25-Hydroxycholesterol 3-acetate (IVa) was obtained (85%) by oxymercuration-demercuration of III, as previously described.⁸⁾ The presence of 25-hydroxy function was found to be no significant obstacle to the application of Barton's procedure.⁶⁾ Thus, 25-hydroxycholesterol (IVb) was dehydrogenated with 3.3 mole equivalents of dichlorodicyanobenzoquinone in dioxane (15 hr at 90° and 4 hr at reflux) giving 25-hydroxycholesta-1,4,6-trien-3-one (V) (50%), mp 178—179° (EtOH), UV, $\lambda_{\max}$ 223, 256 and 298 nm, NMR (CDCl₃), δ (ppm), 1.19 (3H, s, 19-CH₃), 6.0—6.1 (3H, m, C-4,6,7-Hs), 6.22 (1H, dd, $J=11$ and 1.5 Hz, C-2-H) and 7.07 (1H, d, $J=11$ Hz, C-1-H).

By reaction of V with 35% H₂O₂ in 1N NaOH (15 hr, 20°), 1 α ,2 α -epoxide (VI) was obtained in 70% yield: VI, mp 150—152° (acetone-hexane), UV, $\lambda_{\max}$ 292 nm, NMR (CDCl₃), δ (ppm), 1.18 (3H, s, 19-CH₃), 3.42 (1H, dd, $J=4$ and 1.5 Hz, C-2-H), 3.58 (1H, d, $J=4$ Hz, C-1-H), 5.63 (1H, d, $J=1.5$ Hz, C-4-H) and 6.07 (2H, s, C-6, 7-Hs). Treatment of VI with large excesses each of Li metal and NH₄Cl in ammonia-tetrahydrofuran (ca. 1:1) at reflux, produced 1 α ,25-dihydroxycholesterol (VII) (40%), identified by direct comparison with an authentic sample.²⁾

As VII had already been converted to 1 α ,25-dihydroxycholecalciferol,⁹⁾ the present work may pave one of the most practical route to the biological active metabolite of vitamin D₃.

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Synthesis of Natural Gingerol

Gingerol (I, $n=4$), $[\alpha]_D^{25} +25.1^\circ$ ($c=1.0$, CHCl₃),¹⁾ is a major pungent principle in the gingerol homologues²⁾ (I) isolated from ginger, the root of *Zingiber officinale* ROSCOE. In the preceding paper³⁾ we reported the first synthesis of *dl*-gingerol via *dl*-benzylgingerol (*dl*-II) obtained by the condensation of benzylzingerone (III) with caproic aldehyde. The present

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reaction of *d*-*l*-V with ammonia-saturated methanol at 40° in a sealed tube for 2.2 hr. followed by careful chromatography on silica gel eluted with a mixture of *n*-hexane and acetone gave a colorless needles, mp 67°, C₂₄H₃₂O₄, $[\alpha]_D^{15} +20.0^\circ$ (*c*=0.25, CHCl₃). This was confirmed to be identical with *d*-benzylgingerol (*d*-II), mp 67°, $[\alpha]_D^{15} +21.6^\circ$ (*c*=1.0, CHCl₃), derived from natural gingerol by comparison of IR spectra (Nujol) and mixed melting point determination.

Reductive debenzylation of *d*-II gave a phenolic oil,¹⁾ $[\alpha]_D^{27} +23.9^\circ$ (*c*=1.0, CHCl₃), whose IR and NMR spectra were superimposable on those of natural gingerol. For the sake of further confirmation of the synthetic oil, the oil was treated with 2,4-dinitrofluorobenzene to give a slightly yellow needles, mp 84°, C₂₃H₂₈O₈N₂, $[\alpha]_D^{15} +13.8^\circ$ (*c*=0.25, CHCl₃). This was identical with DNP-gingerol (VI), mp 84°, $[\alpha]_D^{15} +14.0^\circ$ (*c*=1.0, CHCl₃), derived from natural gingerol in all respects.

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Intramolecular Reactions of Enaminonitriles. I. A Novel Synthesis of New β -Aminopyrroles and Related Heterocycles¹⁾

Chemistry of β -aminopyrroles has little been studied apparently owing to the scanty of versatile synthetic procedure for the compounds. Thus only a few β -aminopyrroles have been prepared by nitration or nitrosation of appropriate α -substituted pyrroles followed by reduction, a classical method.²⁾ We now wish to describe simple routes for several new β -aminopyrroles and related compounds including substituted 3-amino-4-oxo-4,5,6,7-tetrahydroindoles (**5**, **15**, **18**), pyrido[3,2-*b*]indole (**9**) and pyrrolo[3,2-*b*]pyridine derivatives (**25**, **26**),³⁾ which have a distinctive feature comprising an intramolecular addition of an enamine to a nitrile group.⁴⁾

Chart 1

- 1) Satisfactory analyses were obtained for all new compounds. Melting points were measured on Kofler block and uncorrected.
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