

acter and the others give twice as many females as the red-black females and 3 non-spotted males again: The 2:1 ratio is obtained from the addition of a 1:1 and a 3:1 ratio because as before the males may be either heterozygous or homozygous.

The nearest result is that we have two separate recessive genes for red-black and black-red located in separate chromosome pairs. Different pairs of homologous chromosomes would act as duplicate genes. If these reversals should prove to be a result of crossing over it would be approximately 33 1-3 percent.

Another method is that of incomplete dominance. Here the dextral and sinistral unilateral traits would appear according to 1:1 ratio, instead of 2:1 ratio. Incomplete dominance would of necessity occur only when the organism is heterozygous for red spots and black spots.

VIII. THE EFFECT OF HYDROXIDES ON THE FISSION RATE OF PARAMOECIUM

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Comparatively little is known of the factors which underlie growth as expressed by the reproduction of cells, but the more we know of the methods by which it can be modified, the nearer we shall be to the solution of the problem. *Paramoecium* lends itself favorably to a study of division rate since it consists of a single cell. In a single celled animal are eliminated some of the complications which must be dealt with in higher forms, where effects may vary with varying tissues, and where the complexity of the animal renders the results more difficult of interpretation. The usually short interval between generations, and the ease with which "pedigree" lines may be established also make the protozoon well adapted for experimental work. The investigations of such workers as Calkins and Woodruff have established the value of the rate of cell division in infusoria as an indication of the general physiological condition, and this is ordinarily accepted as a basis on which to determine the metabolic activity. The present study was undertaken with the object of extending some of the observations made by Richards on the effects of certain hydroxides on the rate of division in the eggs of *Haminea virescens*. It appeared of value to the problem to determine the results when the hydroxides are used to stimulate different protoplasm.

All of the experimental lines used in this work were started from a single paramoecium which was taken from a mass culture

in the laboratory and allowed to divide, the resulting cells being isolated on depression slides. In this way all of the lines used had a common parentage, representing parts or continuations of the same protoplasm. A control slide was run with each experimental slide, the two being placed side by side in the moist chamber in order that any external conditions which might affect one would also affect the other. New experiments were started from the controls, and in the large majority of cases no more than four individuals were present at the time of transference, thus insuring cells of practically the same physiological condition. A 0.2% solution of malted milk, neutralized and sterile, was used as basic medium. Counts of individuals present on control and experimental slides were made daily and the conclusions were based on averages obtained from these results.

The first experiments were with potassium hydroxide, the range of concentration favorable to acceleration of division being found to lie between 0.002% and 0.004%. The lower percentage of concentration appeared to produce the more marked increase in rate of growth. The increase produced by the higher concentration though comparatively slight, was constant. A concentration higher than 0.0048% caused the death of the cells, indicating that there is a certain range within which potassium hydroxide tends to accelerate growth, while too great a concentration seems to have an inhibitory effect.

In considering the effects of ammonium hydroxide attention is called to the fact that this hydroxide is very unstable, and that due to the rapidity with which it evaporates, the investigator cannot always be sure of the concentrations. The results in this experiment are somewhat more irregular than in the preceding one, but the average number of individuals present in each case indicates a slight tendency toward acceleration when concentrations of 0.002%, 0.0032% and 0.004% are used.

The use of sodium hydroxide in the medium also gave interesting results. It appears from the data obtained that the addition of this hydroxide in weaker concentrations (0.002% and 0.0032%) shows a decided tendency to accelerate division, while the stronger concentration has an inhibitory effect.

Barium hydroxide in the concentration of 0.002% and strontium hydroxide in the concentrations of 0.002%, 0.0032%, and 0.004% were used. In considering the effects, the data at hand would seem to warrant the conclusion that these hydroxides have no effect on the rate of growth. The result from the use of calcium hydroxide in 0.002% and 0.003% solutions are so irregular as to render inter-

pretation difficult. On the whole, however, the data seems to justify the conclusion that no effect is produced.

Briefly, the experiments indicate that potassium hydroxide, ammonium hydroxide and sodium hydroxide in weaker concentrations show a tendency to accelerate fission rate in *Paramoecium*, while these hydroxides in higher concentrations have an inhibitory effect. Barium hydroxide, strontium hydroxide, and calcium hydroxide show no effect, neither accelerating nor inhibiting reproduction. These results, while not so far reaching as might be wished, agree with the observations of Richards on *Haminea* eggs. It is suggested that those hydroxides which hasten division rate, do so because of their ability to hasten the oxidative processes of the cell. It is of significance that the hydroxides which were found to accelerate the rate of cleavage in the eggs have produced the same results in *Paramoecium*, while those which had no effect on *Haminea* also showed no variation in the protozoon.

IX. NESTING RECORDS FROM 1920 TO 1922 FROM NORMAN, OKLAHOMA

Margaret M. Nice

The extensive planting of trees in the town of Norman and on the University campus has made this region an unusually attractive nesting place for some species of birds. Mourning doves, grackles, mocking birds, brown thrashers and robins have been especially responsive to the opportunities offered them, and their nests may be found here in great abundance.

The numbers of nests of native birds found by my daughter Constance and myself in this vicinity from 1920 to 1922 follow:

Year	No. of Species	No. of Nests	Successes	Failures
1920	27	219	38	62
1921	19	206	41	48
1922	24	187	39	40
	—	—	—	—
Total	37	612	118	150

In 3 cases (field sparrow, blue grosbeak and sycamore warbler), the nests could not be found, but the parents were seen with food in their bills. The total number of nests should be a little larger for we failed to record all the grackle nests seen. As to the successes and failures, most of the nests were not visited often enough to determine their outcome, so it is only in the case of mourning doves of which we made a special study that the figures for successful and non-successful nests are at all representative.