is the product of the death of albuminoid bioplasm." (*a*) If this be true of fibrin, it may fairly be assumed to be true also of myosin, which closely resembles the former. Coagulated plasma, or myosin, is dead, and if the muscle also be dead, and its inherent contractile power at an end, in what manner does dead myosin acting on a dead muscle produce so perfect a counterfeit of muscular contraction, that one of the keenest observers of the day pronounced it "The most steady and persistent contraction which muscle can possibly exhibit"; (*b*) so perfect a counterfeit, indeed, that our eminent English physiologist, the late Dr. Carpenter, employed the microscopical appearances of muscle during rigor mortis as the chief basis for his description of the changes taking place in ordinary muscular contraction, as he himself has told us (*c*).

Again, the reaction of a living muscle in repose is neutral, or alkaline, but after exercise, or tetanus, the reaction becomes acid, an effect in some way depending upon the chemical processes in the muscle associated with its contraction. In rigor mortis the reaction becomes "most distinctly acid" also. But if the muscle be already dead and these chemical changes at an end, what is the source of the acidity? To the presence of this acid, the coagulation of the myosin and the rigidity of the muscle, are of late attributed. But since the acidity is the *result*, or *effect*, of muscular contraction in the living muscle, how can it be the *cause* or starting point of the contraction and stiffening in the dead muscle?

Dr. Lauder Brunton finds that muscle plasma "coagulates too quickly in the muscles of warm-blooded animals to allow of its preparation from them." Now rigor mortis does not usually set in for several hours after death,—Dr. Brown-Sequard found it to be ten hours in four rabbits,—and its onset may even be artificially delayed. The statement, therefore, is only explicable on the supposition that coagulation of the mnscle plasma and rigor mortis do not occur together—that is, as cause and effect. It would seem to be implied that the muscle plasma coagulates too early to be the cause of rigor mortis. Dr. Brunton further shows that the muscle plasma may coagulate without producing rigor mortis. In an experiment, detailed on page 363 of the Hand-book, it is shown that, if half a fresh muscle be immersed for a few minutes in water at a temperature of 104° Fah., the reaction will be acid, as Dr. Brunton says,—"from development of rigor mortis" The other half of the muscle is to be placed for a similar time in boiling water; and here the reaction "will be alkaline." Dr. B. adds,—"Before rigor mortis had time to set in, the albumen of the muscle was coagulated. This coagulation set free a quantity of alkali, hence its reaction." Dr. Brunton's exposition of this experiment, if correct, would be fatal to the myosin hypothesis, since if the coagulation of the muscle plasma be attended by an alkaline reaction while in rigor mortis, the reaction is strongly acid, the former could not be the cause of the latter, and they must be regarded as separate and distinct processes.

The foregoing difficulties certainly seem to create distrust in the myosin hypothesis; and we now turn from it, with its dead muscle and inert myosin, to the other aspect of the case, under which the complete cessation of nerve activity and the final contraction of the muscle marks the onset of rigidity. "The rigidity, the loss of suppleness and the diminished translucency," observable in the muscle in this state, are reasonably accounted for by the condensation of tissue which is here permanent, as the contraction is continuous. That a certain relaxation subsequently occurs, during which meat or game, which is at first tough, becomes more tender and toothy, is attributed by M. Rosenthal to the action of the acid referred to, which relaxes the connective tissue which holds the fibres together, so that the latter separate more readily (*d*). This is but the beginning of the chemical change which ends muscular contractility in the ruin of putrefaction. The following remarkable series of conditions are common both to muscular contraction and to rigor mortis: In both the reaction becomes acid. In both carbonic acid is set free in the muscle. In both the temperature rises,—often markedly so in rigor mortis. In both the muscle is contracted and shortened; in some cases, as in death from cholera, "rigor mortis may be said to be simply a continuation of the

(*a*) Disease Germs, pp. 136, 137.
(*b*) Anstie, Stim. and Narc., p. 70.
(*c*) Hum. Phys., 5th Amer. Ed., pp. 307, 308.

(*d*) Muscles, etc., p. 87-8.