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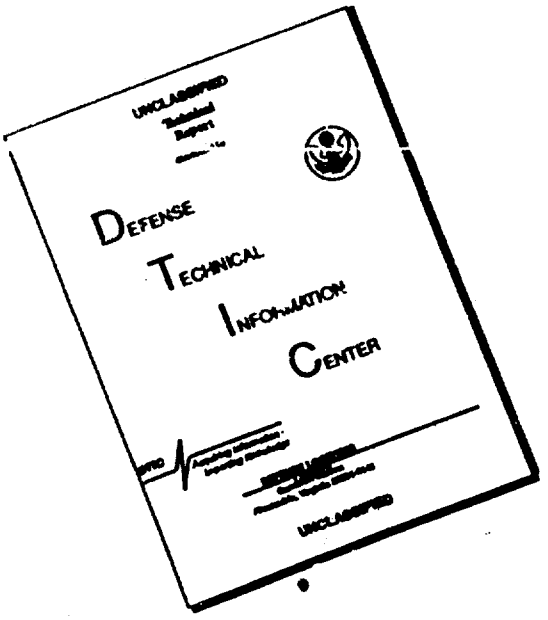

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Transactions of the Academy of Science, USSR, 113(3), 1957: 650-651.

Comparative Study of the Composition of Ribonucleic Acids in Various Type Bacteria.

A. S. Spirin and A. N. Belozerski

In numerous works it has been shown that the composition of desoxyribonucleic acid (DNA) varies greatly from type to type, the difference being greater in more removed types. This was particularly clearly established during analysis of the composition of DNA in an extensive circle of bacteria(1). It was also indicated that the composition of DNA can vary during a deep experimental variation of the bacteria (2).

Thus, one or any composition of DNA is closely tied in with the entire hereditary nature of the organism being studied. In regard to ribonucleic acid (RNA) we, in our former works (2), showed that its composition does not vary noticeably during deep variations of the heretage of the bacteria. In this regard we took on the task of comparing the composition of RNA in various type bacteria. The object was to clearify how much the composition of the RNA can vary in dependence on the hereditary nature of the organism and in what degree it correlates with the composition of DNA.

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For a quantitative analysis of the nucleotide composition of RNA in a bacterial mass, we utilized those same methods of hydrolysis and preparation of the hydrolysates for chromatography as in work #2. However, in order to increase the exactness of the data, we divided all four of the monocucleotides on a single chromatogram. This was done by a successive application of two solvents, passing in one and the same direction. The first solvent was of ethanol, buthanol and 1 m of acetate-ammonium buffer pH 3.7. The second solvent was the same system of isobutyric acid-isobutyrate ammonia, which was utilized in

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our previous work (2). As a result, the stains of nucleotides were distributed in the following order, from top to bottom: guanylic acid, uracil, cytidine and adenine acid. Preparation of the paper, detection of the stains, elution and spectrophotometry were described by us earlier in work #2. For computation of the content of nucleotides we used the data and computation coefficients used by Elson, Gustafson and Chargaff (3), but converted in 5 ml of eluate:

ACID	CONVENTIONAL SIGN	QUANTITY OF NUCLEOTIDES IN 5 ml OF ELUATE μM*
Guanylic	G	0.470.Δ255
Adenine	A	0.363.Δ260
Cytidin	C	0.730.Δ270
Uracil	U	0.515.Δ260

The Obtained data, in regard to the four nucleotides in the RNA, of the studied types of bacteria are in the Table.

In the Table we, as a result of former literature data on the composition of DNA in various bacteria(1), arranged the types studied by us in order of increase of ratio $\frac{G+C}{A+T}$ in them. Thus, the increase of ratio, according to our data, in the DNA of staphylococcus pyogenes is equal to 0.45, in intestinal bacteria it is near 1, and in Mycobacterium tuberculosis it reaches 2.4(1). Increase of this ratio in Actinomyces globisporus streptomycini, according to our data, is near 3.

Thus, in the presented bacteria, the composition of the DNA is quite variant. As the Table shows, the nucleotide composition of RNA, oppositely, is close in the various, even far removed types, and has a small variance. From this we surmise that the nucleotide

*Δ - Signifies the difference between the extinction during a specified wave lenght and extinction during MM(2,3).

composition of RNA does not compare with the nucleotide composition of DNA, and does not vary significantly in dependence on the nature of the organism.

Thus, if we speak of the DNA, we can say it is quite specific, even during study of its overall composition, but this cannot be said of RNA. Without question, these data do not negate the possibility of specificity in RNA, because the specificity could be on a line of varying nucleotide sequence in various RNA, during similar overall compositions. However, the nearness of the nucleotides composition in various RNA indicate a less specificity than with DNA.

(1) Ki Jong Lee, R. Wahl, E. Barbu, Ann. Inst. Pasteur, 91; 212 (1956). (2) A. C. Spirin, A. N. Belozerskii, Biochem., 21; 768 (1956). (3) D. Elson, T. Gustafson, E. Chargaff, J. Biol. Chem., 209; 285 (1954).

Quantitative relationship of nucleotides in RNA of studied bacteria.

Culture	Nucleotides-mol %				Purine / Pyrimid	G + C / A + U	G + U / A + C
	G	A	C	U			
Staphylococcus pyogenes aureus	28.7	26.9	22.4	22.0	1.25	1.05	1.03
Pasteurella tularensis	29.8	27.3	21.0	21.9	1.33	1.03	1.07
Brucella abortus	30.2	25.7	24.7	19.4	1.27	1.22	0.99
Proteus morganii	31.1	26.0	23.7	19.2	1.33	1.21	1.01
Escherichia coli	30.7	26.0	25.2	19.1	1.31	1.22	0.99
Salmonella typhosa	30.7	26.1	23.9	19.3	1.32	1.20	1.00
Shigella dysenteriae	31.1	27.7	24.1	19.1	1.32	1.23	1.01
Corynebacterium diphtheriae	31.6	23.1	23.8	21.5	1.21	1.25	1.13
Pseudomonas aeruginosa	31.8	25.2	23.7	19.3	1.33	1.25	1.05
Sarcina lutea	33.2	23.4	23.9	19.5	1.31	1.33	1.12
Mycobacterium tuberculosis BCG	33.0	22.6	26.4	18.0	1.25	1.46	1.04
Actinomyces globisporus streptom.	31.2	23.9	25.5	19.4	1.23	1.31	1.03