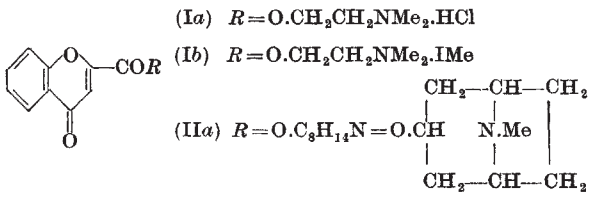
Some New Esters of Chromone-2-Carboxylic Acid

With the view of further pharmacological work by one of us (K. V.-B.), it was decided to synthesize certain esters of chromone-2-carboxylic acid, not previously described[1–4]. The following compounds were obtained: dimethylaminoethyl-chromone-2-carboxylate hydrochloride (I*a*), the methiodide of the base (I*b*); tropyl-chromone-2-carboxylate (II*a*), its hydrochloride (II*b*), methobromide (II*c*) and methiodide (II*d*):



(I*a*) R=O.$CH_2CH_2NMe_2$.HCl

(I*b*) R=O.$CH_2CH_2NMe_2$.IMe

(II*a*) R=O.$C_8H_{14}N$=O.CH(CH$_2$—CH—CH$_2$)N.Me(CH$_2$—CH—CH$_2$)

(II*b*) R=O.$C_8H_{14}N$.HCl; (II*c*) R=O.$C_8H_{14}N$.BrMe;

(II*d*) R=O.$C_8H_{14}N$.IMe; (III*a*) R=OH; (III*b*) R=Cl

Chromone-2-carboxylic acid (III*a*), white needles from alcohol–water, melting point 256–259° (decomposes) (lit. (1), m.p. 256–263° (decomp.)), and its chloride (III*b*), white needles from petroleum ether (50–65°), m.p. 105–106° (lit. (3), m.p. 105·5–106·5°) (found: Cl, 16·6. Calc. for $C_{10}H_5O_3Cl$: Cl, 17·0) were synthesized following the technique of Zagorevskii *et al.*[3].

(I*a*) was obtained by treating 1·5 moles of (III*b*) with 1 mole of 2-dimethylaminoethanol, for 4·5 hr. in toluene by refluxing; white needles from methanol, m.p. 202–204° (decomp.); R_F: *n*-butanol/acetic acid/water (6 : 1 : 2; v/v) (Solvent *A*), 0·35; *n*-butanol/2 *N*-hydrochloric acid (1 : 1; v/v; upper phase) (Solvent *B*), 0·70 (found: C, 56·4; H, 5·5; Cl, 12·0; N, 4·8. $C_{14}H_{15}NO_4$.HCl requires C, 56·5; H, 5·4; Cl, 11·9; N, 4·7).

(I*b*) was obtained by treating 1·5 moles of (III*b*) with 1 mole of choline chloride, for 8 hr. in toluene by refluxing. The crude methochloride was transformed into methiodide by adding sodium iodide in methanol; white plates from methanol, m.p. 224–226° (decomp.); R_F: Solvent *A*, 0·59 and *B*, 0·56 (found: C, 44·4; H, 4·7; I, 31·0; N, 3·4. $C_{15}H_{18}INO_4$ requires C, 44·7; H, 4·5; I, 31·5; N, 3·5).

(II*a*) was obtained by treating 1·5 moles of (III*b*) with 1 mole of tropine in pyridine, left overnight at room temperature, poured into dilute potassium carbonate and extracted with chloroform; white prisms from petroleum ether (50–55°), m.p. 107–109°; R_F: Solvent *A*, 0·68 and *B*, 0·72 (found: C, 68·8; H, 6·0; N, 4·4; $C_{18}H_{19}NO_4$ requires C, 69·0; H, 6·1; N, 4·5).

(II*b*) was obtained by bubbling dry hydrogen chloride into a solution of (II*a*) in ether; white needles from methanol-ether, m.p. 247–251° (decomp.); R_F: Solvent *A*, 0·68 and *B*, 0·73 (found: C, 58·8; H, 6·2; Cl, 9·4; N, 4·0. $C_{18}H_{19}NO_4$.HCl.H_2O requires C, 58·8; H, 6·0; Cl, 9·6; N, 3·8).

(II*c*) was obtained from (II*a*) dissolved in acetone, by adding methyl bromide at room temperature; white plates from methanol-ether, m.p. 270–271° (decomp.); R_F: Solvent *A*, 0·60 and *B*, 0·60 (found: C, 53·6; H, 5·8; Br, 19·0; N, 3·4. $C_{19}H_{22}BrNO_4$.H_2O requires C, 53·5; H, 5·7; Br, 18·7; N, 3·3).

(II*d*) was obtained from (II*a*) in a similar way to (II*c*), but using methyl iodide; white plates from aqueous ethanol, m.p. 276–277° (decomp.); R_F: Solvent *A*, 0·60 and *B*, 0·60 (found: C, 49·8; H, 5·0; I, 27·7; N, 3·0. $C_{19}H_{22}INO_4$ requires C, 50·1; H, 4·9; I, 27·9; N, 3·1).

The melting points were determined on a Kofler hot stage (Leitz, *M*350). The chromatograms were run on Whatman No. 1 paper by ascending technique, at 24°. The spots were developed with Draggendorff's reagent[5].

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Note added in proof: We have now obtained the original work of Zagorevskii *et al.* (*J. Gen. Chem. U.S.S.R.*, **29**, 2267; 1959) in which the ester (I*a*) is described. This compound is not mentioned in *Chem. Abs.*, **54**, 11007 (1960).

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BIOCHEMISTRY

Structure of Feather Keratin

Feather keratin is the outstanding protein fibre structure that still lacks an interpretation generally acceptable in any detail. It has long been known[1] that its X-ray diffraction diagram is of a β-type with the strong indication that the residue-length is only about $3\frac{1}{10}$ Å. instead of the $3\frac{1}{3}$ Å. and $3\frac{1}{2}$ Å. found in β-keratin and silk fibroin, and it has corpuscular properties besides[2], especially as demonstrated in the paper by Bear and Rugo[3], supported also by physico-chemical studies and the finding that the unit is probably a cyclic polypeptide[4]. In Bear and Rugo's scheme the structure is based on a net of corpuscular units the nodes of which are at approximately (0, 0), $(0, \frac{1}{2})$, $(\frac{1}{2}, \frac{1}{4})$, and $(\frac{1}{2}, \frac{3}{4})$, the plane of the net containing both the main-chain and side-chain directions. Continuing from this point and associated observations by the same authors, it is the purpose of this communication to state what we believe to be a very strong case for the structure of the corpuscles themselves. The principal steps in the argument may be summarized as follows:

(1) There are three polypeptide β-configurations ('pleated sheets')[5] with interchain CO . . . NH hydrogen bonds that are linear (see, for example, ref. 6 for our own style of models illustrating this), and in these the amino-acid residue-lengths are approximately $3\frac{1}{2}$ Å., $3\frac{1}{3}$ Å., and $3\frac{1}{10}$ Å., respectively. In the first two the chains are anti-parallel and parallel dyad screws, respectively, and they satisfy the requirements of silk fibroin and β-keratin. In the third the chains are 'parallel polar'; that is, they run in the same direction but are not screws, each chain having all its CO groups on one side and all its NH groups on the other side. It is a fair hypothesis that