LETTERS TO THE EDITORS

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Extractability of the Lotmar–Picken Material from Dried Muscle

Bear and Cannan have reported[1] new experiments with muscle exhibiting the so-called Lotmar–Picken[2] X-ray pattern. We, too, recently found a muscle (in our case a *Mytilus* adductor) which gave the pattern, and we have repeated their observation that after extraction with water it gave only the normal α-pattern characteristic of myosin. In addition, our specimen gave a number of new reflexions in the form of almost continuous circles, distinguished from the Lotmar–Picken reflexions in showing scarcely any orientation and in having a more grainy texture; these reflexions, too, disappeared on extraction with water. We attribute them to a new substance which we provisionally call '*X*'. An analysis of the diffraction pattern on these lines is given in the first three columns of the accompanying table.

Whole muscle			Extract
Lotmar–Picken material		Substance '*X*' (continuous circles)	
Equator	First layer line		
0·075 m			
		0·080 m	0·076 m (*X*)
0·086 vw			
	0·105 vw		
0·107 m			0·106 m (LP)
		0·118 s	0·118 m (*X*)
	0·127 m		0·127 m (LP)
0·128 vw			
0·135 w			0·133 w (LP)
	0·140 w		0·139 w (LP)
0·145 m			0·144 w (LP)
		0·161 mw	0·160 m (*X*)
		0·170 mw	0·167 m (*X*)
0·176 w			0·172 w (LP)
	0·178 w		0·178 vs (NaCl)
		0·186 w	0·186 w (*X*)
		0·193 vw	0·189 w (*X*)
		0·221 m	0·219 w (*X*)
		0·229 w	0·226 w (*X*)
			0·251 s (NaCl)

Figures are sin θ/λ values. Letters indicate intensities as follows: vs = very strong; s = strong; m = moderate; mw = moderately weak; w = weak; vw = very weak. In col. 4, lines attributed to the Lotmar–Picken material are marked 'LP', those attributed to substance '*X*' are marked '*X*', and those attributed to sodium chloride are marked 'NaCl'.

We have obtained some new information by evaporating to dryness the water used to perform the extraction. The residue was seen under the microscope to contain: (*a*) single highly birefringent crystals, and (*b*) soft hygroscopic dendritic deposits which had the appearance of being crystalline but were not detectably birefringent. After thorough drying, the residue gave an X-ray powder pattern which can be analysed into three components: (*a*) strong lines with spacings characteristic of sodium chloride, (*b*) a set of lines the spacings of which are identical with the stronger lines of the Lotmar–Picken pattern, and (*c*) a set of lines corresponding to the continuous circles in the pattern of the original muscle, and presumably due to substance '*X*' (see column 4 of table). This analysis is confirmed by the fact that components (*a*) and (*c*) have a more pronounced graininess than (*b*), and by the observation that on exposure of the specimen to damp air part of the pattern disappears, namely, the lines due to the Lotmar–Picken material, which is presumably deliquescent. We provisionally identify the hygroscopic dendritic deposits with the Lotmar–Picken material and the birefringent crystals with substance '*X*'.

We made two other observations of interest: (*a*) after heating the dried extract to 100° C. for 1½ hr., its X-ray pattern (including the Lotmar–Picken component) was unchanged; and (*b*) a dried water-extract of a 'normal' muscle (exhibiting neither the Lotmar–Picken pattern nor that due to substance '*X*') gave a powder pattern made up of the lines of sodium chloride and the lines characteristic of substance '*X*'; no Lotmar–Picken lines were present.

These observations appear to establish the fact that the Lotmar–Picken material is a soluble, crystalline substance which can be extracted from the muscle by water; and thus, since actomyosin and myosin are most unlikely to be extracted under these conditions, they render it very improbable that the Lotmar–Picken pattern is merely a manifestation of an unusually perfect orientation of myosin. The results argue almost equally strongly against the material being a protein of any sort; the powder pattern of the extract contains no lines with spacings greater than 6·6 A., and the smallest spacings in it which are attributed to the Lotmar–Picken material are of 2·9 A. The powder patterns of all dry protein crystals hitherto examined have included lines of much greater spacing than the former, and have generally faded out before reaching the latter, value. Thus we agree with the view expressed by Bear and Cannan that the Lotmar–Picken substance is probably not a protein, and consider that our results lend additional support to it. The close agreement between one cell dimension of the Lotmar–Picken substance and the axial repeat of myosin would therefore appear to have no significance, except perhaps in the sense that it may encourage the substance to crystallize in the muscle in preferred orientation.

In order to exclude absolutely the possibility that the Lotmar–Picken substance is a protein, we attempted (*a*) to recrystallize the material from a solution which had been heated to 100° C., (*b*) to pass a solution of it through a fine-pored dialysis membrane and then to recrystallize it. These experiments were unsuccessful; but the amount of material available was insufficient to repeat them, and we do not regard the negative results as significant—crystallization of the substance is always a matter of chance, for we found that it did not take place on every occasion when we dried the initial water extract from the muscle. For the same reason we do not consider that our failure to obtain a Lotmar–Picken pattern from the dried extract of a 'normal' muscle proves that the substance is absent from such muscles.

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[1] Bear, R. S., and Cannan, C. M. M., *Nature*, **168**, 684 (1951).
[2] Lotmar, W., and Picken, L. E. R., *Helv. Chim. Acta*, **25**, 538 (1942).

Is α-Keratin a Coiled Coil?

All recent work[1–6] has confirmed that the structure of the synthetic polypeptide poly-γ-methyl-L-glutamate is based on the α-helix of Pauling and Corey[7]. This structure gives a strong 1·5-A. reflexion on the meridian, and both MacArthur[8] and Perutz[1] have shown that this reflexion also occurs in α-keratin. This suggests forcibly that the α-helix forms an important part of α-keratin.