ern Germany and Denmark, infect monkeys when fed in a manner characteristic for the *Br. abortus*, "bovis" type.

Three *Br. abortus* type "suis" strains of human origin have not exhibited any striking pathogenicity or marked febrigenic properties neither by feeding nor by cutaneous or intravenous infection.

Serum agglutinins specific for the brucella group are formed only in the presence of a definite infection. The ingestion of heat killed abortus bacilli with or without bile is antigenically ineffective in monkeys and rabbits.

Over 10% of the rhesus and cynomolgus monkeys possess a natural immunity against brucella infections via the alimentary tract. Animals which react to the oral administration of virulent abortus organisms with moderate and in general transitory serum reactions resist subsequent feeding infections with *Br. abortus* "bovis" and "suis" but not with a Tunisian *Br. melitensis.* Continuous ingestion of small numbers of abortus may lead to mild, unrecognized or "silent" yet immunizing infections. At least in one observation, the local and general immunity thus induced has been definite.

4694

Relation of Stainability and Electric Potential Differences to the pH Value.

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As shown previously[1] the addition of a water insoluble acid to a fat mixture leads to basophilic staining and a relative positive potential. The addition of a water insoluble base has the opposite effect on both properties. In tissues, basophilic staining is also associated with a positive potential, acidophilic staining with a negative potential. Water immiscibility of the acid or of an added base is essential. By the addition of a water-soluble acid or base both stainability and e.m.f. are influenced in opposite directions.

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[1] Beutner, R., PROC. SOC. EXP. BIOL. AND MED., 1929, xxvii, 44.

An effect of this type is observed in Loeb's gelatin systems,† *e. g.*,

saline + more alkal	(basophilic) sodium gelatinate on alkali. side of iso-electr. point	(acidophilic) gelatin chlorid on acid side of iso-electr. point	saline more acid —

In this case also the basophilic substance is on the side of the positive pole; as a general rule we may consider that almost any system—

+ saline	basophilic substance or mixture	acidophilic substance or mixture	saline —

produces an e.m.f. as indicated. A few exceptions to this rule have been observed in certain artificial systems which, however, are composed of substances not likely to occur in tissues in general and hence have a minor biological importance (details about these observations will be reported in a later publication).

According to a recent observation of R. Chambers[2] the nucleus has a higher pH value than the protoplasm indicating a slight alkalinity. This alkalinity, as well as the nuclear content of water-insoluble acids, probably bound to proteins as nucleo-proteins, would explain its basophilic stainability. Consequently, according to our experiments, the nucleus should be electrically positive as expected by G. W. Crile some time ago.

Whether the concomitant changes of stainability and e.m.f. are brought about in tissues chiefly by variations of its water-soluble or of its water-insoluble constituents can not yet be decided. Even if water-soluble constituents, or pH-changes play the most important rôle, this would not prove that proteins play a predominant rôle in the production of bioelectricity because the electromotive effect of Loeb's gelatin cell can also be produced by means of fats or other water-immiscible fluids.

To prove this point new experiments have been performed. A mixture of equivalent parts of a fatty acid and an oil-soluble amine in a neutral fat or other similar solvent was used. This mixture when shaken with aqueous buffer solutions of varying pH shows the

† This statement is derived from Loeb's "Proteins and Colloidal Behavior." On p. 28-30 he describes differential staining, and on p. 155 the electromotive forces of gelatin cells. It must be noted, however, that Loeb uses the + and — signs in the opposite sense for expressing the direction of the electromotive forces since he means by these signs the charge of the gelatin relative to the solution. The writer has formerly been misled by Loeb's presentation and quoted the sign of these gelatin cells and the corresponding oil cells in the wrong way in his lecture before the XIII International Physiological Congress, at Boston, August, 1929.

[2] Chambers, R., *Biol. Bull.*, 1928, lv, 369.

same type of stainability as does gelatin, namely: staining acidophilic below a certain pH value; and basophilic above a certain pH value, forming the following cell system:

acid	fatty acid amine mixture in oil		alkal.
— buffer sol.	shaken with acid	shaken with alkalin. sol.	buffer sol. +
	acidophilic	*basophilic*	

This shows that the negative pole is on the side of the acidophilic mixture in this case, just as in the case of gelatin and in olive oil mixtures with oleic acid or amylamine. Experimental details about this work will be published soon.

We see, therefore, that stainability and e.m.f. show the same relation in the case of proteins and of fats as well. It has not been possible so far to set up artificial systems composed of proteins which differ in their water-immiscible constituents, the reason being simply that proteins which dissolve a water-insoluble acid are not well known. We expect, however, to overcome this technical difficulty by combining in a cell system proteins containing preferably acid groups with those containing preferably basic groups. It is too early as yet to predict the outcome of such experiments, but if they are possible, they will very likely also reveal the same relation between stainability and e.m.f. which has been found in almost all other cases. *Hence none of our experiments prove that fats exclusively are the cause of bioelectricity.* Proteins might be used in the place of fats in every instance if the present technical difficulties can be overcome.

The writers wish to express their appreciation to Dr. G. W. Crile for his kind interest in this work.

4695

An In Vitro Test to Indicate Basophilic or Acidophilic Character of a Dye.

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It has been found[1] that eosin, an acidophilic dye, is taken up by a fat mixture containing an oil soluble base, while a basophilic dye,

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[1] Beutner, R., PROC. SOC. EXP. BIOL. AND MED., 1929, xxvii, 44.