cess dithizone. The $CHCl_3$ was evaporated, and the residue was taken to dryness six times with concentrated HNO_3. The residue was taken up in HNO_3 and extracted at a pH of 1 with 1 ml of standard dithizone solution. No color change was noted. Contamination appears to be much less than 1.5 μg.
14. The values of $\Delta Ff°$ [*Natl. Bur. Standards (U.S.) Circ. No. 500* (1952)] for sulfides indicate that Ag should not occur as Ag_2S in meteorites.
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20. Attempts to examine the isotopic composition of silver in Ag_2S, $AgNO_3$, or Ag_2SO_4 with single-filament sources were not successful. Silver peaks were observed when phosphoric acid was used with the silver sample, but the 109 peak was often as high as the 107 peak and sometimes higher. With phosphorous acid and a single filament, the results were no better; the ratio of Ag^{107} to Ag^{109} varied from less than 1 to more than 1.
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16 September 1957

Adrenal Lipid Response in Chinese Hamsters Infected with Trichinella spiralis

The unique paucity of histochemically demonstrable lipid in the adrenal of the golden hamster (*1*), together with its atypical response to stress situations (*2*), suggests the possibility that the Chinese hamster may present a similar picture. Leathem and Stauber (*3*), using the intracellular protozoan parasite *Leishmania donovani,* showed that the adrenal cortex of the golden hamster responded to the stress of infection with a progressive accumulation of sudanophilic substance.

The present study (*4*) was carried out with 14 Chinese hamsters, each of which had been fed approximately 100 *Trichinella spiralis* larvae from a donor animal. Adrenals were removed from infected animals (under Nembutal anesthesia) on days 3, 5, 14, and 26 and from normal controls at the beginning of the experiment. They were fixed in 10 percent formalin and embedded in gelatin, and sections were stained with Sudan black B (*5*).

The adrenals of normal Chinese hamsters, unlike those of the golden hamster, were shown to have uniformly distributed lipid material in the cortex (Fig. 1*A*). Infected animals sacrificed on the third day of parasitization exhibited some loss of lipid in the outer zone of the cortex (Fig. 1*B*). On the fifth day, cortical lipid was absent (Fig. 1*C*). On the 14th day of infection, adrenals exhibited a renewal of sudanophilic substance. The latter was most marked in the inner zone of the cortex (Fig. 1*D*). By the 26th day of infection, the normal diffuse pattern of lipid was again evident (Fig. 1*E*).

The results reported here indicate that the adrenal of the normal Chinese hamster resembles that of other mammals more closely than does that of the golden hamster. Similarly, the adrenal of the Chinese hamster responds to the stress of infection in a more conventional way. The stress, in this case, is a result of the intestinal response to the adult worm of *T. spiralis.* Insofar as adrenal lipid is a measure of stress in this host-parasite complex, we see a rapid loss of the indicator material during the early development of worms in the intestine, followed by recovery at a time (the 14th to 26th day) which corresponds to the secondary insult of migrating larvae. Adult female worms with larvae fully developed at six days of infection have been observed, and larvae have been iso-

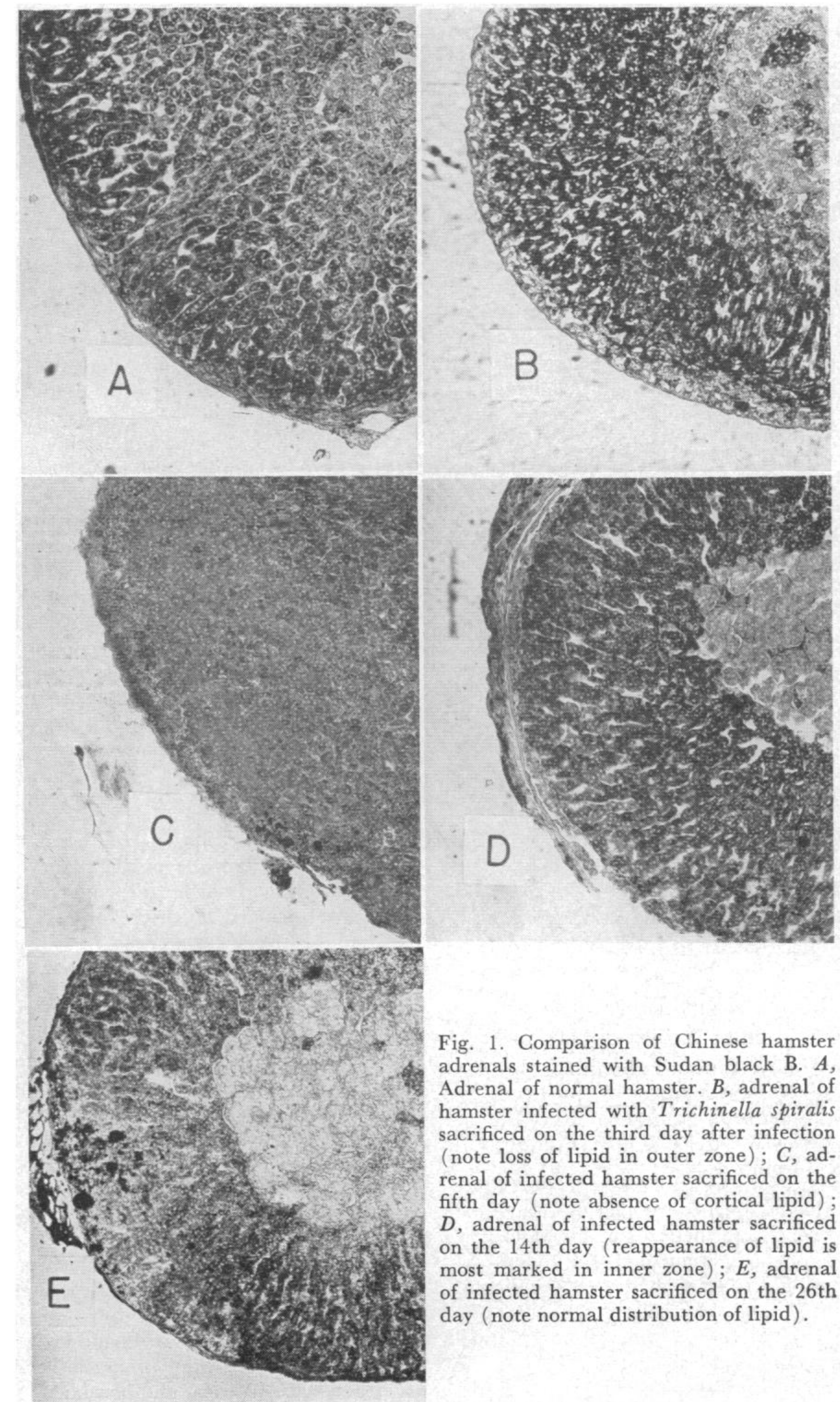

Fig. 1. Comparison of Chinese hamster adrenals stained with Sudan black B. *A,* Adrenal of normal hamster. *B,* adrenal of hamster infected with *Trichinella spiralis* sacrificed on the third day after infection (note loss of lipid in outer zone); *C,* adrenal of infected hamster sacrificed on the fifth day (note absence of cortical lipid); *D,* adrenal of infected hamster sacrificed on the 14th day (reappearance of lipid is most marked in inner zone); *E,* adrenal of infected hamster sacrificed on the 26th day (note normal distribution of lipid).

lated from cardiac blood at this time. Serum from Chinese hamsters infected 20 days previously was capable of forming, *in vitro,* circumoral precipitates on adult female worms isolated from the intestine of the golden hamster.

In a parallel study (*6*), it was found that animals which had been infected for 14 to 26 days exhibited severe generalized myositis. Although the latter condition doubtless constitutes a stress situation for the host, it does not appear to be reflected in changes in adrenal lipid within the time limit of this study. Hematoxylin- and eosin-stained sections of the adrenals exhibited no evidence of pathological changes during the course of the experiment and beyond (to 112 days of infection). Adrenal weights (*6*) bore no obvious relationship to the status of the infection. It is possible that stress brought about by the migratory phase of the infection would be mediated or reflected in other endocrine changes or that measures of adrenal response other than sudanophilic substance would resolve this apparent duality of physiological response. Data on the Chinese hamster response should constitute a useful adjunct for comparative study in connection with the studies of the singular adrenal responses of the golden hamster in stress situations.

ALBERT L. RITTERSON
SIDNEY I. MAUER
Departments of Bacteriology and Anatomy, University of Rochester School of Medicine and Dentistry, Rochester, New York

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24 June 1957

Ultracentrifugal Determination of Molecular Weight of Myosin by the Archibald Procedure

Attempts to determine the molecular weight of myosin from ultracentrifugal sedimentation and diffusion data have not, so far, been successful. This failure is due not only to the fact that there has been no agreement about the values for the sedimentation and diffusion constants but is aggravated by the finding of Parrish and Mommaerts (*1*) that the sedimentation constant, after the usual corrections, still depends not only on the protein concentration but also on the

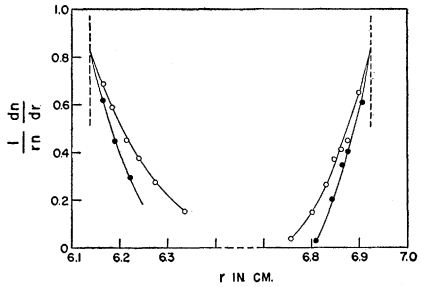

Fig. 1. Archibald plots for the ultracentrifugal sedimentation of myosin. Protein concentration, 0.5 percent; temperature, 5°C; rotor speed, 4196 rev/min; duration, 24 and 42 hours. The parameter $\frac{1}{rn} \times \frac{dn}{dr}$ is plotted against the distance in the cell, r; the curves, extrapolated toward the meniscus and the bottom of the cell (vertical dotted lines), indicate the values for δ.

temperature and rotor speed. These kinetic anomalies, which we have confirmed in the present work, are entirely unexplained and seem to invalidate any efforts to determine the molecular weight in the traditional fashion.

It seemed advisable, therefore, to attempt a determination with methods which have an equilibrium rather than a kinetic basis. Since equilibrium centrifugation would be impracticable because of the long duration, we have followed the direction indicated by Archibald (*2*), in which the approach toward sedimentation-diffusion equilibrium is investigated. We have made the required measurements in a Spinco ultracentrifuge equipped with an optical system for the observation of Rayleigh interference fringes. These measurements, as explained by Archibald, are intended to estimate a parameter

$$\frac{1}{rn} \times \frac{dn}{dr} = \delta$$

in which n is the protein concentration and r is the distance from the center of rotation, from which the molecular weight is obtained by the relation

$$\delta = M(1 - V\rho)\omega^2/RT$$

In 13 separate experiments (for example, Fig. 1) on four different crystallized myosin preparations with moderate variations of concentration, rotor speed, duration, and temperature, the molecular weight was consistently found to be 382,000 with individual variations within ± 20,000. In all instances, the same molecular weight was obtained from extrapolation toward the top and toward the bottom of the cell. In one more elaborate experiment, in which, at 4196 rev/min and at 5°C, exposures were taken every 12 hours for 3 days, the molecular weight was found to be 385,000 ± 4000 for the top of the cell and 375,000 ± 4000 for the bottom.

These values are in definite disagreement with all results published so far, but they seem to rest on a much better experimental and theoretical foundation (*3*). It may be pointed out that a figure of 380,000 to 400,000 corresponds to the presumable weight of the myosin moiety of the 504,000 g of actomysin which, according to Nanninga and Mommaerts (*4*), reacts stoichiometrically with 1 mole of adenosine triphosphate. Hence, the myosin molecule has one active center for this interaction (*5*).

W. F. H. M. MOMMAERTS
BRIGITTE BLANKENHORN ALDRICH
Department of Medicine, University of California, Los Angeles, and Cardiovascular Research Laboratory, Los Angeles, California

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3 September 1957

Effect of Kinetin and Gibberellic Acid on Excised Anthers of Allium cepa

The process of meiosis and the subsequent formation of haploid male gametes is one of the most important events in the life history of an angiosperm. Recently some attempts have been made to cultivate anthers on nutrient media and to follow the course of meiosis and pollen development in order to understand their physiology and biochemistry. Anther culture technique not only seeks to throw light on the mechanism of meiosis but can be of great help in solving problems of cytology and of growth and differentiation.

So far, the best development of pollen *in vitro* has been obtained with anthers of *Trillium erectum* with the help of 25 to 50 percent coconut milk (*1, 2*). Linskens (*2*) believes that the beneficial effect of coconut milk is due to its nucleic acid content. Anthers excised earlier than pachytene or even diplotene-diakinesis generally failed to undergo meiosis in culture media. It is believed that certain substances are transported to the anthers from the flower or from some other region of the plant at this stage and that these substances are responsible for the development of the anthers.

Recent studies have shown that two new growth-promoting substances, kinetin (*3*) and gibberellic acid (*4, 5*), have a very marked effect on the growth of