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Short Communications

The properties of algal and sperm flagella obtained by sedimentation

Flagella from the alga *Polytoma uvella* have been reported by the author to contain about 0.6% ribonucleic acid phosphorus[1]. This was in contrast with the tails of fish sperm, from which this substance appeared to be absent. The reason for the difference was not apparent, but it now seems that the algal nucleic acid was cytoplasmic in origin. Previously, flagella material had been isolated from a suspension by precipitation with alcohol and acetic acid, and in the electron microscope this suspension seemed reasonably pure. If, however, the flagella are isolated by sedimentation, the nucleic acid phosphorus, on a lipid-free basis, measured by u.v. absorption, falls to 0.22% ± 0.04% (6 determinations), and if the intact cells are shaken with 0.5 *M* sucrose instead of distilled water and two or three drops of chloroform, this value falls again to 0.10% ± 0.02% (4 determinations). The small residual phosphorus is not considered significant.

Other properties of flagella obtained by sedimentation are compared in Table I with those of the original precipitated material. Methods are as described previously with the exception that cystine was determined by the slightly more sensitive and more convenient Fleming reaction as used by VASSEL[2].

Thus lipid, which is left behind during precipitation, is present in the sedimented flagella. The rather high value of 20% for *Polytoma* flagella can hardly arise from the very thin sheath but must come more probably from the matrix and/or the fibrils themselves.

The cystine content of flagella appears to be 1% or less. Lower values were obtained from sedimented material but hydrolysis, especially in the presence of carbohydrate, destroys a proportion of the cystine. More carbohydrate was present in the sedimented *Polytoma* preparations than in material obtained by precipitation, and it seems likely that the lower cystine values obtained in the former case were due to a greater breakdown of this amino acid during the preliminary hydrolysis. Hydrolyses were all performed in a HCl–formic acid mixture[3], which would reduce but certainly not eliminate the destruction of cystine.

TABLE I

COMPARISON OF PROPERTIES, OTHER THAN PHOSPHORUS DISTRIBUTION, OF FLAGELLAR PREPARATIONS OBTAINED BY PRECIPITATION AND BY SEDIMENTATION

	Precipitated Polytoma preparations	*Precipitated sperm (various) preparations*	*Sedimented Polytoma preparations*	*Sedimented sperm (perch) preparations*
Ash content (%)	0–3	—	3–4	0–3
Nitrogen (%)	14.8–15.2	—	10.1	7.6–9.8
Nitrogen of lipid-free material (%)	14.8–15.2	—	12.7	14.5
Lipid	Absent	Absent	About 20%	Some variation around 40%
X-ray	Consistent with protein. No information about form	Consistent with protein. No information about form	Consistent with protein. No information about form	—
Infra-red absorption	C=O absorption maximum about 1650 cm^{-1}. Little indication of β	—	C=O absorption maximum about 1650 cm^{-1}. Little indication of β	C=O absorption maximum about 1650 cm^{-1}. Little indication of β
Paper chromatography	Common mixture of amino-acids. Proline present, hydroxyproline absent	—	Common mixture of amino-acids. Proline present, hydroxyproline absent	—
Tyrosine (g acid/100 g protein)	3.35–3.92	3.73–4.26	3.44–3.85	3.38–3.85
Tryptophan (g acid/100 g protein)	2.22–2.61	2.63–2.68	2.35–2.84	2.63–3.06
Cystine (g acid/100 g protein)	0.81–0.87	1.12	0.40–0.41	—
Hexosamine (%)	0.2–0.5	—	—	Not detectable *i.e.* 0.2 or less.
Hexose (%)	0.6–6.2	—	6.6–8.4	1.3–1.8
Adenosine triphosphatase activity	Positive	—	Positive	Positive

Little or no carbohydrate was present in the sedimented perch-sperm flagella, suggesting that its presence in *Polytoma* preparations was either adventitious or of minor structural significance.

Department of Biomolecular Structure, University of Leeds (Great Britain) J. TIBBS

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