

moderately increased on the affected side when the animal was held in certain positions, although it was not enough to interfere seriously with the gait. The degree of hypertonus diminished with time, although the leg still tended to assume an extended posture when its normal fellow would be flexed. The normal active resistance to passive extension was much reduced, and struggling was much less on the affected side.

The results would appear to confirm the thesis that the "extra-pyramidal" descending pathways from the motor cortex form an important functional system in the cat.

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The Reactions of Rat and Mouse Eggs to Hydrogen Ions.

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The mammalian egg is enclosed by a transparent membrane, the oölemma or zona pellucida, which disappears as the blastocyst implants itself in the uterine wall. Various suggestions, unsupported by experimental evidence, have been advanced as to the factors concerned in the removal of the egg membrane within the uterus. In the course of studies *in vitro* on rat and mouse eggs, it was found that eggs placed in acidified Ringer's solution rapidly lost the zona. No difference was observed between the reactions of rat and mouse eggs but occasionally eggs from the same animal showed marked differences. In one case, the zona of a 4-celled rat egg swelled and disappeared in 10 minutes, while the zona of a second egg (8-celled) remained unaffected after several hours in the same drop of fluid (pH 4.3). Practical use of this method of removing the zonae has been made in the study of the development of the isolated blastomeres of the rat.¹

Rat and mouse eggs, from the 2-celled to early blastocyst stages, were cultured at room temperature by the hanging drop method in depression slides. For aid in these experiments, I am greatly indebted to Dr. J. S. Nicholas, who removed the uterine tubes from the animals and obtained most of the eggs. The eggs were obtained by mincing the uterine tubes in unbuffered Ringer's fluid in an embryological watch glass, and after a few minutes removing the

¹ Nicholas, J. S., and Hall, B. V., *Anat. Rec.*, **58**, 83.

eggs with a capillary pipette under a binocular dissecting microscope. The eggs were transferred to a second watch glass filled with unbuffered Ringer's fluid and then to the test solutions.

Test solutions were prepared by diluting unbuffered Ringer's fluid, made up to 0.001 *M* HCl, with non-acidified Ringer's solution to the concentration desired. Hydrogen ion concentrations were checked electrometrically by the quinhydrone electrode. Calcium-free Ringer's fluids were used because experience proved that the tendency of the naked blastomeres to adhere to the glass walls of the dishes and pipettes is less in the absence of the calcium ion. Experiments were also conducted with unbuffered Ringer's solutions made alkaline with NaOH. The zonae are not visibly affected in 0.001 *N* NaOH, but in the alkaline solutions, the blastomeres swell and become transparent.

The action of the acidified Ringer's fluid is first noticeable in the swelling of the oölemma, which frequently increases to nearly double its normal thickness. The smooth outer contour of the zona changes to a wavy outline and may become fringe-like. These changes in the zona, observed *in vitro*, appear to be similar to those occurring *in utero* where the removal of the oölemma has been described as "a swelling and dissolving process, which gives to the external surface a mammillated aspect."² As the dissolving process in the acid medium continues, the zona pellucida changes from a well formed, elastic capsule to a sticky, flaccid, rubbery covering. The changes in the zona as it dissolves in an acid medium resemble those seen in the dissolution of solid gelatin in warm water. As the zona dissolves, it grows thinner, becomes film-like and disappears. The dissolving process can be observed as a series of gradual changes in the zona in the less acid solutions (pH 4 to 5), in which it takes from one to 24 hours depending upon the concentration of HCl. In the more acid fluids (below pH 3.7) the dissolution of the egg membrane takes place within a few minutes. In a few cases the zona disappeared from eggs placed in Ringer's fluid at pH 5.4, but the results obtained with fluids above pH 4.3 were not uniform.

The above results indicate that sufficient acidity in the uterine environment would effect the necessary changes in the zona pellucida to permit the growing blastocyst to expand, and eventually would bring about the complete removal of the zona. It is significant in this respect that hydrogen ion concentrations as low as pH 5.7 have been measured in deciduomata of the rat and that such decidual tissue surrounds the implanting blastocyst.³

² Defrise, A., *Anat. Rec.*, **57**, 239.

³ Hall, B. V. In press.