Initially, there were four components in this lot of albumin when tested with the gel-diffusion technique. After the initial run, material from the leading three drip points, containing all antigenic components, was pooled, dialyzed, dried in vacuum from the frozen state, and run over the curtain a second time. As can be seen in Fig. 1, material taken from the leading drip point, No. 8, contained a single component; a specimen taken from the next drip point, No. 7, contained four components. The yield of the sample exhibiting a single band in the gel-diffusion test was of the order of 5 to 10 percent by weight of the original material.

It is possible that the final product contained minute amounts of the three other components present in the original material, since there are several recognized limitations to interpretation of gel-diffusion observations (*5*). For example, if the contaminating components were present in sufficiently low concentration, they could be present and still not give rise to a visible band in the gel-diffusion test. Similarly, it is possible that the single visible band represents more than a single antigen. This is unlikely, however, since these antigens would then have to possess the same diffusion rate and be present in similar concentrations, and the antiserum would have to contain homologous antibody at similar concentrations. The final product, representing 5 to 10 percent of the original material, may represent a serum albumin or, possibly, a protein with a faster electrophoretic mobility than serum albumin. It was apparent in the gel-diffusion test that the antibody to the purified material was present in relatively low concentration, but by the criterions we have available for purity, this product appears to be homogeneous.

References and Notes

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Effect of High Fat Feedings on Viscosity of the Blood

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Aggregation and adhesiveness of red blood cells were observed *in vitro* by Swank (*1*) and *in vivo* by Swank and Cullen (*2, 3*) to develop about 4 hr after fat feedings. They reached their maximum intensity 3 to 4 hr later and then subsided slowly to normal. The *in vivo* changes were observed in the cheek pouch of hamsters anesthetized with urethane, using the technique of Fulton, Jackson, and Lutz (*4*), and were recorded in colored motion pictures. The purpose of this report (*5*) is to show that significant increases in the viscosity of blood from the vena cava accompanies the aggregation and adhesiveness of red blood cells observed in the cheek pouch after fat meals.

Blood viscosity was measured by a method based on principles utilized earlier by Fahreus (*6*) and others, and developed for this specific problem (*7*). The time required for 0.1 ml of blood to flow through a standardized orifice at a negative pressure of 100 mm-Hg at 37°C gives a relative measure of viscosity that has proved fairly dependable. This time interval divided by the time required for the same amount of water to pass through the same orifice under the same conditions of temperature and pressure gives the viscosity of blood relative to that of water.

In the present experiments, the standardized orifice was a gage 25 hypodermic needle 1 in. long (vita). The tip of this needle with the bevel down was inserted into the abdominal inferior vena cava of the urethane anesthetized hamster. The negative pressure was applied by opening a stopcock on a 0.1-ml calibrated pipette to which the calibrated hypodermic needle was attached. The flow of blood was timed with a stop watch to 0.1 sec. It is essential in this type of determination that the tip of the needle inside the inferior vena cava be clearly visible; that the flow of blood in the pipette be smooth and steady; that the total time of the flow be less than 30 sec and preferably less than 20 sec; and that duplicate determinations that check to within less than 10 percent deviation be made. The hematocrits were determined on blood drawn from the vena cava into heparin immediately after the viscosity measurements (*1*).

A close correlation was first shown to exist between visible evidences of adhesiveness and aggregation of the red blood cells and an increase in the viscosity of the whole blood in nine hamsters fed a "normal" diet containing mixed grain, vegetable greens, and fox chow, and in 18 experimental animals 5 to 7 hr after being fed 1 to 3 ml of 35-percent cream (3 to 10 g/kg body weight) by stomach tube. Next the duration and extent of the viscosity changes after fat meals were determined.

Hamsters fed a diet containing about 50 percent of their calories as animal fat (*8*) for 5 to 7 days and then given a single fat meal of 2 to 3 ml of 35-percent cream almost always exhibited an increased viscosity of the blood. Animals so fed were anesthetized and their blood viscosities and hematocrits were determined 3, 6, 9, 14, 24, 48, and 72 hr after the single cream meals. The blood viscosity began to increase about 3 hr after the cream feeding and reached its peak in 6 to 9 hr (Fig. 1). During the first 9 hr only minor variations occurred in the hematocrit. The viscosity then returned to normal by the end of 24 hr. This was accompanied by a significant drop in the hematocrit. The hematocrit then returned to normal by the end of 72 hr, accompanied by a rise and then a fall of the viscosity to normal. The low hematocrit at the end of 24 hr is thought to be due to "sticking" of many of the red blood cells in the peripheral circula-

tion and to "plasma skimming," and the rapid return of hematocrit to normal in the next 24 to 48 hr is thought to be due to a return of these red blood cells to the active circulation.

The two viscosity measurements and the corresponding hematocrit determinations indicated by the arrows in Fig. 1 were high, and the general physical state of the two animals concerned was very poor. These values were therefore not used in the determination of the average hematocrit and viscosity values in the figure.

Gross inspection of the viscera of the hamsters revealed that the hamsters with elevated blood viscosity exhibited (i) much more than the usual degree of cyanosis of the venous blood, (ii) patchy or generalized hyperemia of the viscera, (iii) engorged prominent arteries along the curvature of the stomach and in the omentum, and (iv) a greatly reduced tendency to bleed from the vena cava puncture wound.

The addition of heparin *in vitro* in amounts sufficient to render the blood incoagulable (100 units/2 ml blood) reduced an elevated blood viscosity due to fat feeding to, or near to, normal (Table 1). Also, the injection of heparin intravenously in doses of about 400 units per hamster reduced an elevated blood viscosity after fat feeding and, at the same time, significantly increased the bleeding tendency from the puncture wound in the vena cava. In no instance was the viscosity reduced to normal and in all instances the effect of heparin *in vivo* was transient.

The maximum adhesiveness and aggregation of the red blood cells in hamsters occurs 2 to 4 hr after the peak of the plasma lipemia and lasts for several hours after the lipemia clears (*1–3*). It would appear that the maximum increase in the viscosity also occurs after the peak of the lipemia. The possible mechanism by which high fat meals cause aggregation and adhesiveness of the red blood cells has already been discussed (*1–3*).

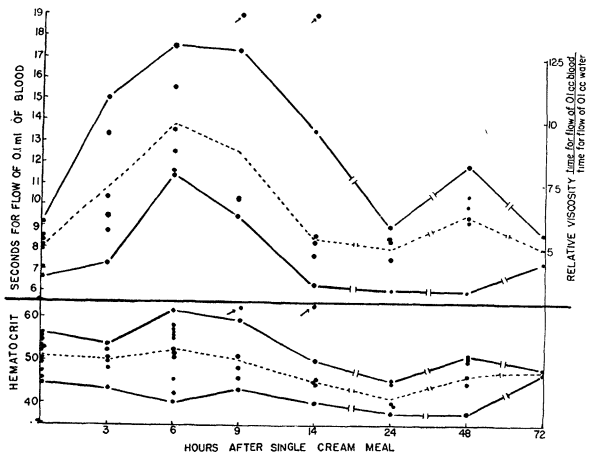

Fig. 1. Changes that occur in the viscosity and hematocrit after a standard fat meal. Each dot for viscosity represents the average of two to three viscosity determinations in the same hamster. Solid lines: maximum and minimum values for viscosity and hematocrit; dashed line: average of all determinations for each time interval.

Table 1. Effect of *in vitro* heparin upon viscosity of the blood. Time in seconds for flow of 0.1 ml of blood.

From inferior vena cava	From syringe containing heparin		
	Immediately after withdrawal	5 min after withdrawal	After additional heparin
15.4	15.0	9.2	
16.0	15.0	9.0	
9.0	9.6	9.0	7.0
10.5	7.7	5.0	

If it is shown in human beings that large fat meals may be followed by aggregation and adhesiveness of the red blood cells with slowing of the circulation and an increase in the relative viscosity of the blood, it will be necessary to consider seriously whether this mechanism is a factor in human disease, particularly in chronic vascular and thrombotic diseases and in multiple sclerosis (*9*).

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New Method for Study of Intracellular Parasites with the Electron Microscope

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Electron microscopic examination of parasites contained within an erythrocyte is difficult, because the red blood corpuscle itself is too thick for the penetration of the 50-kv electron beam. In the electronic image, the infected blood cell appears uniformly dense, within which the parasites cannot be identified. Several methods have been proposed for overcoming this difficulty. The first is to subject unfixed cells to osmotic hemolysis in distilled water (*1, 2*). Another method is to make ultra-thin sections suitable for electron microscopy, either by means of special microtomes (*3*) or by splitting of specimens (*4, 5*).