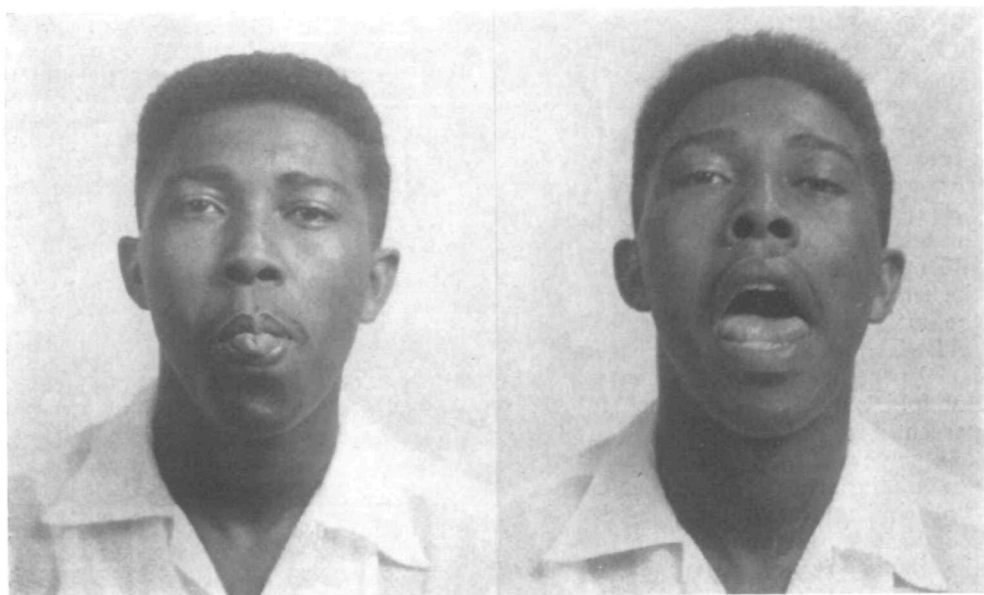


TONGUE-FOLDING AND TONGUE-ROLLING

In An American Negro Population Sample

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ROLLING AND FOLDING

Figure 18

Demonstrations of the rolling and folding characteristics are shown above. These lingual abilities are used as the criterion for rolling and folding in this study.

THE tongue is a mobile organ, capable of many types of movement. One of these, as reported by Sturtevant⁴ is the ability to roll up the lateral edges of the tongue. He suggested that this lingual movement is inherited as a dominant character. Another kind of lingual movement was described by Hsu¹ as a folding of the distal end of the tongue back onto the main body of the organ. The latter movement is performed without employing the use of the teeth. Hsu¹ indicated that upfolding of the lingual appendage

may be inherited as a pair of recessive genes. Whitney⁵ studied a sample of the white population and corroborated Hsu's¹ findings. Lui and Hsu² investigated a sample of the Chinese population to see if rolling and up-folding were inherited independently of each other. They suggested that there is an interaction between the two types of movements. The purpose of this paper is to report the results of a study on the frequencies of rolling and folding in a sample of the American Negro population.

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A survey was conducted at Southern University on a sample of the student population. The abilities to roll and fold the tongue were tested simultaneously on 1,890 students. The subjects examined included 919 students during the summer session of 1954 and 971 freshmen of the 1954-55 term. The symbols *AA* and *Aa* represent the genotypes for rolling, *aa* for non-rolling. The symbols *BB* and *Bb* represent the genotypes for non-folding, and *bb* for folding.

Demonstrations of the rolling and folding lingual characteristics are shown in Figure 1*A* and *B*. Folding the distal end of the tongue back on the main organ (Figure 1*B*) will be used as the criterion for folding during this investigation.

Table I shows that 17.26 percent of the females tested and 10.27 percent of the males in this survey can roll and fold. The table further indicates that 70.79 percent of the males can roll, but not fold, and of the females only 65.25 percent have this ability. Table I shows 2.44 percent of the females and 2.10 percent of the males can fold but not roll. Statistical analyses of these data in Table I indicate no significant differences in the frequencies of rolling and folding with regard to the sexes as indicated by Table I.

Table II shows a comparison of the proportion of tongue-rolling and folding between a sample of the Chinese population and a

sample of the Negro population. Hsu¹ indicated that 58.25 percent of his sample could roll but not fold, while the present data show that 68.25 percent of a sample of the Negro population can roll but not fold. In addition, Lui and Hsu² indicated that only 3.26 percent could roll and fold, while in the Negro population 13.70 percent are in this class. Lui and Hsu² failed to find any individuals that could fold but not roll, while the present data show that 2.27 percent of those tested have this ability.

As shown in Table II, it appears that there are slight differences between the two populations. These differences may be due to the rigid criterion used by Lui and Hsu² in determining folding. If this is true, then the differences may not be significant. The data, however, fail to demonstrate the classical Mendelian ratio 9:3:3:1, for two randomly assorted genes. Such a ratio would be expected only in a population in which the allele frequencies of *A* and *a* and those of *B* and *b* were 0.5, that is, where *A* and *a* and *B* and *b* are of equal frequencies.

Table III shows that there is 18 percent of the recessive class of non-rolling individuals (341 out of a total 1,890), and 16 percent (320 out of a total 1,890) with the recessive

TABLE III. Test for independence of two tongue movement characters

	Roll	Not roll	
Fold	259 (247.5)*	43 (54.5)*	302
Not fold	1290 (1301.5)*	298 (286.5)*	1598
χ^2 = about 3.52			
P = about 0.7	1549	341	1890

*The figures in parentheses are those expected on the null-hypothesis that the frequencies of roll to not-roll are the same in the fold and not-fold groups.

TABLE I. Frequency of two tongue movements in relation to sex

Sex	Can roll and fold		Can roll but not fold		Can neither roll nor fold		Can fold but not roll		Total	
	Actual No.	Percent	Actual No.	Percent	Actual No.	Percent	Actual No.	Percent	Actual No.	Percent
Female	149	17.26	563	65.24	130	15.06	21	2.44	863	100
Male	110	10.72	727	70.79	168	16.39	22	2.10	1027	100
Total	259	13.99	1290	68.02	298	15.78	43	2.27	1890	100

TABLE II. Comparison of the proportion of tongue rolling and folding in two different populations

Author	Genotype Population	Can roll but not fold		Can roll and fold		Can neither fold nor roll		Can fold but not roll		Total	
		Actual No.	Percent	Actual No.	Percent	Actual No.	Percent	Actual No.	Percent	Actual No.	Percent
Present Data	Negro	1290	68.25	259	13.70	298	15.78	43	2.27	1890	100
Lui and Hsu	Chinese	615	58.96	34	3.26	394	37.78	0		1043	100

trait for folding. According to the Hardy-Weinberg law the allele frequencies P_a and P_b are to be obtained by $P_a = \sqrt{.18}$ and $\sqrt{.16}$, thus giving 42 percent respectively. The gene frequencies are the basis of the distribution of the population.

Lui and Hsu² failed to find any individuals who could fold but not roll, and therefore assumed an interaction of genes A and b . Table III shows that 43 such individuals were found in the population sample in this study. The present data (Table III) are compatible with independence in the expression of the two pairs of characters, although there are some deficiencies in the fold-not-roll class.

Although the P value is greater than five percent, it is rather low and the relatively high chi-square 3.52 is mostly due to a deficiency in the fold-not-roll class. The data suggest a possibility of a high degree of independence between the rolling and folding characters.

Summary

A gene frequency study on the occurrence of rolling and folding in a sample of the American Negro population was made. The data suggest a possibility of a high degree of independence between the rolling and folding characters.

Literature Cited

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SYMPOSIUM ON EFFECTS OF RADIATION AND OTHER DELETERIOUS AGENTS ON EMBRYONIC DEVELOPMENT

This symposium* was sponsored by the Biology Division of the Oak Ridge National Laboratory and was held at Oak Ridge, Tennessee, April 20 and 21, 1953. An idea of the comprehensive nature of this symposium can be obtained by glancing through the table of contents:

Introduction—Alexander Hollaender; James G. Wilson, Differentiation and the reaction of rat embryos to radiation; Roberts Rugh, The effect of ionizing radiations on amphibian development; James N. Dent, and Ernest L. Hunt, Radiotracer techniques in embryological research; Liane Brauch Russell and W. L. Russell, An analysis of the changing radiation response of the developing mouse embryo; Samuel P. Hicks, The effects of ionizing radiation, certain hormones, and radiomimetic drugs on the developing nervous system; Dietrich Bodenstein, Effects of radiomimetic substances on embryonic development, with special reference to nitrogen mustards; Josef Warkany, Disturbance of embryonic development by maternal vitamin deficiencies; F. Clark Fraser, H. Kalter, B. E. Walker and T. D. Fairstat, The experimental production of cleft palate with cortisone and other hormones; Walter Landauer, On the chemical production of developmental abnormalities and of phenocopies in chicken embryos; B. H. Willier, Phases in embryonic development; James N. Yamazaki, Stanley W. Wright and

Phyllis M. Wright, A study of the outcome of pregnancy in women exposed to the atomic blast in Nagasaki; Paul Weiss, Summarizing remarks.

Although this is a work on embryonic development there are a number of features in it that are of considerable interest to geneticists. One of the most interesting things is the finding that there are definite critical periods for the application of these mutagenic agents whether they be X-rays, nitrogen mustards, or other teratogenic agents. Rather large doses were required to produce the abnormalities that were studied. Wilson found that below 200 roentgens delivered on the eighth day of the life of a rat embryo mortality did not increase in a graded fashion as the dosage increased but suddenly became complete at 200 r. Radiation at the eighth day in the life of the embryos produced no malformations. The major effect at this stage of the rather undifferentiated embryo was one of mortality which became complete at 200 r, also the body weight of embryos was slightly reduced. At later stages such as the 9th, 10th and 11th days the amount of radiation required to kill 100 percent of the embryos increased to 600 r. However, at these later stages there were many abnormalities produced.

The rat embryo at eight days is rather undifferentiated and differentiation proceeds

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