that during the period between 2 and 4 days after birth, body-weight increased from 1·50 to 1·86 kgm. (mean = 1·68 kgm.). Thus the difference in oxygen consumption between 3-day-old pigs of weights 1·50 and 1·86 kgm. was compared with the difference in oxygen consumption between pigs aged 2 and 4 days but the same weight, 1·68 kgm. A similar procedure was adopted for the older pigs (1–5 weeks). The results of these calculations are given in Tables 2*a* and 2*b* and show that differences in body-weight had at least double the effect on oxygen consumption of corresponding differences in age. Indeed, during the first week, it is not certain whether age affected oxygen consumption at all; the individual partial regression coefficients for the first two groups shown in Table 1 were not significant but, taken together, there is a suggestion that oxygen consumption increases slightly with age (body-weight and rectal temperature fixed). From 1 to 5 weeks, the reduction in oxygen consumption with age (body-weight and rectal temperature fixed) was significant; possible reasons for this comparatively small effect will be discussed in a later paper.

As a result of this experiment, it appears that the changes in the oxygen consumption-rate of the young pig with age are of only minor importance when body-size and body-temperature changes have been taken into account. This conclusion considered in conjunction with the vigorous metabolic response of the newly born pig to cooling of its environment reported by Mount[2] suggests that thermogenesis is well developed at birth.

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Determination of Small Rapid Volume Changes in a Muscle during Activity

A method has been developed for measuring small rapid volume changes occurring in a muscle during a single twitch. In order to achieve the necessary sensitivity and speed of response, a capacitance transducer has been developed which uses a commercially available detector-amplifier circuit (the 'Dynagage', from Photocon Products). The changes are displayed on a cathode-ray oscilloscope. Single gastrocnemius and sartorius muscles from *Rana pipiens* are used.

Following a stimulus applied through a multi-electrode assembly, volume changes occur after a short latent period. An initial apparently small increase in volume precedes the main decrease of volume (Fig. 1), which is about 1·6 × 10^{-5} c.c./gm. in gastrocnemius and 5 × 10^{-6} c.c./gm. in sartorius muscle.

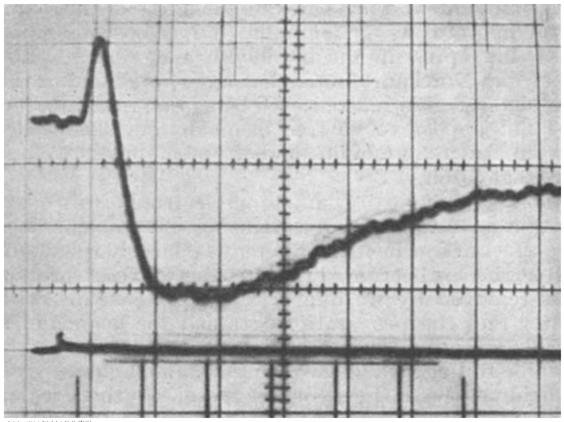

Fig. 1. Record of volume changes at 18° C., in single frog sartorius muscle. The muscle is held isometrically at reference length and is stimulated with a single shock. The stimulus point is indicated below the volume record. Each large division represents 20 msec. on the abscissa and 0·3 × 10^{-6} c.c. on the ordinate. Uncorrected for delay

Analysis to correct for delays in the chamber using a step-function volume-change from a loudspeaker coil movement showed that the early increase is actually almost as large as the later decrease in volume, and has almost the same time course as latency relaxation (Sandow, 1944) and as early transparency changes in a twitch (D. K. Hill, 1953).

The increase in volume is rapidly reversed and the maximum decrement in volume is reached appreciably before the peak of isometric tension. At the end of relaxation a decrease in volume persists (Fig. 1), and at 0° C. almost no volume recovery occurs in sartorius muscle. It therefore seems unlikely that these volume changes result from internal pressure changes due to muscle tension (A. V. Hill, 1948), and perhaps the time course of decrease in volume reflects that of the developing active state.

In view of the continuing inability to demonstrate chemical changes during a single contraction, it may be well to re-estimate the information, which measurements such as volume and opacity changes can provide, on the events both of the excitation coupling and on protein organization in contraction.

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HÆMATOLOGY

A Hæmoglobin-binding β-Globulin in Human Serum

A number of human serum proteins have the property of forming definite compounds with hæmoglobin. The term haptoglobin has been applied to them by Jayle[1,2], who was able to isolate them by salt fractionation and characterize them as α_2-globulins by electrophoresis. In several studies using paper electrophoresis, hæmoglobin-binding proteins have been detected in the α_2 region. Hæmoglobin has also been found in the β-globulin region, especially when