

## Formation of Two Novel Heterocycles

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DURING studies on 2-aminobenzothiazole (I), we have synthesised 2-( $\omega$ -chloroacylamino)benzothiazoles (II), so that the pharmacological properties of the products of the reaction of these chloroacylamino-derivatives (II) with various amines can be examined.<sup>1</sup> While the reaction of 2-aminobenzo-

determination of the molecular weight and spectra† [ $\lambda_{\max}$  218 m $\mu$  ( $\epsilon$  27,000) and 310 m $\mu$  ( $\epsilon$  25,500);  $\nu_{\max}$  (KBr) 6.05  $\mu$ ]. The corresponding chloroacyl compound (II) ( $n = 2$ ) presents a  $\lambda_{\max}$  at 275 m $\mu$  of moderate intensity and  $\nu_{\max}$  (KBr) at 5.92  $\mu$ . Compound (III) being too insoluble in the usual solvents, it was not possible to obtain its n.m.r. spectrum.

Reaction of 2-aminobenzothiazole with  $\gamma$ -chlorobutyryl chloride under the same experimental conditions leads to the corresponding chloroamide (II,  $n = 3$ , 80% yield). This, on reaction with certain amines, *e.g.*, diethylamine and piperidine, gives a compound C<sub>11</sub>H<sub>10</sub>N<sub>2</sub>OS, m.p. 177–178°, instead of the desired alkylaminoacylamino-derivative. Again, the structure (IV) assigned to this product is confirmed by elemental analysis and spectral data. Of considerable value for this assignation is the n.m.r. spectrum obtained in CDCl<sub>3</sub>—CCl<sub>4</sub> solution at 60 Mc./sec. (Me<sub>4</sub>Si as internal standard); signals appear at  $\delta$  2.0–2.8 p.p.m. as a multiplet (4H),  $\delta$  4.21 p.p.m. as a triplet (2H, —CO—CH<sub>2</sub>—) and  $\delta$  7.2–7.9 p.p.m. as a multiplet (4H, aromatic).

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thiazole with chloroacetyl chloride proceeds normally, leading exclusively to the corresponding 2-(2-chloroacetamido)benzothiazole (II,  $n = 1$ ), the reaction with  $\beta$ -chloropropionyl and  $\gamma$ -chlorobutyryl chloride shows certain peculiarities.

Reaction of equimolar quantities (chloroform solution) of 2-aminobenzothiazole and  $\beta$ -chloropropionyl chloride in alkaline medium (Na<sub>2</sub>CO<sub>3</sub>) gives 2-(3-chloropropionylamino)benzothiazole (II,  $n = 2$ , 45–50% yield) and a halogen-free product (C<sub>10</sub>H<sub>8</sub>N<sub>2</sub>OS, m.p. 214–217°, 18–20% yield). We assign to this product the structure (III), which is confirmed by elemental analysis, mass-spectral

† All new compounds gave satisfactory elemental analyses. U.v. spectra were measured in absolute ethanol solution.

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