NUCLEOTIDE SEQUENCE OF *CHLORELLA* CYTOPLASMIC 5 S RNA

B.R. JORDAN and G. GALLING
with the technical assistance of R. JOURDAN
Centre de Biochimie et de Biologie Moléculaire
C.N.R.S., 31, Chemin Joseph Aiguier, 13274 Marseille, France

Received 6 August 1973

1. Introduction

5 S ribosomal RNA is the molecule of choice for studies on the evolution of RNA sequences [1]. It is relatively easy to obtain pure and in good yield (unlike a tRNA specific for a single amino acid) and short enough to be sequenced without difficulty (unlike high molecular weight ribosomal RNA's). The unicellular eukaryotic alga *Chlorella* contains two different families of 5 S RNA molecules, one in the cytoplasm and the other located in the chloroplast. Both of these RNA's are easily labelled and separated [2]. It is of interest to examine the nucleotide sequence of the two types of 5 S RNA for the following reasons. First, some degree of homology might be expected between *Chlorella* cytoplasmic 5 S RNA and other eukaryotic 5 S RNA's and possibly between *Chlorella* chloroplasmic 5 S RNA and prokaryotic 5 S RNA's. Secondly, the determination of new 5 S RNA sequences should help to define the possible function of this molecule and no sequence of plant cell 5 S RNA has been reported so far. We report here the sequence of *Chlorella* cytoplasmic 5 S RNA. This molecule is quite different from (although related to) KB cell and yeast 5 S RNA's.

2. Methods

^{32}P-labelled cytoplasmic 5 S RNA was prepared from *Chlorella pyrenoidosa*, strain 211/86 of the algal collection of the Pflanzenphysiologisches Institut, University of Göttingen, Germany, as previously described [2]. The sequence was derived by established methods [3,4], using two-dimensional acrylamide gel, electrophoresis [5] for the fractionation of partial enzymic digests of whole molecules or of previously obtained fragments. Kethoxal modification [6,7] of G residues was also used to obtain some overlaps. Details of these procedures and the complete derivation of the sequence will be reported elsewhere.

3. Results

The complete sequence of *Chlorella* cytoplasmic 5 S RNA is shown in fig. 1, aligned with the KB cell [8] and yeast [9] 5 S RNA sequences; several regions of homology are apparent. It is surprising to note that *Chlorella* cytoplasmic 5 S RNA seems closer to KB cell than to yeast 5 S RNA, at least on the basis of this straightforward comparison. Two GAAC sequences (possible candidates for recognition of the GTψC sequence in tRNA) are found but the results of partial hydrolysis show that none of them is in an exposed region of the molecule. The existence of a base paired structure for the 5′- and 3′-terminal regions is suggested by the sequence and also supported by partial hydrolysis data. The existence of a triphosphate at the 5′ end of the molecule indicates that it is probably, like the other eukaryotic 5 S RNA's, a primary transcription product.

Acknowledgements

This work was supported in part by grants from the D.G.R.S.T., the C.E.A. and the Deutsche Forschungsgemeinschaft.

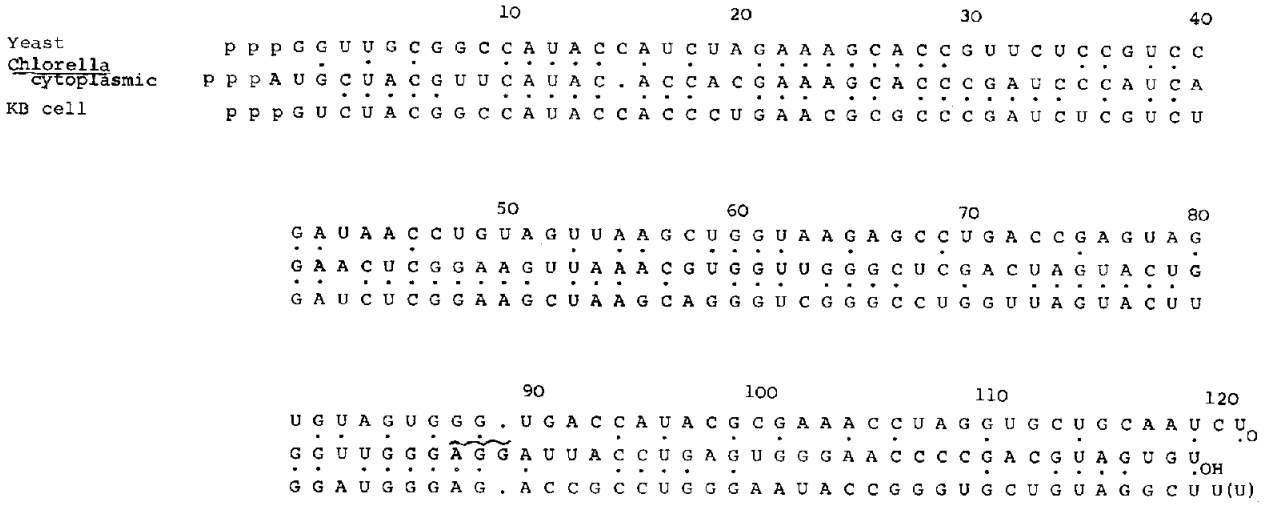

Fig. 1. Sequence of *Chlorella* cytoplasmic 5 S RNA compared with the yeast and KB cell sequences. One deletion and one addition have been postulated in order to maximize homology; homologous regions are shown by dots between the relevant sequences. The wavy line indicates a trinucleotide whose sequence is not quite certain; an additional UG sequence may be present at the 3′ end of the molecule.

References

[1] Sankoff, D. and Cedergren, R.J. (1973) J. Mol. Biol.77, 159–164.

[2] Galling, G. and Jordan, B.R. (1972) Biochimie 54, 1257–1265.

[3] Brownlee, G.C., Sanger, F., and Barrell, B.G. (1968) J. Mol. Biol. 34, 379–412.

[4] Ehresmann, C., Stiegler, P., Fellner, P., and Ebel, J.P. (1972) Biochimie 53, 901–967.

[5] Vigne, R., and Jordan, B.R. (1971) Biochimie 53, 981–986.

[6] Litt, M. (1969) Biochemistry 8, 3249–3253.

[7] Bellemare, G., Jordan, B.R., Rocca-Serra, J., and Monier, R. (1972) Biochimie 54, 1453–1466.

[8] Forget, B.G., and Weissman, S.M. (1967) Science 158, 1695–1699.

[9] Hindley, J., and Page, S.M. (1972) FEBS Letters 26, 157–160.