Experimental Section[3]

Substituted anthranilic acids were synthesized according to the methods reported in the literature. The acids (I) used were anthranilic and 5-chloro,[4] 5-bromo-,[5] 5-iodo-,[6] 3,5-dichloro-,[4] 3,5-dibromo-,[5] and 3,5-diiodoanthranilic.[6] Acetanthranils (II) were synthesized by refluxing 1 mole of the appropriate acid (I) with 2 moles of Ac_2O or propionic anhydride for 1 hr. After excess Ac_2O was distilled, the acetanthranils which separated as solid masses[1,2] were used without further purification. Quinazolones were synthesized in good yields by heating equimolar proportions of the appropriate acetanthranils and ethyl *p*-aminosalicylate as reported earlier.[7] The quinazolones (III) shown in Table I are characterized by their sharp melting points and analyses. Quinazolone hydrazides (IV) were synthesized by refluxing 1 mole of the appropriate quinazolone with 2 moles of $NH_2NH_2 \cdot H_2O$ (99–100%) in absolute EtOH for 6–8 hr.[8] On distilling the excess EtOH, the quinazolone hydrazides which separated as solid masses in good yields were characterized by their sharp melting points and analyses (Table II).

TABLE I
SUBSTITUTED QUINAZOLONES (III)

X	X′	R	Mp, °C	Yield, %	Formula	Analyses
H	H	CH_3	197	60	$C_{18}H_{16}N_2O_4$	N
Cl	H	CH_3	132	65	$C_{18}H_{15}ClN_2O_4$	N
Br	H	CH_3	183	55	$C_{18}H_{15}BrN_2O_4$	N
I	H	CH_3	158	58	$C_{18}H_{15}IN_2O_4$	N
Cl	Cl	CH_3	223	56	$C_{18}H_{14}Cl_2N_2O_4$	N
Br	Br	CH_3	220	54	$C_{18}H_{14}Br_2N_2O_4$	N
I	I	CH_3	178	60	$C_{18}H_{14}I_2N_2O_4$	N
H	H	C_2H_5	107	50	$C_{19}H_{18}N_2O_4$	N
Cl	H	C_2H_5	172	54	$C_{19}H_{17}ClN_2O_4$	N
Br	H	C_2H_5	155	45	$C_{19}H_{17}BrN_2O_4$	N
I	H	C_2H_5	142	56	$C_{19}H_{17}IN_2O_4$	N
Cl	Cl	C_2H_5	160	55	$C_{19}H_{16}Cl_2N_2O_4$	N
Br	Br	C_2H_5	164	62	$C_{19}H_{16}Br_2N_2O_4$	N
I	I	C_2H_5	141	54	$C_{19}H_{16}I_2N_2O_4$	N[a]

[a] N: calcd, 4.75; found, 4.20.

TABLE II
QUINAZOLONE HYDRAZIDES (IV)

X	X′	R	Mp, °C	Yield, %	Formula	Analyses
H	H	CH_3	162	45	$C_{16}H_{14}N_4O_3$	N[a]
Cl	H	CH_3	168	48	$C_{16}H_{13}ClN_4O_3$	N[b]
Br	H	CH_3	175	50	$C_{16}H_{13}BrN_4O_3$	N
I	H	CH_3	183	55	$C_{16}H_{13}IN_4O_3$	N[c]
Cl	Cl	CH_3	220	55	$C_{16}H_{12}Cl_2N_4O_3$	N[d]
Br	Br	CH_3	218	45	$C_{16}H_{12}Br_2N_4O_3$	N
I	I	CH_3	240	58	$C_{16}H_{12}I_2N_4O_3$	N[e]
H	H	C_2H_5	121	50	$C_{17}H_{16}N_4O_3$	N
Cl	H	C_2H_5	232	40	$C_{17}H_{15}ClN_4O_3$	N
Br	H	C_2H_5	225	45	$C_{17}H_{15}BrN_4O_3$	N
I	H	C_2H_5	150	60	$C_{17}H_{15}IN_4O_3$	N[f]
Cl	Cl	C_2H_5	132	56	$C_{17}H_{14}Cl_2N_4O_3$	N[g]
Br	Br	C_2H_5	166	55	$C_{17}H_{14}Br_2N_4O_3$	N
I	I	C_2H_5	196	54	$C_{17}H_{14}I_2N_4O_3$	N

[a] N: calcd, 18.06; found, 17.50. [b] N: calcd, 16.26; found, 15.80. [c] N: calcd, 12.84; found, 12.30. [d] N: calcd, 14.78; found, 15.50. [e] N: calcd, 9.90; found, 9.40. [f] N: calcd, 12.45; found, 13.20. [g] N: calcd, 14.25; found, 13.80.

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Heterocycles. III. Syntheses of N-Tosyl-3-carbomethoxy-3-methyl-4-keto-1,2,3,4-tetrahydroquinoline and N-Tosyl-3-cyano-3-methyl-4-keto-1,2,3,4-tetrahydroquinoline[1]

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Recent interest in the synthesis and of the physiological activity of aza steroids[2] prompted us to synthesize a number of aza steroids. The title compounds were synthesized as intermediates. The method of synthesis is analogous to the route used by Bachmann, *et al.*,[3] and Johnson, *et al.*,[4] for the preparation of equilenin.

Experimental Section[5]

Methyl N-Tosyl-4-keto-1,2,3,4-tetrahydroquinoline-3-glyoxalate (I).—To a suspended solution of 1.7 g of $NaOCH_3$ in 20 ml of C_6H_6 was added 3.6 g of dimethyl oxalate, and the mixture was heated for 10 min. To the ice-cooled solution was added a solution of 4.5 g of N-tosyl-4-keto-1,2,3,4-tetrahydroquinoline[6] in 100 ml of C_6H_6 over a 10-min period and the mixture was stirred at room temperature for 15 hr. The mixture was hydrolyzed with H_2O. The organic layer was extracted with 5% NaOH solution and the combined aqueous solution was acidified with dilute HCl. The light yellow crystals were filtered off and dried *in vacuo*. Recrystallizations from MeOH gave 5.5 g (94.5%) of I, mp 126–127°. *Anal.* ($C_{19}H_{17}NO_6S$) C, H, N.

N-Tosyl-3-carbomethoxy-4-keto-1,2,3,4-tetrahydroquinoline (II).—A mixture of 5.0 g of I and 2.5 g of powdered soft glass was heated at 200° for 1 hr. After cooling, the mixture was treated with acetone, and the solution was decanted from the glass and evaporated. The residue was recrystallized from MeOH to give 3.36 g (72.5%) of II, mp 123–125°. *Anal.* ($C_{18}H_{17}NO_5S$) C, H, N.

N-Tosyl-3-carbomethoxy-3-methyl-4-keto-1,2,3,4-tetrahydroquinoline (III).—To a solution of 1.2 g of Na in 24 ml of MeOH was added a solution of 3.6 g of II in a mixture of 20 ml of MeOH and 20 ml of C_6H_6. The mixture was refluxed for 15 min, cooled, and treated with 3 ml of MeI. After 30 min at room temperature, an additional 3 ml of MeI was added. The resulting solution was stirred at room temperature for 2 hr, then refluxed for 45 min, cooled, neutralized with AcOH, and evaporated nearly to dryness. The residue was treated with C_6H_6 and H_2O, and the organic layer was washed (saturated $NaHCO_3$ solution, H_2O), dried (Na_2SO_4), and evaporated to give 3.25 g (86.9%) of crude product. Recrystallization from MeOH gave 1.84 g (49.2%) of pure III, mp 124–125°. *Anal.* ($C_{19}H_{19}NO_5S$) C, H, N.

N-Tosyl-3-hydroxymethylene-4-keto-1,2,3,4-tetrahydroquinoline (IV).—To a suspension of 1.7 g of $NaOCH_3$ in 30 ml of C_6H_6

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(5) All melting points are uncorrected. Microanalyses were performed by Miss T. Nisi. Where analyses are indicated only by symbols of the elements, analytical results obtained for those elements were within ±0.4% of the theoretical values.
(6) W. S. Johnson, E. L. Wehrli, and B. G. Buel, *J. Am. Chem. Soc.*, **71**, 1901 (1949).

was added 2.3 g of ethyl formate and was stirred for 10 min. To the ice-cooled mixture was added a solution of 4.5 g of N-tosyl-4-keto-1,2,3,4-tetrahydroquinoline in 150 ml of C_6H_6 with stirring and allowed to stir for 18 hr at room temperature. The reaction mixture was hydrolyzed with cold H_2O. The organic layer was extracted (H_2O, dilute NaOH). Acidification of the combined aqueous portion with cold HCl gave 4.1 g (83.7%) of IV, mp 107–110° (from MeOH). *Anal.* ($C_{17}H_{13}NO_4S$) C, H, N.

A hot mixture of crude IV and MeOH, when treated with a small amount of HCl, gave **N-tosyl-3-methoxymethylene-4-keto-1,2,3,4-tetrahydroquinoline,** mp 178–178.5 (from MeOH). *Anal.* ($C_{18}H_{17}NO_4S$) C, H, N.

N-Tosyl-3-ethoxymethylene-4-keto-1,2,3,4-tetrahydroquinoline, mp 129–130.5° (from EtOH), was prepared similarly. *Anal.* ($C_{19}H_{19}NO_4S$) C, H, N.

N-Tosyl-1,2,3,4-tetrahydroquinolino[4,3-*d*]isoxazole (V).—A mixture of 3.3 g of IV, 1.6 g of powdered $HONH_2 \cdot HCl$, and 100 ml of AcOH was stirred for 8 hr at 80–85°. Most of the AcOH was removed under reduced pressure, and the residue was diluted with H_2O and extracted with C_6H_6–Et_2O. The organic layer was washed (saturated $NaHCO_3$ solution, H_2O), dried (Na_2SO_4), and concentrated to give 2.2 g (67.4%) of V, mp 175–179°. Recrystallization from EtOH gave a pure sample of mp 177–180.5°. *Anal.* ($C_{17}H_{14}N_2O_3S$) C, H, N.

N-Tosyl-3-cyano-4-keto-1,2,3,4-tetrahydroquinoline (VI).—A solution of 2.2 g of V in 30 ml of C_6H_6 was added to a cooled solution of 1 g of Na in 40 ml of MeOH. After stirring for 1.5 hr at room temperature, the mixture was treated with H_2O and extracted with 5% NaOH solution. Acidification of the combined aqueous solution with HCl gave 2.1 g (95.5%) of VI, mp 150.5–153° (from EtOH). *Anal.* ($C_{17}H_{14}N_2O_3S$) C, H, N.

N-Tosyl-3-cyano-3-methyl-4-keto-1,2,3,4-tetrahydroquinoline (VII). A. Directly from V.—To a solution of 1.0 g of K in 40 ml of *t*-BuOH was added 1.6 g of V and heated at 60–70° for 10 min. After cooling and adding 7 ml of MeI for 10 min, the reaction mixture was stirred at 60–70° for 3 hr, cooled, neutralized with AcOH, and concentrated *in vacuo*. The residue was treated with C_6H_6 and H_2O. The organic layer was washed (5% NaOH, H_2O) and dried (Na_2SO_4), and the solvent was removed. Recrystallizations from MeOH gave 1.0 g (60.0%) of VII, mp 128–129°. *Anal.* ($C_{18}H_{16}N_2O_3S$) C, H, N.

B. From VI.—To a solution of 1.0 g of K in 40 ml of *t*-BuOH was added 1.6 g of VI and heated for 10 min at 65°. After cooling, 7 ml of MeI was added during 10 min and refluxed for 3 hr, cooled, neutralized with AcOH, and evaporated nearly to dryness. The residue was treated with C_6H_6 and H_2O, washed (5% NaOH, H_2O), dried (Na_2SO_4), and concentrated to give 1.0 g (60.0%) of VII.

When the isomerization and methylation of V was carried out by using $NaOCH_3$, the yield of VII was poor.

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Terpene Compounds as Drugs. IV. Terpenyl Derivatives of Local Anesthetics

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In connection with our interest in the field of terpene chemistry we have replaced the alkyl radicals of known local anesthetics, such as benzocaine, procaine, and lidocaine, with terpenyl groups, in order to seek possible changes in the pharmacological properties of the original drugs. The new substances, *i.e.*, farnesyl *p*-aminobenzoate (I), digeranylaminoethyl *p*-aminobenzoate (II), and 2-digeranylamino-2′,6′-acetoxylidide (III), lacked local anesthetic activity.

Experimental Section[1]

Farnesyl *p*-Aminobenzoate (I).—A mixture of methyl *p*-aminobenzoate (9 g, 0.06 mole), farnesol (13.3 g, 0.06 mole), and NaOMe (0.5 g) was gradually heated over 8 hr to 145° under N_2. The reaction mixture was cooled to room temperature and then taken up in ether, and the ethereal extract was washed (dilute HCl, dilute NaOH, H_2O) until neutral. After drying, the ethereal solution was evaporated and the residue was distilled, giving 6.6 g of an oil, bp 206–211° (0.2 mm). The product was purified by chromatography on silica gel, using C_6H_6–Me_2CO (8:2) as eluent. I (5.4 , 26%) was obtained as a colorless oil, $n^{25}D$ 1.5512, R_f (tlc) 0.64.

Anal. Calcd for $C_{22}H_{31}NO_2$: C, 77.37; H, 9.15; N, 4.10. Found: C, 77.42; H, 9.13; N, 4.05.

Digeranylamine occurred as a by-product from the preparation of geranylamine[2] in a 10–12% yield, viscous colorless oil, bp 135–137° (0.03 mm).

Anal. Calcd for $C_{20}H_{35}N$: C, 82.97; H, 12.19; N, 4.84. Found: C, 83.04; H, 12.11; N, 4.85.

2-(Digeranylamino)ethanol.—A solution of geranyl bromide (86.8 g, 0.4 mole) in anhydrous ether (200 ml) was dropped into a solution of 2-aminoethanol (12.2 g, 0.2 mole) and triethylamine (40.5 g, 0.4 mole) in anhydrous ether (300 ml). The suspension was refluxed for 45 hr, cooled, and washed (H_2O), and the ethereal layer was dried (Na_2SO_4) and evaporated. The residue was distilled to yield a viscous colorless oil (34.6 g, 52%), bp 161–163° (0.025 mm).

Anal. Calcd for $C_{22}H_{39}NO$: C, 79.21; H, 11.78; N, 4.20. Found: C, 79.30; H, 11.75; N, 4.19.

The same product was obtained, but in lower yields, by warming at 110° for 7 hr digeranylamine, ethylene chlorohydrin, and anhydrous pyridine in equimolecular amounts.

Digeranylaminoethyl *p*-Aminobenzoate (II).—Methyl *p*-aminobenzoate (6.0 g, 0.04 mole), 2-(digeranylamino)ethanol (13.3 g, 0.04 mole), and NaOMe (0.5 g) were made to react as described in the preparation of I. The crude product obtained was purified by chromatography on silica gel using C_6H_6–Me_2CO (9:1) as eluent to give II (4.3 g, 24%) as a colorless oil, $n^{25}D$ 1.5455, R_f (tlc) 0.42.

Anal. Calcd for $C_{29}H_{44}N_2O_2$: C, 76.94; H, 9.80; N, 6.19. Found: C, 77.03; H, 9.88; N, 6.16.

2-Digeranylamino-2′,6′-acetoxylidide (III).—A mixture of 2,6-(α-chloroacetoxy)xylidine (9.9 g, 0.05 mole), digeranylamine (14.5 g, 0.05 mole), and anhydrous pyridine (4 g, 0.05 mole) was warmed at 150–160° for 6 hr. After cooling, the reaction product was taken up with H_2O and ether, and the ethereal layer was washed (dilute HCl, H_2O) until neutral. After drying and evaporating, the residue was chromatographed on silica gel, using $CHCl_3$–Me_2CO (9:1) as eluent. II (6.8 g, 30%) was obtained as a colorless oil, $n^{25}D$ 1.5255, R_f (tlc) 0.70.

Anal. Calcd for $C_{30}H_{46}N_2O$: C, 79.95; H, 10.29; N, 6.22. Found: C, 80.01; H, 10.28; N, 6.23.

(1) Boiling points are uncorrected. The R_f values were determined on glass chromatostrips coated with silica gel G (Merck); the thin layer chromatograms (tlc) were developed with 85:15 C_6H_6–Me_2CO and the spots were developed with $KMnO_4$.

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Mannich Bases of 4-(Methylthio)phenol and 3-Methyl-4-(methylthio)phenol

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Certain phenolic Mannich bases possess quinidine-,[1] ergonetrine-,[2] as well as oxytocin-like[3] effects. In this report, we describe the synthesis of several Mannich bases of 4-(methylthio)-phenol (I) and 3-methyl-4-(methylthio)phenol (II), the first

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