**Table 1** Lymphocytes and sperm in heterosexual male ejaculates

| Male | Volume (ml) | Sperm ($\times 10^6$ per ml) | Leukocytes ($\times 10^6$ per ml) | Lymphocytes (per cent) | Lymphocytes ($\times 10^6$ per ml) | Lymphocytes (per ejaculate) |
|---|---|---|---|---|---|---|
| (1) | 0.3 | 118 | 0.14 | 98 | 0.14 | 42,000 |
| (2) | 2.5 | 55 | 1.2 | 90 | 1.08 | 2,700,000 |
| (3) | 5.0 | 33 | 0.2 | 79 | 0.16 | 790,000 |
| (4) | 7.5 | 34 | 9.0 | 43 | 3.87 | 29,000,000 |
| (5) | 2.0 | 49 | 10.0 | 66 | 6.60 | 13,200,000 |
| (6) | 4.2 | 19 | 6.0 | 86 | 5.16 | 21,700,000 |
| (7) | 3.5 | 46 | 3.4 | 94 | 3.20 | 11,200,000 |
| (8) | 3.0 | 84 | 0.2 | 76 | 0.15 | 456,000 |
| (9) | 3.5 | 86 | 4.2 | 93 | 3.91 | 13,700,000 |
| (10) | 1.5 | 100 | 2.6 | 90 | 2.34 | 3,500,000 |
| (11) | 3.5 | 20 | 1.0 | 92 | 0.92 | 3,200,000 |
| (12) | 3.0 | 111 | 2.2 | 84 | 1.85 | 5,500,000 |
| Average | (3.3) | (63) | (3.35) | (83) | (2.45) | (8,750,000) |
| | | | Post-vasectomy | | | |
| (1) | 2.0 | 0.0 | 0.56 | 77 | 0.43 | 860,000 |
| (2) | 3.0 | 0.0 | 0.06 | 88 | 0.05 | 158,000 |
| (3) | 2.5 | 0.0 | 0.90 | 62 | 0.56 | 1,400,000 |
| (4) | 4.0 | 1.5 | 0.08 | 93 | 0.07 | 298,000 |
| (5) | 2.5 | 0.0 | 0.06 | 96 | 0.06 | 144,000 |
| (6) | 3.0 | 0.0 | 0.08 | 94 | 0.08 | 226,000 |
| (7) | 3.0 | 0.0 | 0.40 | 95 | 0.30 | 1,140,000 |
| (8) | 2.5 | 2.2 | 0.05 | 75 | 0.04 | 94,000 |
| (9) | 1.5 | 0.0 | 0.80 | 86 | 0.69 | 1,030,000 |
| Average | (2.7) | | (0.33) | (85) | (0.25) | (594,000) |

Ejaculates from heterosexual human males without and with vasectomy were studied by direct chamber counting and differential counts in stained smears. The specimens were supplied by unselected men consecutively studied at the SBMFC laboratory from 1 October to 31 December 1983 for infertility or for the effectiveness of vasectomy. Note that whether or not sperm are present, leukocytes are found constantly in semen. Of the seminal leukocytes, usually more than 83% (range 43–98%) are small lymphocytes, perhaps owing to their emperipoletic nature[3,4]. The number of lymphocytes per ml of semen vary greatly (from 40,000 to 6,600,000) with averages of $0.25 \times 10^6$ in vasectomized males and $2.45 \times 10^6$ in males with vasa intact. Such variations might be owing to counting problems associated with attaining uniform dilutions, individual difficulties with collection of specimens or lack of selection with respect to age and health of the male population studied.

prone to use anal intercourse as a method of birth control[9]. To ascertain how many seminal lymphocytes might be involved in humans, we studied ejaculates from heterosexual males undergoing routine fertility studies, as shown in Table 1. The data indicate that semen normally contains relatively large numbers of small lymphocytes which could transfect lymphotropic virus or induce immuno-deficiency in the peresence or absence of sperm.

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SIR — Studies during recent years have convincingly demonstrated that human seminal plasma can impair the activity of many of the cells involved in the immune response and also interfere with the generation and activity of a number of soluble factors involved in the defence against infection. Thus small concentrations of seminal plasma (1 per cent volume or less) are known to inhibit the *in vitro* response of lymphocytes to a variety of stimuli including lectins, alloantigens, sheep erythrocytes, hapten-sheep erythocyte conjugates, bovine serum albumin and tetanus toxoid (see, for example, refs 1,2). Inhibitory effects have also been noted *in vivo*[2].

Evidence has recently emerged to suggest that some of the reported effects might be attributable to impairment of the function of accessory cells such as macrophages[3]. It seems that many properties of such cells are inhibited by small doses of seminal plasma, including their capacity to act as accessory cells in mitogen induced lymphocyte blastogenesis and their ability to phagocytose inert particles and generate reactive oxygen species following triggering with opsonized zymosan. The response of granulocytes to opsonized zymosan is likewise impaired[3]. More recently it has become apparent that seminal plasma drastically inhibits the activity of natural killer (NK) cells *in vitro* (K. J. and S. Szymaniec, in preparation). These observations are particularly relevant in view of the impaired NK cell activities observed in AIDS[4] and the role such cells may play in tumour surveillance[5] and in controlling B cell proliferation and differentiation[6].

Others have found that seminal plasma may interfere with the activity of complement components (especially C1 and C3), inhibit the alternate complement pathway[7] and block binding of IgG molecules to Fc receptors on cell membranes[8].

The identity of the factor(s) involved remains to be established, although there is no shortage of possible candidates. It is highly likely that the different effects observed are mediated by different components. Whatever the nature of the factors it is interesting to note that seminal plasma proteins do not readily cross the vaginal mucosa[2]. In contrast the anal route is frequently used for administering substances that have a systemic effect.

The observed effects are undoubtedly relevant to a variety of clinical conditons, in addition to AIDS. These include chronic prostatitis, cancer of the prostate and cervix, and sexually transmitted diseases in general. In the latter context it is interesting to note that there are reports that human seminal plasma can inhibit both the antibody and cell mediated killing of *Neisseria gonorrhoeae* and *Escherichia coli*[7]. Further consideration of the possible clinical relevance of the wide ranging immunosuppressive effects of semen and seminal plasma is clearly warranted.

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## Water pipe problem is solved

SIR — In places where the atmospheric humidity is high, condensate forms on smooth surfaces which have a temperature lower than that of the dew point. One such surface is the outside of horizontal water pipes. Gravity causes the condensate to drain and collect into globules on the undersurface of the pipes; when the suspended globules grow to a size governed by the surface tension and gravitational forces, they detach and fall. I have measured the approximately equal spacings between such globules on a 1½-inch pipe. They range from 1.4 to 2.0 cm with an averaged value of about 1.7 cm.

This phenomenon may be viewed as an example of Rayleigh-Taylor instability[1]. As liquid collects on the underside of a horizontal surface we have the situation of a heavy fluid (water) above a lighter fluid (air). Then, the maximum wavelength, $\lambda$, consistent with stability is given by

$$\lambda = 2\pi \left[\frac{T}{g(\varrho_L - \varrho_G)}\right]^{1/2}$$

where $T$ is the surface tension and $g$ the acceleration due to gravity, and $\varrho_L$ and $\varrho_G$ the density of liquid and gas respectively. The numerical value for $\lambda$ calculated for the air–water system is 1.73 cm. This is in excellent agreement with the averaged measured value of about 1.7 cm despite the fact that the pipe had a rather irregular outside surface which would result in considerable bias in the draining of the condensate.

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