Only 5 of the 80 strains tested were not sensitive to 31.2 μg or less of neomycin.

The degree of resistance possessed by variants exposed to Q-19 and neomycin is low. These variants display the "penicillin" rather than the "streptomycin" type of drug resistance.

Q-19 and neomycin are bactericidal in a concentration equal to or only slightly higher than that in which they are bacteriostatic.

Received March 8, 1950. P.S.E.B.M., 1950, v74.

Content of Desoxyribo and Ribonucleic Acids of Retina Under Various Conditions.* (17802)

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Reports from various sources indicate(1) that the cells of cortical centers show considerable loss of ribonucleic acid after intense physiological stimulation, the level of ribonucleic acid returning to normal only slowly. In these experiments the ribonucleic acid was determined by microscopic measurement of the ultraviolet absorption of individual cells. The interpretation of results of such measurements has recently been criticized(2). The retina consists of several layers of ganglion cells and their neurites and nerve cells differentiated to cones and rods. All these nerve cells are readily accessible, can be obtained in considerable amount and can easily be stimulated by physiological means and in varied intensity. We have attempted to study, by chemical methods, the influence of light stimuli on the ribonucleic acid content of the retina of the rabbit, but observed no significant effect. However, it was found that the retina differs with respect to the composition of its nucleic acid fraction considerably from other tissues (including the cortex of the brain.) As this research cannot be continued in the near future we report here our experimental material so far obtained.

Experimental preparation of materials. The eyes were enucleated immediately after death of the animal. To obtain easy and complete separation of the retina from the choroidea the eye was immediately placed in solid CO_2 and either was kept frozen for several days or, after being frozen, immersed in absolute alcohol at 0° and kept there for 5 days. Neither the freezing nor the treatment with alcohol interfered with the determination of the nucleic acids. The retina could be separated from the choroidea equally readily after being thawed and after fixation in alcohol.

Analytical methods. The nucleic acids were extracted according to the procedure of Schneider(3). Desoxyribonucleic acid (DNA) was determined as a rule by the diphenylamine reaction(4). Readings were carried out at 610 mμ with the Beckman spectrophotometer. To ascertain that the substance determined by the diphenylamine reaction was identical with desoxyribonucleic acid, the determination of the latter was carried out in a few cases by the cysteine reaction according to the procedure recommended by Stumpf (5). These completely different procedures gave practically identical results. The ribonucleic acid (RNA) was in all cases determined by the orcinol reaction according to

* This work was supported by research grant to Dr. H. Waelsch from the Supreme Council 33rd Northern Masonic Jurisdiction, United States.

1. Hydén H., Cold Spring Harbor Symposia on Quantitative Biol., 1947, v12, 107.

2. Commoner H., *Science,* 1949, v110, 31; Commoner H., and Lipkin, D., *Science,* 1949, v110, 41.

3. Schneider W., *J. Biol. Chem.,* 1945, v161, 293; 1946, v164, 747.

4. Dische, Z., *Mikrochemie,* 1929, v7, 33.

5. Stumpf, P. K., *J. Biol. Chem.,* 1947, v169, 367.

TABLE I.
Ratio DNA/RNA in Retinas and Other Tissues of Various Species.

Exp. No.	Animal	Tissue	DNA* mg%	RNA† mg%	Ratio DNA/RNA
1	Rabbit	Retina	520	145	3.6
2	"	"	1240	232	5.3
3	Steer	"	530	130	4.1
4	"	"	692	200	3.5
5	"	"	392	140	2.8
6	"	"	460	140	3.2
7	"	"	396	95.4	4.1
8	Mouse	Liver	142	960	.15
9	"	"	178.5	810	.22
10	Cat	Grey Matter	120	130	.92
11	"	" "	100	127	.78
12	Rabbit	" "	71	124	.57
13	Steer	Optic Nerve	44	90	.49
14	"	" "	41	76	.54
15	Rabbit	" "	41	84.8	.48
16	Cat	Retina	824	206	4.0
17	"	"	1724	250	6.9
18	"	"	1750	250	7.0
19	"	"	1640	292	5.6
20	"	"	1568	292	5.3

* DNA—Desoxyribonucleic acid.
† RNA—Ribonucleic acid.

Dische and Schwartz(6). The results of these determinations were again checked in a few cases by the so-called basic cysteine reaction(7). Good agreement was found between both procedures. Nitrogen determinations were carried out by nesslerisation on an aliquot of the trichloracetic acid extract containing nucleic acids and on total residue of the TCA extraction. In the first series of experiments the DNA and RNA content of the retinas of steer, cat and rabbit was determined. The results of these experiments are listed in Table I. The values of nucleic acids were calculated either on the basis of wet weight of the retina (without pigment epithelium) (Exp. 1-15, Table I) or on the basis of the weight of the retina fixed by alcohol. (Exp. 16-20 Table I). Under these circumstances only the ratio DNA/RNA can be regarded as significant and comparable with the results of other tissues.

As can be seen from Table I DNA/RNA is smaller than 1 in the liver,† the gray matter and the optical nerve, while it varies between 2.1 and 7 in the retina of all species investigated.

In a second series of experiments (Table II) the content of DNA and RNA in retinas of rabbits kept dark 12-24 hours were compared with that of retinas exposed to light under various conditions. Three types of experiments were carried out. In the first type one eye of the animal was covered with a rubber cup tied by adhesive, while the other eye was exposed for 4 hours to daylight. (Exp. I) In a second experiment a group of 4 chinchilla rabbits was kept in dark for 8 hours while another group of 4 was exposed to daylight for the same period of time. (Exp. II) In a third experiment 2 groups of 3 chinchilla rabbits were kept over night in complete darkness and then one group was killed and the eyes immediately enucleated and frozen in dry ice while the other was exposed for 10 minutes to the light of a 150 Watt bulb at a distance of 10 cm before death. The globes were fixed in cold alcohol and DNA, RNA and nitrogen of the fixed retinas, (separated from pigment epithelium), determined. The DNA and RNA

6. Dische, Z., and Schwartz, K., *Mikrochim. acta*, 1937, v2, 13.

7. Dische, Z., *J. Biol. Chem.*, 1949, v181, 379.

† The nucleic acid content of liver is well known and our determinations in liver were carried out, to check the reliability of our procedure for the determination of nucleic acid in grey matter and retina.

TABLE II.
DNA and RNA Content of Irradiated and Dark Adapted Retinas of Rabbits. All results expressed in mg of DNA, RNA per 100 mg Nitrogen.

Exp. No.	Stimulated by light DNA	RNA	Dark adapted DNA	RNA
I	101	17.6	95	15.6
II	90	26	90	20
IIIa	130	29	130	38
IIIb	94.1	26	91.5	28

content was calculated per 100 mg nitrogen. As can be seen from Table II no significant differences were found between the dark adapted retinas and those exposed to light. The high ratio DNA/RNA in the retina as compared with other tissues is due partly to a very high content in DNA and partly relatively low values in RNA.

Discussion. It seems doubtful whether it is possible to explain the high ratio DNA/RNA by a higher ratio nucleus: cytoplasm in the retina as compared with the grey substance. The high ratio could be brought about by a much higher concentration of DNA in the nuclei of the retina or be due to a replacement of one part of RNA by DNA in the cytoplasm of the retina cells. The consideration of certain characteristic properties of nucleic acids shows that this latter alternative could be of significance for the understanding of certain correlations between structural factors and function of the retina. Nucleic acids can combine not only with histones in nucleoproteins, but can form labile complexes with neutral proteins in the neighborhood of their isoelectric point. Because of strong polarity, high degree of polymerisation and asymmetry of the molecules of nucleic acids they can, by combining with proteins, influence the insolubility as well as impart to the protein molecules specific spatial orientation. This spatial orientation of protein molecules can be regarded as an important factor in the structural integration of cellular constituents. This function of nucleic acids can be deduced not only from the role of desoxyribonucleic acids as constituent of genes but also from the correlation found by various authors between the amount of ribonucleic acid in embryonal and tumor cells and the speed of growth and differentiation. The desoxyribonucleic acid in cells seems to be more highly polymerized than ribonucleic acid. The orientating influence on protein exerted by nucleic acids in general will depend on their degree of polymerisation. The higher ratio DNA/RNA in the retina as compared with other tissues may indicate that certain structural factors in the cytoplasm underlying the specific function of the retina require nucleic acids of higher degree of polymerisation, as that of ribonucleic acid.

Summary. (1) The ratio of desoxyribonucleic acid:ribonucleic acid in mammalian retinas is reversed in comparison with that in grey matter and other tissues. (2) No differences were found in the content in ribonucleic acid between dark and light adapted retinas.

Received March 10, 1950. P.S.E.B.M., 1950, v74.