antibody situation. The odd appearance of the virus seen in the EM during the 8-10-day period may have been a corroboration of this speculation. That the "cyclic" pattern of the viremia is a bona fide observation is indicated by similar findings in a study of H-1 viremia in adult hamsters to be reported elsewhere (11).

Summary. A viremia and subsequently HA-I and neutralizing antibodies were found in each of 2 human subjects injected with H-1 virus, indicating that the human is susceptible to, and can support, the proliferation of this agent. Studies of blood samples from one of the 2 individuals indicated that the viremia had a cyclic pattern.

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H-1 Virus Viremia in the Adult Hamster.* (30279)

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A previous paper(1) reported that H-1 virus can produce a viremia in the human host as well as the formation of both hemagglutination-inhibiting (HA-I) and neutralizing antibodies. An interesting finding was the "cyclic" pattern of the viremia observed. In one individual where daily blood samples were studied, it was possible to isolate H-1 virus from the whole blood from days 1 through 5 after injection and again from days 8 through 10. No virus could be recovered from the blood of days 6 and 7. Electron microscope observations corroborated these findings. The present paper describes a similar cyclic pattern of H-1 virus viremia in adult hamsters and also the appearance of titratable HA-I and neutralizing antibodies for this agent while the viremia was still present.

Materials and methods. The procedures employed for these experiments are the same as those previously described(1).

Virus. The H-1 virus used for injection of adult hamsters had a hemagglutination titer of 1:2560 with guinea pig red cells. It had originally been isolated from the transplantable human tumor, HEp 1(2), passed serially for 4 passages in newborn hamsters, and then injected into a human(1) from whom it was isolated 2 days after injection.

Animals. Young adult female hamsters, 2 months of age, were employed for the present report. (A repeat of this work with male animals of the same age or older hamsters of either sex gave the same results.) Twenty-eight animals were given a single subcutaneous injection of ¼ ml of virus. The hamsters were bled from the heart daily thereafter in groups of 2 until day 12. Two further bleedings were done on days 14 and 21. The blood obtained was pooled and tested for H-1 viremia by injection of the whole blood into newborn hamsters. Each baby received 1 drop. If virus is present, such injected babies either

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TABLE I. H-1 Virus Viremia and Hemagglutination-Inhibition (HA-I) Titers in Blood of Adult Hamsters Injected Subcutaneously with H-1 Virus.

Day of treatment of adult hamsters	HA-I* titer to H-1 virus of blood inj†	Tests for viremia in newborn hamsters			
		Original litters inj	1st pass	2nd pass	3rd pass
Pre	0	#1 = 5 (0)‡ → 7 (0)	→ 5 (0)	→ 7 (0)	
		#2 = 6 (0) → 7 (0)	→ 6 (0)	→ 7 (θ)	
Day 1 (24 hr)	0	1 = dead 10 days → dead 4 days			
		2 = dead 10 days → dead 5 days			
2	0	1 = dead 10 days → dead 3 days			
		2 = dead 10 days → dead 5 days			
3	0	1 = dead 10 days → dead 5 days			
		2 = dead 13 days → dead 5 days			
4	0	1 = 1 (1) → dead 12 days	→ dead 4 days		
		2 = 5 (5) → 1 (1)	→ dead 3 days		
5	0	1 = 4 (1) → dead 12 days	→ dead 5 days		
		2 = 4 (1) → 1 (1)	→ dead 5 days		
6	0	1 = 7 (1) → 1 (1)	→ dead 12 days		
		2 = 7 (0)§ → 7 (0)	→ 5 (0)	→ 8 (0)	
7	40	1 = 6 (0) → 7 (0)	→ 5 (0)	→ 6 (0)	
		2 = 5 (0) → 6 (0)	→ 7 (0)	→ 8 (0)	
8	160	1 = 7 (0) → 8 (0)	→ 7 (0)	→ 7 (0)	
		2 = 6 (0) → 5 (0)	→ 9 (0)	→ 5 (0)	
9	160	1 = 4 (1) → 1 (1)	→ dead 8 days		
		2 = 6 (1) → 1 (1)	→ dead 5 days		
10	320	1 = 5 (0) → 6 (0)	→ 7 (0)	→ 8 (0)	
		2 = 7 (0) → 8 (0)	→ 6 (0)	→ 7 (0)	

HA-I antibody titers to H-1 virus in blood from days 11, 12, 14, and 21 were 640, 640, 1280, and 2560 respectively. When injected into 2 litters each of newborn hamsters, these blood samples were entirely negative and similar to day 10 (3 passes done).

* Guinea pig cells were employed for the HA-I procedures. Results are expressed as the highest serum dilution which completely inhibited hemagglutination.

† Pooled blood from at least 2 hamsters was injected.

‡ Number in parentheses = No. of hamsters with H-1 virus deformity compared to total No. of animals surviving. H-1 virus was isolated from all litters where deformities occurred or animals died.

§ Pooled sera of these animals had a titer of 1:320 neutralizing antibodies to H-1.

die or become deformed depending on whether a high or moderate concentration of virus is present. A very low titer of virus may produce antibodies only. Two newborn litters were injected with the pooled blood obtained on any one day. At least one passage was made from each litter(1) and where the original litter injected was negative, a total of 3 passes was done. Sera, prepared from samples of whole blood by centrifugation at 1500 rpm for 10 minutes, were tested for the presence of HA-I antibodies to the 3 related viruses, H-1, H-3, and Kilham's RV.

Results. The results are summarized in Table I. H-1 virus was isolated from the blood 24 hours after the subcutaneous injection, and remained at the same high level for the first 3 days. On days 4 and 5, the titer of virus, as judged by infectivity in newborn hamsters, was somewhat reduced, while on day 6, there appeared to be further diminution since no isolation of H-1 virus was obtained from 1 of the 2 litters injected. The original litter in this negative group did develop HA-I and neutralizing antibodies to H-1 virus. It is presumed that the titer of virus was so low in the livers of the 2 babies from this litter killed for passage that no virus was transferred. On days 7 and 8, the pooled adult hamster blood was not infective for newborn hamsters. It is noteworthy that on day 7 the first titratable HA-I antibodies to H-1 virus appeared. Such antibodies were still present on day 9 when there was again

a definite viremia in the adult hamsters. No viremia was seen in the blood of day 10 or subsequent bleedings.

These observations in the hamster agree generally with those previously reported for the human. In both instances, after an initial period of viremia, there was an interval during which no virus could be recovered, followed by reappearance of the virus for a short time and finally by permanent disappearance of the agent. There was a longer interval (3 days) in the human during which virus reappeared than in the hamster (1 day). This difference may have reflected an underlying quantitative antigen-antibody relationship since in the human in which viremia was most carefully observed (in this case a cancer patient), antibody was not evident until day 14, while in the hamster, titratable HA-I antibodies were present on day 7. It was noted previously(1) that the virus seen with the electron microscope during the "reappearance" in the human had a "motheaten" appearance, and it was suggested that this might have been due to the action of antibody even though none had as yet been observed. No electron microscope studies were done with the blood from the injected adult hamsters. However HA-I antibodies which were evident by day 7 were present on day 9 when infective virus was isolated. Neutralizing antibodies in these sera were not titrated but it was learned that undiluted sera from days 6 through 14 as well as day 21, mixed with an equal volume of H-1 virus suspension, protected newborn hamsters injected with this material. Control animals inoculated with the same virus suspension mixed with an equal volume of normal hamster serum died in 6 days. Both the HA-I and neutralizing antibodies were specific for H-1 virus; they did not react with H-3 or Kilham's rat virus (RV), both of which are related agents.

It is difficult to say why whole blood from days 6 and 9 possessed "unneutralized" virus as observed by the tests in newborn hamsters while sera from the same days was effective in a protection test. It may be that the H-1 virus associated with cells or other particulate constituents of whole blood was not susceptible to the full effect of serum antibodies.

Summary. Subcutaneous injection of H-1 virus in adult hamsters produced a cyclic-type viremia and the appearance of titratable HA-I and neutralizing antibodies while viremia was still present.

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Coronary Artery Enlargement in the Hypoxic White Rat. (30280)

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Coronary arteries enlarge in white rats submitted to a simulated altitude of 22,000 feet for 2 hours a day for 15 days(1). Elevation of hematocrit and hypertrophy of the heart were noted. Whether change in the coronary arteries could be produced without changes in hematocrit or heart size was unanswered.

Method. Fifty, approximately 150 g, young, male litter mate, Sprague-Dawley rats were divided randomly into control and experimental groups. Of the latter, 12 were exposed to 18,000 feet simulated altitude (380 mm Hg pressure, pO_2 of 79 mm Hg) in a vacuum jar for 2 hours a day for 15 days. Twelve additional rats were exposed to simulated altitude of 22,000 feet (321 mm Hg pressure, pO_2 of 67 mm Hg) for 2 hours a day for 7 days. The remainder as controls were placed in the chamber at atmospheric pressure for comparable times. An electrical

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