et al. (1988) divided 10 women who ejaculated in response to G spot stimulation in the laboratory into three groups: relatively hard-to-induce expulsion, easily induced expulsion, and intermediate. The women in the hard-to-induce group (N = 3) needed about 10 to 15 minutes of G spot stimulation to reach orgasm and ejaculate. The women in the easily induced group (N = 2) released fluid from the urethra after a maximum of 1-1/2 minutes of G spot stimulation but did not report orgasm. The women in the intermediate group (N = 5) had urethral expulsions after 4 to 8 minutes of G spot stimulation but did not report orgasm with the expulsion of fluid.

Although four studies have supported a statistically significant difference in chemical composition between the ejaculated fluid and urine in females (Addiego et al., 1981; Belzer et al., 1984; Sensabaugh & Kahane, 1982; Zaviacic, Dolezalova, Holoman, Zaviacicova, Mikulecky, & Brazdil, 1988), two studies have not supported these findings (Alzate, 1985; Goldberg et al., 1983). Perhaps some women do expel urine during sexual response, and this may be related to urinary stress incontinence.

Sexologists are familiar with the rhythmic menstrual cycle of women in terms of phases. However, there are other rhythmic components of the menstrual cycle. The results demonstrating circatrigintan (30 +/– 5D) circavigintan (20 +/– 5D) rhythm (period of 22-27 days) of the cellular component of the female ejaculate (Zaviacic et al., 1984) are of practical value for gynecologic urology and the problems of urinary incontinence in women. It has been demonstrated that with stimulation of the G spot during the secretory phase of the menstrual cycle, far more uroepithelial squamous cells were released into the ejaculate than during the proliferative phase of the menstrual cycle. However, this does not mean that only pre-menopausal women experience ejaculation; women of all ages have reported experiencing ejaculation (Ladas, Whipple, & Perry, 1982). Concerning the role of the urethral epithelium in the closing mechanisms of the female urethra, it may be assumed that during the secretory phases of the menstrual cycle, the conditions for the development of incontinence are more favorable in women (Mikulecky et al., 1986; Zaviacic et al., 1984). The treatment of urinary incontinence by estrogens is thus substantiated as estrogens positively influence the thickness of both the urethral epithelium and its wall (Bhatia, Bergman, & Karram, 1989).

Conclusions

An overview of the reasons leading to the non-vestigial concept of the female prostate as a specific organ of the female urogenital system with certain functions, substantiated by morphological and clinical research, has been presented. Based on these data it is indeed appropriate to call these tissues the prostate or the female prostate.

The phenomenon of female ejaculation exists. Based on the previously mentioned research, one could conclude that some women expel a fluid from the urethra during sexual response that is similar to urine and may be related to urinary stress incontinence, and others expel a fluid that is different from urine. Recommendations in the past to women who experience this expulsion of fluid have been to hold back from experiencing orgasm or to undergo surgery for urinary stress incontinence. It is hoped that awareness of the existence of female ejaculation will help women and their partners feel more comfortable with this normal phenomenon and thus avoid surgery designed to eliminate it (Whipple & Komisaruk, 1991; Zaviacic, Whipple, Zaviacicova, & Holoman, 1993).

Because the source of the female ejaculate has not yet been determined definitively, it is premature to state that the female prostate is the sole source of female ejaculation, but this organ may well participate in ejaculation. In addition, because the anatomy of the sensitive area felt through the anterior wall of the vagina, the Gräfenberg spot, has not yet been precisely identified morphologically, it is also premature to link the G spot with the female prostate in every case. These may be separate entities, which may be related in some women and may not be related in other women. Further systematic research is needed to identify definitively the anatomical properties of the Gräfenberg spot and to determine if these entities, the female prostate, the Gräfenberg spot, and female ejaculation, are functionally connected.

References

Addiego, F., Belzer, E. G., Comolli, J., Moger, W., Perry, J. D., & Whipple, B. (1981). Female ejaculation: A case study. *The Journal of Sex Research, 17*, 13-21.

Alzate, H. (1985). Vaginal eroticism: A replication study. *Archives of Sexual Behavior, 14*, 529-537.

Alzate, H. (1990). Letters to the editor: Vaginal erogeneity, the "G spot," and "female ejaculation." *Journal of Sex Education Therapy, 16*, 137-140.

Alzate, H., & Hoch, A. (1986). The "G spot" and "female ejaculation": A current appraisal. *Journal of Sex & Marital Therapy, 12*, 211-220.

Alzate, H., & Hoch, A. (1988). Letter to the editor: A reply to Zaviacic. *Journal of Sex & Marital Therapy, 14*, 299-301.

Belzer, E. G., Whipple, B., & Moger, W. (1984). On female ejaculation. *The Journal of Sex Research, 20*, 403-406.

Bhatia, N. N., Bergman, A., & Karram, M. M. (1989). Effects of estrogen on urethral function in women with urinary incontinence. *American Journal of Obstetrics and Gynecology, 160*, 176-181.

De Graaf, R. (1672) New treatise concerning the generative organs of women. In H. B. Jocely & B. P. Setchell (Eds.), *Journal of Reproduction and Fertility*, Supplement

No. 17 (pp. 77-222). Oxford, England: Blackwell Scientific Publications, 1972.

Folsom, A. I., & O'Brian, H. A. (1943). The female obstructing prostate. *Journal of the American Medical Association, 121*, 573-580.

Goldberg, D. C., Whipple, B., Fishkin, R. E., Waxman, H., Fink, P. J., & Weisberg, M. (1983). The Gräfenberg spot and female ejaculation: A review of initial hypotheses. *Journal of Sex and Marital Therapy, 9*, 27-37.

Gräfenberg, E. (1950). The role of the urethra in female orgasm. *International Journal of Sexology, 3*, 145-148.

Huffman, J. W. (1951). Clinical significance of the paraurethral ducts and glands. *Archives of Surgery, 62*, 615-626.

Ladas, A. K., Whipple, B., & Perry, J. D. (1982). *The G spot and other recent discoveries about human sexuality*. New York: Holt, Rinehart & Winston.

Longo, V. J. (1982). The female prostate. *Urology, 20*, 108-109.

Mikulecky, M., Zaviacic, M., Halberg, F., Kubacek, L., & Valachova, A. (1986). Cosinor demonstration of circatrigintan (circavigintan) biorhythm in cell component volume of female urethral ejaculate. *Chronobiologia, 13*, 155-159.

Mostofi, F. K., & Davis, C. J. (1985). Male reproductive system and prostate. In J. M. Kissane & W. A. D. Anderson (Eds.), *Anderson's Pathology* (pp. 791-833). St. Louis: C. V. Mosby, Co.

Perry, J. D., & Whipple, B. (1981). Pelvic muscle strength of female ejaculators: Evidence in support of a new theory of orgasm. *The Journal of Sex Research, 17*, 22-39.

Polien, J. J., & Dreilinger, A. (1984). Immunohistochemical identification of prostatic acid phosphatase and prostate specific antigen in female periurethral glands. *Urology, 23*, 303-304.

Sensabaugh, G. R., & Kahane, D. (1982, May). Biochemical studies on "female ejaculates." Paper presented at the meeting of the California Association of Criminalist, Newport Beach, CA.

Sevely, J. L., & Bennett, J. W. (1978). Concerning female ejaculation and the female prostate. *The Journal of Sex Research, 14*, 1-20.

Stifter, K. F. (1988). *Die dritte Dimension der Lust. Das Geheimnis der weiblichen Ejakulation*. Frankfurt/Main: Ullstein.

Svanholm, H., Anderson, P. O., & Rohl, H. (1987). Tumor of the female paraurethral duct: Immunohistochemical similarity with prostatic carcinoma. *Virchowis Archives, 411*, 395-398.

Tepper, S. L., Jagirdar, J., Heath, D., & Gellei, S. A. (1984). Homology between the female paraurethral (Skene's) glands and the prostate. *Archives of Pathology and Laboratory Medicine, 108*, 423-425.

Whipple, B., & Komisaruk, B. R. (1991). The G spot, orgasm, and female ejaculation: Are they related? In P. Kothari (Ed.), *The proceedings of the first international conference on orgasm* (pp. 227-237). Bombay, India: VRP Publishers.

Zaviacic, M. (1984a). Enzyme histochemistry of the adult human female prostate: Acid phosphatase distribution. *Cellular and Molecular Biology (Oxford), 30*, 545-551.

Zaviacic, M. (1984b). Enzyme histochemistry of the adult human female prostate: Hydrolase and dehydrogenase distribution. *Cellular and Molecular Biology (Oxford), 30*, 537-543.

Zaviacic, M. (1985a). The adult human female prostate homologue and the male prostate gland: A comparative enzyme-histochemical study. *Acta Histochemica, 77*, 19-31.

Zaviacic, M. (1985b). *The female prostate and urethra. Functional-morphological study*. Thesis for Dr.Sc. Bratislava, Slovakia: Comenius University.

Zaviacic, M. (1986a). Argyrophil and argentaffin APUD cells in the human female prostate homologue and the urethra. *Acta Histochemica, 79*, 93-96.

Zaviacic, M. (1986b). Endocrine-paracrine argyrophil cells in the adult human female prostate and urethra. *The Histochemical Journal, 18*, 139.

Zaviacic, M. (1986c). The prostate and urethra of the female: Equipment by the argyrophilic cells of the diffuse neuroendo(para) crine system. *Folia Facultatis Medicae Universitatis Comenianae Bratislaviensis, 24*, 163-183 (In Slovak).

Zaviacic, M. (1987a). Age effect upon enzymic equipment of the female prostate (paraurethral glands). *Pathology Research and Practice, 182*, 579.

Zaviacic, M. (1987b). Letter to the editor: The female prostate: Nonvestigial organ of the female. A reappraisal. *Journal of Sex and Marital Therapy, 13*, 148-152.

Zaviacic, M., Dolezalova, S., Holoman, I. K., Zaviacicova, A., Mikulecky, M., & Brazdil, V. (1988). Concentrations of fructose in female ejaculate and urine: A comparative biochemical study. *The Journal of Sex Research, 24*, 319-325.

Zaviacic, M., Holoman, I. K., Molcan, J., & Zaviacicova, A. (1988). Weibliche Ejakulation klinisch provoziert. *Sexualmedizin, 17*, 196-200.

Zaviacic, M., Jakubovsky, J., Polak, S., Zaviacicova, A., Holoman, I. K., & Gregor, P. (1984). The fluid of female urethral expulsions analyzed by histochemical electronmicroscopic and other methods. *Histochemical Journal, 16*, 445-447.

Zaviacic, M., Kokavec, M., Oberucova, J., Zaviacicova, A., & Holoman, I. K. (1988). Forensic-medical aspects of female prostate and female ejaculation: Acid phosphatase positivity in spots on soiled female underwear and in the wipe-up spot from female urethra and vagina: Evidence for the existence of continual secretion of the female prostate. *Archiv Mediciny Sadovej i Kryminologii, 38*, 28-35.

Zaviacic, M., Kokavec, M., Zaviacicova, A., Blazekova, J., & Holoman, I. K. (1987). Forensic-medical aspects of female prostate and female ejaculation: Acid phosphatase positivity in the artificially prepared spots from fluid expelled at ejaculation of the female. *Archiv Mediciny Sadovej i Kryminologii, 37*, 152-159.

Zaviacic, M., Kokavec, M., Zaviacicova, A., Holoman, I. K., & Oberucova, J. (1987). Forensich-medizinische Aspekte der weiblichen Prostata und der Ejakulation des Weibs und die Ausnutzungsmoglichkeiten dieser Erkenntnisse bei der Untersuchung der Siittichkeitsstrafteten. *Cs. Kriminalistika, 20*, 205-219 (In Slovak).

Zaviacic, M., Oberucova, J., & Holoman, I. K. (1987). Acid phosphatase positivity in spots produced in vitro from the fluid of urethral expulsion (female ejaculate) of the female: Macroenzymic histochemical forensic medical study. *Bratislavske Lekarske Listy, 87*, 423-431 (In Slovak).

Zaviacic, M., Porubsky, J., Vierik, J., & Holoman, I. K. (1989). Enzymes of the prostate in women of fertile age and after the menopause: Comparative histochemical investigation. *Cs. Gynekologie, 54*, 755-760 (In Slovak).

Zaviacic, M., Sidlo, J., Borovsky, M., & Kuderjava, I. (1992). Adenocarcinoma of the female prostate and renal cell carcinoma: Case of tumor duplicity in a 70-year-old woman. Presented at the 296 Clinocopathological Conference of the Institute of Pathology Comenius University, Bratislava, Dec. 7, 1992.

Zaviacic, M., Whipple, B., Zaviacicova, A., & Holoman, I. K. (1993). Medical aspects of the phenomenon of urethral expulsions (ejaculation) of the female and their utilization in practice. *Slovensky Lekar, 3*, 53-56 (In Slovak).

Zaviacic, M., Zaviacicova, A., Brozman, M., Holoman, I. K., Bruchac, D., Oberucova, J., & Kokavec, M. (1985). The female prostate or Skene's paraurethral glands and ducts? Reasons for returning to the original term of De Graaf. *Cs Gynekologie, 50*, 372-377 (In Slovak).

Zaviacic, M., Zaviacicova, A., Holoman, I. K., & Molcan, J. (1988). Female urethral expulsions evoked by local digital stimulation of the G-spot: Differences in the response patterns. *The Journal of Sex Research, 24*, 311-318.

Zaviacic, M., Zaviacicova, A., Komornik, J., Mikulecky, M., & Holoman, I. K. (1984). Circatrigintan (30 +/- 5d) variations of the cellular component of female urethral expulsion fluid: A biometrical study. *International Urology and Nephrology, 16*, 311-318.

Manuscript accepted February 15, 1993