SEMINAL CARBOHYDRATE IN BOAR AND STALLION

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The seminal plasma of the boar is known to be rich in inositol but has a much lower content of fructose than that of either the bull or the ram, while stallion seminal plasma contains some inositol and hardly any fructose (Mann, 1954, 1964; Mann, Minotakis & Polge, 1963). The purpose of the present study was to ascertain whether other carbohydrates, either free or bound, occur in boar and stallion seminal plasma.

Semen was collected by artificial vagina and the gel was removed. The seminal plasma, obtained by centrifugation at 2000 *g* for 10 min, was separated into a dialysable and non-dialysable portion by dialysis at 2 to 5° C against glass-distilled water (five changes at 12-hr intervals). Both the dialysable and non-dialysable portions were concentrated to the original volume of seminal plasma. For the analysis of free sugars, the dialysable portion was treated with barium hydroxide and zinc sulphate and passed through an ion-exchange-resin column composed of Amberlite IR-120 (H⁺) and Dowex AG-1 (OAc⁻) in exactly the same way as described in the study of human and bovine seminal plasma (Mann & Rottenberg, 1966; Baronos, 1971). For the analysis of bound sugars, samples of both the dialysable and non-dialysable portions were subjected for 3 hr to hydrolysis in N-H₂SO₄ before de-ionization. Total carbohydrate was determined by the orcinol method (Vasseur, 1948), and fructose by the resorcinol method (Mann, 1946). Glucose and galactose were assayed enzymatically (Middleton & Griffiths, 1957; Baronos, 1971). Glycerol and inositol were determined by gas-liquid chromatography after conversion to trimethylsilyl derivatives, using a SE 30 (methyl silicone gum) 5-ft long column (Selvendran & Isherwood, 1970); before the determination of glycerol and inositol, the sugars were destroyed by treatment with hot KOH and the material passed through a column of Dowex 50 (H⁺) and Dowex 1 (OAc⁻). The various carbohydrate constituents were identified by paper chromatography using ethyl acetate:pyridine:water (8:2:1) as solvent and the silver reagent for spraying (Trevelyan, Proctor & Harrison, 1950). The areas on chromatograms corresponding to galactose, mannose, glucose and fucose, as present in the non-dialysable hydrolysed material, were eluted with water and their content determined in the eluates by the orcinol method.

As regards free sugars, chromatography has shown that boar seminal plasma contains fructose, inositol and a little glucose, and also an appreciable quantity

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of two substances with exactly the same R_F value as authentic glycerol and galactose. Stallion seminal plasma had neither fructose nor galactose but contained some inositol as well as glucose and also a substance which behaved chromatographically as glycerol. As regards bound carbohydrate, this was mainly present in the non-dialysable portion of the seminal plasma; in the boar, it was composed of galactose, mannose and fucose in an approximately 10:3:1 ratio; in the stallion, it contained galactose, glucose, mannose and fucose in a ratio of 20:2:5:1.

TABLE 1
CONCENTRATION OF VARIOUS CARBOHYDRATES IN THE DIALYSABLE AND NON-DIALYSABLE PORTION OF BOAR AND STALLION SEMINAL PLASMA

	Total orcinol- reactive carbohydrate	Fructose	Glucose	Galactose	Inositol	Glycerol
Boar seminal plasma						
Dialysable, non-hydrolysed portion	16 to 80 (4)	9 to 60 (4)	1 to 5 (4)	4 to 20 (4)	300 to 450 (3)	10 to 20 (3)
Non-dialysable, acid-hydrolysed portion	100 to 130 (4)	—	trace (4)	40 to 100 (4)	—	trace (3)
Stallion seminal plasma						
Dialysable non-hydrolysed portion	20 (1)	trace (1)	12 (1)	—	127 (1)	23 (1)
Non-dialysable, acid-hydrolysed portion	42 (1)	—	3.1 (1)	36 (1)	—	trace (1)

Results are expressed in mg/100 ml; numbers of samples in parentheses.

Other analytical results are set out in Table 1. Among the carbohydrates listed in the Table is a substance tentatively identified as glycerol, not only by paper chromatography but by gas chromatography as well. The free carbohydrate of boar seminal plasma appears, therefore, to consist of both glycerol and galactose as well as inositol and fructose. Most of the galactose appears to be derived from the seminal-vesicle secretion; samples of that secretion collected directly from the glands of seventeen boars contained 6 to 22 mg free galactose/100 ml. Glycerol was determined in material pooled from three seminal vesicles: it contained 7.5 mg/100 ml, as determined by gas-liquid chromatography. Stallion seminal plasma can be seen from Table 1 to contain some glucose, as well as some glycerol and inositol.

As regards bound carbohydrate, it is evident from Table 1 that galactose is the main carbohydrate in both boar and stallion seminal plasma.

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