

Transmission of Hepatitis B Virus by Exposure to Human Semen Containing Hepatitis B Surface Antigen

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OBJECTIVE : To test the hypothesis that human semen can transmit Hepatitis B virus (HBV) infection.

BACKGROUND : Epidemiological evidence suggests that HBV may be transmitted by a sexual route. Hepatitis B antigen (HB Ag) has been detected in semen (1). The present study attempted to determine if human semen can transmit HBV by parental and vaginal administration using the gibbon as a model primate subject. The gibbon has been used for HBV transmission studies in our laboratory in the past and has been shown to be susceptible to HBV infection (2).

METHODS : Mayo, a chronic Hepatitis B surface antigen (subtype adw) carrier, has been implicated as the source for two cases of Hepatitis B infection. His contact with these cases involved sexual activity. Mayo has provided semen (12 ml over a 48 hours period). Studies on semen collected at this time showed AUSRIA II P/N = 48. Six ml of this semen, frozen at -70°C , were forwarded from Dr. Harvey Alter for this study. Thawed semen showed AUSRIA II P/N = 8.4.

Two white-handed gibbons (*Hylobates lar*) were used as experimental animals. Both were females, ages 3 and $3\frac{1}{2}$ years, free of both HB Ag and anti-HB_s, determined by radioimmune assay. Semen was administered to the experimental gibbons as shown in Table 1. Another four gibbons were (all anti-HB_s positive) served as uninoculated controls. Gibbons were held in individual galvanized, netted cages so as to prevent direct contact between animals, and were fed a commercial primate diet supplemented with fruits and vegetables. Only persons free of HB Ag were allowed to care for the gibbons. The animals were examined by a veterinarian once a week for evidence of fever, jaundice, hepatomegally, weight loss and other abnormal signs. Feeding habits were observed every day. Five ml of whole blood were drawn each week for complete blood count, biochemistry (SGOT and SGPT) and serology. All sera were tested for the presence of HB Ag and anti-HB_s by solid phase radioimmune assay. Positive reactions of HB_s Ag were confirmed by a 50% or more reduction in reactivity after incubating the test sera with anti-HB_s-containing human serum (RIA-Neutralization).

RESULTS : Seven weeks after inoculation of semen, gibbon PC-21 (vaginal route) was positive for HB Ag (Figure 1). This gibbon had detectable antigenemia for the next two weeks, accompanied by a slight rise in SGPT level in the 9th week. Anti-HB_s was detected in all subsequent sera and was accompanied by a marked

rise in SGPT in 12th week. During this period, the gibbon had a normal physical examination, normal temperature, normal eating habits, and no change in weight. Gibbon PC-16, (inoculated by the subcutaneous route), remained well until the 8th week after exposure, when HB_s Ag was detected in its serum by RIA (Figure 2). The antigenemia remained for 4 weeks; anti-HB_s was detected in all subsequent sera. PC-16 was clinically normal until the 18th week, when it suddenly experienced a 1.1 kg weight loss. Although no other physical signs were detected, the gibbon expired on the next day. At autopsy the organs were grossly normal. Results of histopathology are not yet complete. Throughout the study period all four control gibbons remained clinically healthy, and none developed any abnormalities in blood count or biochemistry.

Table 1. Gibbon exposure schedule

Gibbon	Age(yr)	Sex	Route of Semen Administration	Dose	Day	Total Dose
PC-21	3.0	F	Intra-vaginal	1.2 ml	D0, D1, D2	3.6 ml
PC-16	3.5	F	Subcutaneous	0.6 ml	D0, D1, D2	1.8 ml
PC-13	4.5	F	None (controls*)	-	-	-
PC-14	4.0	M				
B-40	11.0	M				
PC-26	2.5	F				

* All four gibbons carried anti-HB_s

REFERENCES :

1. Heathcote, J.C.H., *et al.*, 1974: Hepatitis B Antigen in Saliva and Semen. *Lancet*, 1:71-73.
2. Bancroft, W.H., *et al.*, 1977: Transmission of Hepatitis B Virus to Gibbons by Exposure to Human Saliva Containing HB_s Ag. *J. Inf. Dis.* 135:79-85.

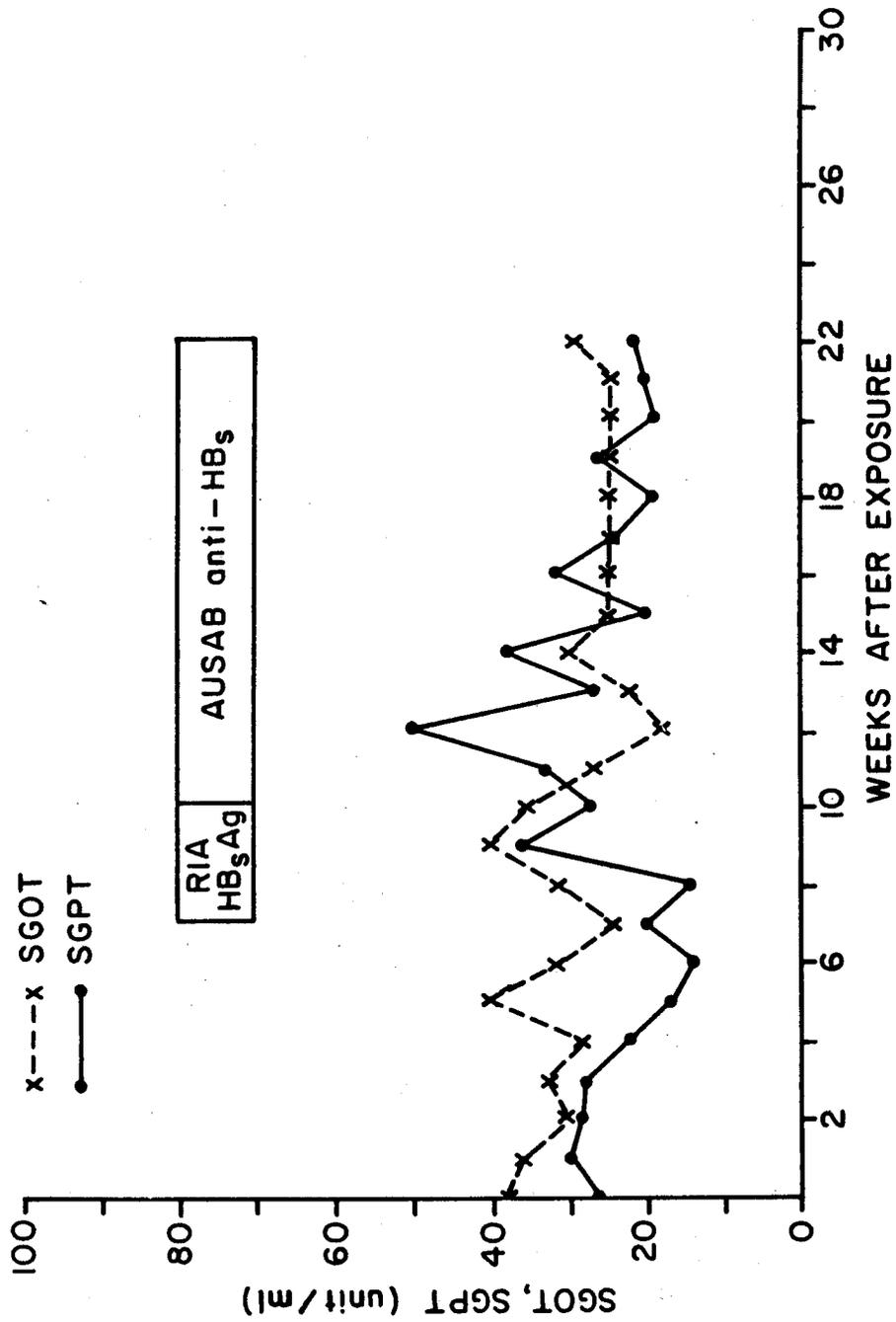


FIGURE 1. RESPONSE OF GIBBON PC-21 TO SEXUAL TRANSMISSION OF HUMAN SEMEN CONTAINING HB_sAg.

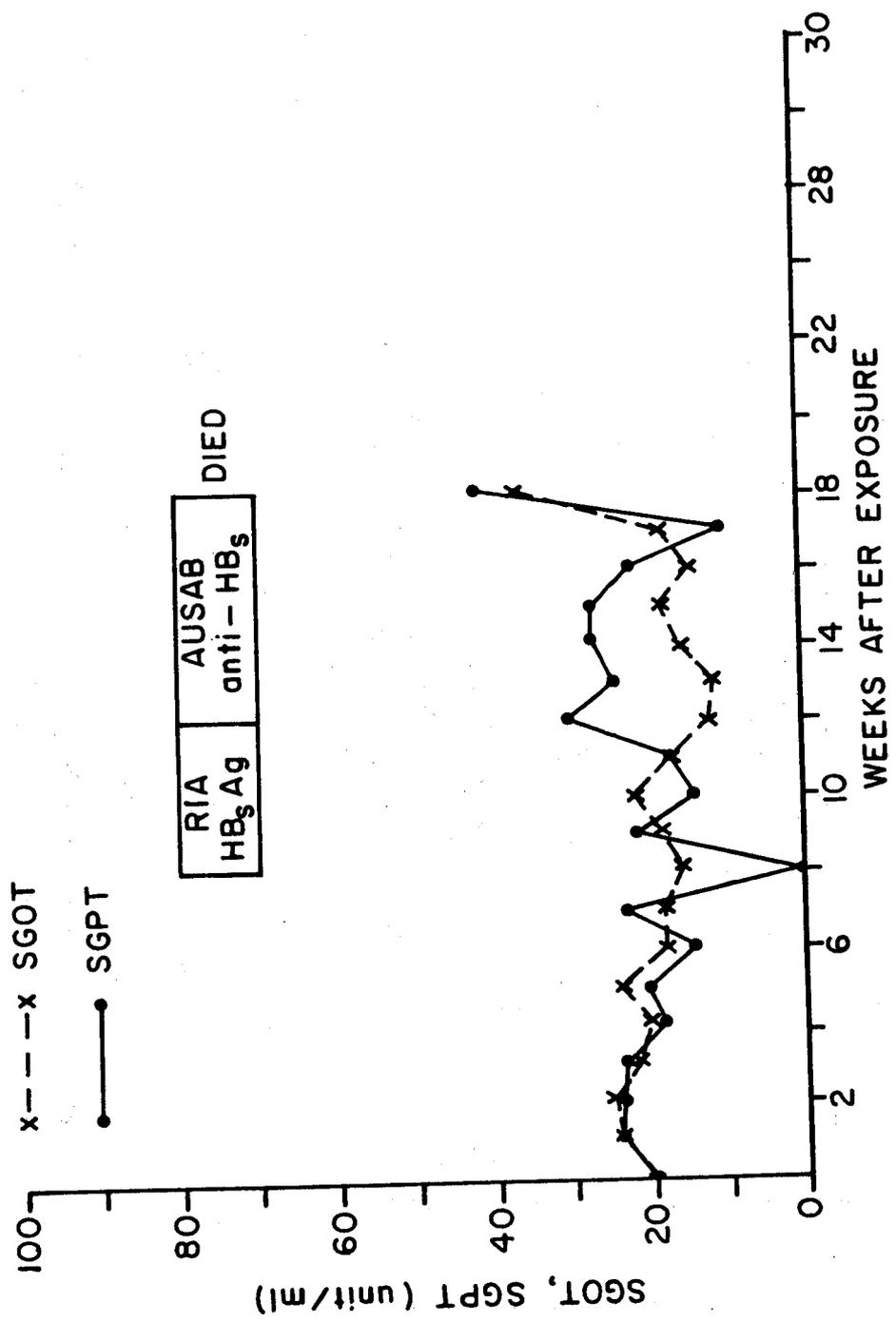


FIGURE 2. RESPONSE OF GIBBON PC-16 TO THE SUBCUTANEOUS INJECTION OF HUMAN SEMEN CONTAINING HBsAg