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TECHNICAL NOTE

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Phosphoglucomutase Typing of Vaginal Swabs

The phosphoglucomutase (PGM) isoenzymes present in blood are also known to occur in semen. Culliford [*1*] and Rees and Rothwell [*2*] found no discrepancy between the PGM pattern of blood and the corresponding semen samples. Rees and Rothwell warned of possible interferences from vaginal secretions when typing semen from a vaginal swab. Thus, if the female is heterozygous for PGM the enzyme type of the semen cannot be established.

Materials and Method

Grunbaum's method [*3*] for PGM typing is adapted in this laboratory for use with a Shandon tank [*4*]. The blood samples and vaginal swabs were collected from known volunteers and rape victims.

Results and Discussion

During studies of PGM typing of seminal fluid on vaginal swabs from sexual assault and rape victims the presence of an extra-fast-moving PGM band was observed that was not found in the whole blood of either the female or the male suspect. Samples of whole blood and swabs of vaginal secretions taken at least 36 h after intercourse were collected from eleven volunteers. The fast band was present in all the swabs, but the normal enzyme type at the PGM_1 or PGM_2 locus, corresponding to the donor's blood sample, was either very weak or entirely absent. Further swabs were collected from six of the volunteers shortly after intercourse. These postcoital swabs gave the fast band as well as the pattern of the expected type and intensity at the PGM_1 or PGM_2 locus, which corresponded to the combination of patterns found in the blood samples of the male and female involved. So not only was there an extra band present in vaginal secretion but during sexual contact vaginal PGM at the 1 and 2 loci must have increased considerably.

The fast band does not appear to be related to any particular PGM locus, unlike the extra band Blake and Sensabaugh [*5*] sometimes noticed at the PGM_3 locus of concentrated sperm extracts that had been allowed to overstain. The fast band has not been

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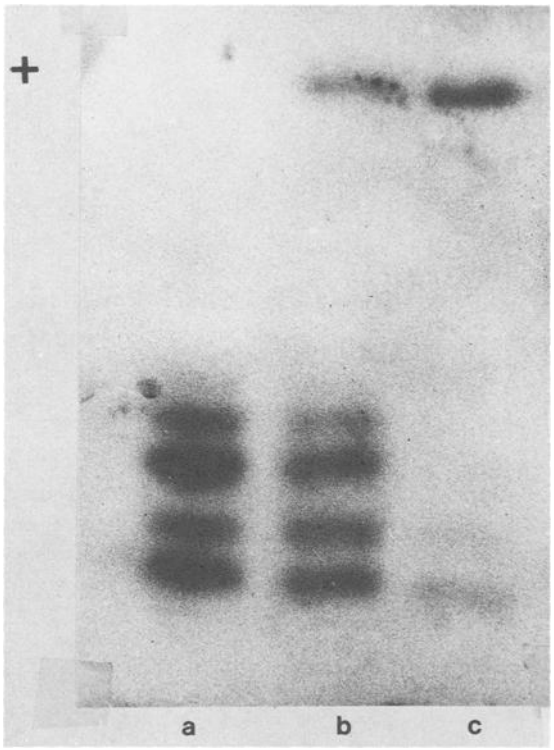

FIG. 1—*Three PGM patterns from the same donor;* (a) *PGM-1 in a lysed blood sample;* (b) *PGM-1 with the fast band obtained from a vaginal swab after sexual stimulation; and* (c) *traces of PGM-1 with the strong fast band from a vaginal swab taken before sexual stimulation.*

observed in pure semen samples and differs from extra bands found occasionally in decaying whole blood when an enhancement of the enzyme activity occurs.

The higher enzyme level at the PGM_1 and PGM_2 loci from the postcoital swabs could be introduced into the vagina in the vaginal transudate or the Bartholin's gland secretion [6], both of which enter the vagina as a physiological response to sexual stimulation. As the quantity of Bartholin's gland secretion released during sexual stimulation is very small it appears unlikely that this secretion could be responsible for the greatly increased PGM levels. The possibility that the increase in enzyme level is due to the variation in female sex hormones during the menstrual cycle was investigated. Precoital vaginal swabs and swabs taken after sexual stimulation but before ejaculation were taken from two subjects at four regular intervals throughout the menstrual cycle. One of the women was taking an oral contraceptive pill, the other was not.

The fast band was present in the precoital swabs but a PGM-1 or PGM-2 pattern could not be detected. In all the swabs taken after sexual stimulation the fast band and the normal PGM-1 or PGM-2 pattern were closely observable. No significant difference in the intensity of the PGM bands from the swabs taken after stimulation was observed, so it was thought unlikely that the monthly variation of the female sex hormones is responsible for the difference in enzyme levels.

Since first noticing these aspects of PGM typing on vaginal swabs 16 cases involving the grouping of swabs from rape victims have been examined. In each case a fast band was clearly present. The swabs were generally collected within 1 to 12 h of intercourse and the chances of interpreting the seminal and vaginal components of the PGM pattern appeared

to decrease with time at approximately the same rate. It is likely that this is due to the natural drainage of the vagina. The one swab taken 12 h after intercourse had a pattern too faint to interpret.

Conclusion

While the fast band appears to be a constant constituent of vaginal secretion in the subjects studied, the enzyme at the PGM_1 and PGM_2 loci presumably originates from the vaginal transudate and is only present after sexual stimulation. This conclusion differs slightly from the postulate made by Price et al [7] that vaginal PGM was produced by sexual intercourse as vaginal transudate occurs in most women 10 to 30 s after commencement of sexual stimulation, without intercourse necessarily occurring.

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