Interpretation of the ABH reactions of Casework Seminal Stains

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INTRODUCTION

Recently a four year study of the ABH reactions of seminal stains was completed (Davies, to be published). The stains came from cases where the identity of the assailant was virtually certain and both the ABO group and the secretor status of complainant and assailant were known. The majority of the cases involved sexual intercourse so most of the seminal stains contained at least some vaginal material. One of the more important aspects of the results of the survey was the knowledge gained regarding the success of typing different ABO groups of secretor semen, together with the possible contribution to the ABH reactions of any secretor vaginal material present.

In the following summary of the findings, where reference is made to the reactions of secretor semen of a particular ABO group, the data came from either neat seminal stains or those resulting from sexual intercourse with a female who was not a secretor of an ABO group which would contribute to those reactions. Similarly the facts regarding secretor vaginal material of groups A, B and O came from rape cases where the assailant was not a secretor of an ABO group that would contribute to the observed reactions. Very few seminal stains containing AB secretor vaginal material were grouped and these are not included in the paper.

SECRETOR SEMEN

Table 1 - The number of conclusive reactions obtained from stains of secretor semen

A secretor	B secretor	AB secretor	O secretor
67% (97/147)	66% (89/134)	64% (18/28)	40% (42/104)

The grouping of A, B and AB secretor semen was equally successful (Table 1), two-thirds of the stains gave conclusive reactions for the seminal ABO group. In contrast less than half of the stains of O secretor semen gave conclusive H reactions. (A conclusive reaction was where several dilutions of the stain extract gave strong elution reactions and a $^1/_5$ dilution gave at least 50% inhibition.)

Advances in Forensic Haemogenetics 2
Edited by W. R. Mayr

Strong and Weak Seminal Stains

The stains in the survey were classed as strong, moderate or weak according to the strength of the acid phosphatase (AP) reaction and the numbers of spermatozoa present on a slide made from the stain extract. Strong stains were defined as those with a high level of AP activity and abundant spermatozoa and weak stains as those with little or no AP activity and few spermatozoa.

Table 2 - The numbers of conclusive reactions obtained from strong stains of secretor semen.

A secretor	B secretor	AB secretor	O secretor
34/40	38/41	11/11	19/34

A + B + AB secretor = 83/92 = 90%
O secretor = 19/34 = 56%

It was found that most strong stains of A, B and AB secretor semen gave conclusive reactions, together with just over half of the strong stains of O secretor semen (Table 2). A large proportion of the failures were vaginal swabs. (It was obvious in this survey, as it had been in previous work (Davies 1982) that vaginal swabs were less useful for determining the seminal ABO group than were stains on other items.)

Just over a third of weak stains of A, B and AB secretor semen gave conclusive reactions (37%, 26/71), whereas only one weak stain of O secretor semen gave conclusive H reactions (1/17), and that was a penile swab where other secretions could have contributed to the reaction.

SECRETOR VAGINAL MATERIAL

Table 3 - The number of conclusive reactions for the group of the vaginal material, obtained from mixtures of it and semen.

A secretor	B secretor	O secretor
70% (144/207)	49% (42/86)	8% (6/76)

Grouping of A secretor vaginal material was at least as successful as that of semen of the same group (Table 3). It seemed that B secretor vaginal material gave conclusive B reactions rather less often and the O secretor vaginal material gave conclusive reactions only occasionally.

DISCUSSION

The above findings regarding the reactions of secretor semen and vaginal material are entirely empirical, but two papers published by Le Pendu et al (1982, 1983) appear to provide a scientific explanation for some of the observations. In the first paper it was demonstrated that large quantities of H type 1 and H type 2 antigenic determinants were present n the saliva of OLe^b individuals and that relatively small amounts were present in their sera. In the second paper it was shown that there were large quantities of A and B antigens in the saliva of ALe^b and BLe^b individuals respectively, but the levels in serum were not investigated.

The two sorts of anti-A sera used in the later work did not distinguish between A type 1 and A type 2 synthetic antigens and it is commonly thought that most anti-A and anti-B sera react with their relevant determinants on both type 1 and type 2 chains. In contrast, the structure of the H antigenic determinant is profoundly affected by the type of linkage between the β-D-galactose and the β-N-acetyl-D-glucosamine residues (Lemieux 1982) and it is thought that the Ulex europaeus anti-H lectin, commonly used for grouping body fluids, only reacts with H type 2, not H type 1 (Pereira et al 1978, Sugh et al 1982, Lemieux 1982, Le Pendu et al 1982).

If this is so and if the secreted blood group substances in semen are much the same as those in saliva, then this could be the reason for the relatively poor grouping reactions of O secretor seminal stains. As Ulex europaeus anti-H lectin is used in this laboratory, only a portion of the H antigenic determinants in semen would be detected. Grouping of A, B and AB secretor semen may be more successful because the anti-A and anti-B sera react with both type 1 and type 2 antigenic determinants. If vaginal fluid is more like serum than saliva, then the observation of low levels of H blood group substance in the sera of OLe^b individuals could be an explanation for the extremely poor grouping reactions of O secretor vaginal material, especially as the anti-H used only detects a portion of the small amount present.

IMPLICATIONS

The implications of the findings regarding secretor semen and vaginal material are as follows.

1. When interpreting the ABH reactions of seminal stains, due weight must be given to the possible contribution of any vaginal material present. The strength of the contribution will depend not only on the amount of vaginal material and the secretor status of the female, but also on the ABO group.

2. As grouping of A, B and AB secretor semen is usually successful particularly if the stain is strong, in some circumstances absence of reaction may be interpreted as absence of a particular group of semen.

3. As grouping of weak stains of A, B and AB secretor semen is fairly successful, failure to group such stains may result in lost evidence.

4. Although grouping of O secretor semen is far less successful than that of A, B and AB secretor semen, nevertheless there appears to be far more detectable H substance in O secretor semen than in vaginal material of the same group. Potentially this means that the strength of the H reaction might be a way of identifying O secretor semen when mixed with O secretor vaginal material.

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