Stability and Enamine–Imine Tautomerism in 1,2- and 2,5-Dihydropyrimidines[1]

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Received June 25, 1986

A series of 1,2- and 2,5-dihydropyrimidines was synthesized by $LiAlH_4$ reduction of the corresponding pyrimidines. It was demonstrated that these compounds undergo imine–enamine tautomerism. The ratio as well as the stability of imine (2,5) or enamine (1,2) tautomeric forms strongly depends upon the nature of the substituents at positions 4 and 6 of the ring. 2,5-Dihydropyrimidines are easily sublimed at room temperature. A low-temperature X-ray diffraction analysis of 4,6-diethoxy-2,5-dihydropyrimidine showed that this molecule is completely planar.

Despite the importance of dihydroazines for clarifying a wide range of theoretical, medicinal, and biological problems, the chemistry of this group of compounds is still extremely spotty.[2] A deeper knowledge of the behavior of this class of compounds is, therefore, desirable.

From the theoretical viewpoint, it is essential to predict the structure, binding properties, chemical reactivity, etc., of dihydro compounds from the number and positioning of nitrogen atoms in the ring, as well as from the disposition of double bonds. Such quantum mechanical calculations also enable an evaluation of the degree of aromatic character in potential "homoaromatic" and "antiaromatic" isomers. Availability of novel model compounds for verifying these predictions would open up new horizons in theoretical heterocyclic chemistry, particularly in clarifying the structures leading to spontaneous isomerization of a derivative or in verifying its redox properties.

From the biochemical point of view, dihydroazines (particularly those containing the 1,4-dihydropyridine moiety[3]) are of intense interest because of presence of this group at the active site of the "hydrogen transferring coenzyme" NADH (reduced nicotinamide adenine dinucleotide). This nucleotide, a central participant in metabolic processes in living organisms, participates in the reduction of various unsaturated functionalities.

In the area of drug development, dihydroazines show great promise, particularly since the 4-aryldihydropyridines exhibit powerful vasodilation activity via modifying the calcium ion membrane channel.[4] Additionally, dihydropyridines have been found to actively transport medication across biological membranes.[5]

Until recently, most of the information available on dihydroazines centered around dihydropyridines, with very little data extending to the related dihydropyrimidines. This lacuna has motivated our deep involvement in developing dihydropyrimidine chemistry, particularly dihydropyrimidines containing no substituents on the ring nitrogen.[6] These molecules have long been considered unstable for oxidation, polymerization, or disproportionation reactions.[7]

Figure 1 depicts the five possible isomeric structures of dihydropyrimidines, exhibiting different dispositions of the double bonds.

However, these structures are not easy to synthesize and, as a result, most of the known dihydropyrimidines have either 1,2- (A) or the tautomeric 1,4- (B) and 1,6- (C) geometry. On the basis of our own work and data available in the literature,[8] the dihydropyrimidines can be conveniently divided into two groups, within each of which interconversion between isomers is possible under thermal conditions, namely, the 1,4- (B), 1,6- (C), and 4,5- (E) compounds, and the 1,2- (A) and 2,5- (D) isomers. It is worthwhile to note that, while thermal interconversion between the two groups is not observed, photochemical rearrangement of 1,4-(or 1,6-)dihydropyrimidines to 1,2-isomers has been reported.[9]

It should be stressed that dihydroazines take part in various isomerization processes, usually characterized by reversible or irreversible migrations within the ring, the study of which is still in its infancy. Hydrogen migration, for example, is classified either as rearrangement or tautomerism depending on its kinetic and thermodynamic parameters; the former term is reserved for irreversible processes, while the latter is used to describe fast reversible exchanges.[10] A study of isomerization in dihydropyrimidines provides an excellent opportunity for clarifying the factors regulating these processes.

After successfully developing versatile synthetic techniques for obtaining a variety of 1,4- and 1,6-dihydropyrimidines,[11] as well as the observation of amidinic tautomerism between the two,[12] we began examining the possibility of preparative synthesis of similarly N-unsub-

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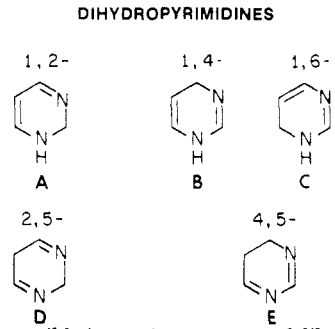


Figure 1. Five possible isomeric structures of dihydropyrimidines.

stituted 1,2-dihydro derivatives and studying their properties. Particularly important goals of this study were the possible observation of the formally allowed [1.5] hydrogen shift,[12] of "homoaromaticity",[13] or of imine–enamine tautomerism[14] in these compounds, behaviors of which have been seen in other systems.

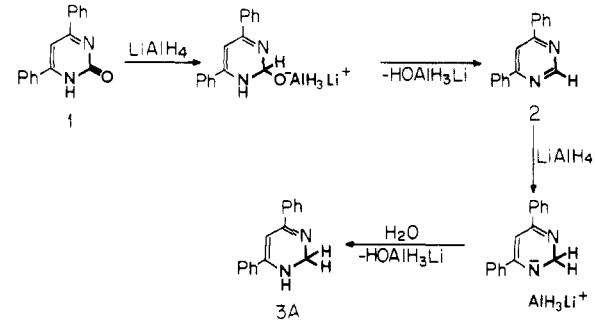
To date, few reports on the formation of 1,2-dihydropyrimidines exist in the literature, and in those cases where a product could be isolated and characterized, the material was either an N-substituted derivative or else it contained geminal disubstitution at position 2, situations that prevent the molecule from oxidizing to the corresponding pyrimidine. Among the methods reported for synthesizing dihydropyrimidines are (a) multicomponent condensation involving a β-dicarbonyl compound, a carbonyl-containing fragment, and ammonia in the presence of ammonium salts;[15] (b) modification of (a) utilizing β-dicarbonyl and *gem*-diamine;[16] (c) a diimine and a carbonyl reagent;[17] (d) Raney Ni desulfurization of pyrimidine-2(1*H*)-thione;[18] (e) electrochemical reduction of 4,6-dimethyl-2-phenylpyrimidine;[19] (f) photochemical di-π-methane rearrangement of 1,4-dihydropyrimidines;[19] and (g) rearrangement of 1-benzyl-3,5-diphenylpyrazoles in the presence of sodium amide.[20]

Because of the simplicity and convenience of $LiAlH_4$ reduction of amides, we chose to examine the possibility of applying this procedure to the preparation of 1,2-dihydropyrimidines. It should be noted that Mamaev and Gracheva reported in 1968 on the $LiAlH_4$ reduction of 4,6-diphenylpyrimidin-2(1*H*)-one and suggested the formation of 1,2-dihydropyrimidine as a yellow byproduct.[21]

Reinvestigation and optimization of this reduction enabled us to prepare 1,2-dihydropyrimidine in 78% yield.[21] Mechanistically, the $LiAlH_4$ reduction of pyrimidin-2-ones should proceed by a route similar to that of amides, namely, reduction of the amide to the imine, followed by nucleophilic addition and reduction of the available C=N double bond (Scheme I).

If this supposition is true, one should also be able to obtain the same compound by direct reduction of the corresponding 4,6-diphenylpyrimidine. Indeed, $LiAlH_4$ reduction in tetrahydrofuran gave 4,6-diphenyl-1,2-dihydropyrimidine in 30–70% yield (depending on the reaction conditions). This reaction is usually very clean and, aside from the end product, only the unreacted starting material could be detected in the reaction mixture. The reason for incomplete transformation of the pyrimidine is still unclear, although reoxidation during the workup procedure is one reasonable possibility. This approach was successfully extended to other derivatives.

Scheme I



Following the preparation of 4,6-diphenyl-1,2-dihydropyrimidine, a spectral study of the product was undertaken to examine the possibility of observing homoaromaticity in solution. However, all attempts to slow down ring inversion failed even at −110 °C (dichloromethane + Freon-11).[22] Moreover, X-ray diffraction analysis completely ruled out the possibility of "homoaromaticity" for this molecule.[23] Of interest though was the fact that the ^1H NMR spectra exhibited two unexpected new triplets. These were assigned to 4,6-diphenyl-2,5-dihydropyrimidine, the imine tautomeric form, which was also detected in ^{13}C NMR. The ratio of enamine/imine in chloroform was found to be 2:1. This is the first observation of enamine–imine tautomerism in dihydropyrimidines. From the concentrations of tautomers in $CHCl_3$, the $\Delta G°$ in this solvent is 0.41 kcal. According to the ab initio calculations of unsubstituted dihydropyrimidines, the 1,2-dihydro form is about 5 kcal/mol more stable than the 2,5-dihydro structure.[24] It should be noted that the known 1,2-dihydropyrimidines with alkyl substituents at positions 4 and 6 exist solely in 1,2-dihydro form.[25]

Therefore, observation of the imine tautomer (**3D**) is most probably the result of stabilization by the phenyl groups at positions 4 and 6, induced by nonpolar conjugation. This contrasts with the situation in acyclic nitrogen-containing systems, where imine–enamine tautomeric equilibrium is usually shifted toward the enamines when going from aliphatic to aromatic α-substitutents.[26]

It should be emphasized that in dimethyl sulfoxide (Me_2SO) equilibrium shifts completely to the 1,2-dihydropyrimidine, owing to the latter's strong hydrogen bonding with Me_2SO. This agrees with other imine–enamine tautomerism studies in which the quantity of enamine increases with a decrease in temperature and with an increase in the solvent polarity.[27] The understanding of how structure and substituents influence the position

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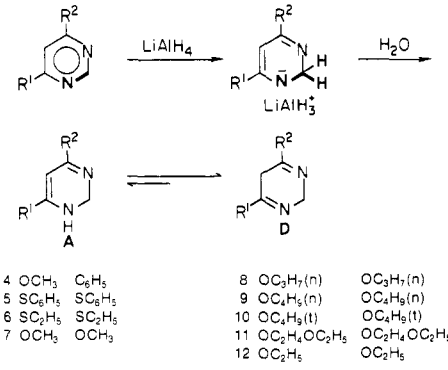
Scheme II



of imine–enamine equilibrium enables one to prepare ring structures that are usually stable by working with appropriately substituted starting materials. Theoretical calculations indicate that the substitution of electron-donating groups at positions 4 and 6 tend to stabilize the 2,5-dihydro structure.[24]

Except for an isolated report by Mehta et al., 2,5-dihydropyrimidine compounds are unknown.[28] This class of materials is of interest because it represents the remaining member of the five isomeric dihydropyrimidines for which there is still no general synthesis.

It is known that, in contrast to acyclic compounds, the cyclic enamine is usually more stable than the corresponding imine. In order to stabilize the cyclic enamines, one substitutes electron-withdrawing groups in the β-position, whereas to stabilize cyclic imines, electron-donating substituents in the α-position are required.[2,27,29]

Since electron-donating groups at positions 4 and 6 tend to stabilize the 2,5-dihydro imine form, a series of dihydropyrimidines was designed containing increasingly electron-donating substituents at these sites. For this purpose, we developed a highly efficient $LiAlH_4$ reduction, which was applied to the required pyrimidine precursors of this series of compounds. This enabled preparation of 4-phenyl-6-methoxy-, a series of 4,6-dialkoxy-, as well as the 4,6-(diethylthio)- and 4,6-(diphenylthio)-2,5-dihydropyrimidines (see Experimental Section). All these products were obtained in quantitative yield, according to thin layer chromatography (TLC). It is interesting to note that while quantitative reduction of the thio derivatives was completed within 1 min, reduction of 4-methoxy-6-phenylpyrimidine required about 5 min and 4,6-dialkoxy-substituted materials needed 1 or 2 h (Scheme II).

Enamine-imine tautomerism of these compounds was studied by ^1H NMR in various solvents. The 4-phenyl-6-methoxy derivative exists in deuterochloroform as an equilibrium of the 1,2 and 2,5 forms in the ratio 1:6, respectively. In more polar DMSO, the ratio was reversed to 8:1. All dialkoxy compounds exist solely in the 2,5-dihydro form, independent of solvent. It is interesting that the 4,6-diphenylthio material exists in deuterochloroform as an equilibrium of 1,2 to 2,5 of 1:3, whereas in DMSO it is 8:1. It is thus clear that the stability of the tautomers is highly dependent upon the electron-donating properties of the substituents at positions 4 and 6 and the polarity of the solvent.

Structures of the prepared compounds were unambiguously determined by ^1H NMR. Each 2,5 isomer prepared exhibited triplets in the 2.6–3.4 ppm (CH_2 at position 5) and 5.1–5.6 ppm (CH_2 at position 2) regions, with a spin–

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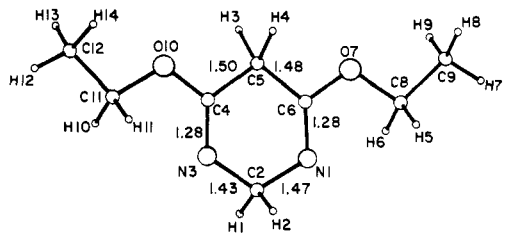

Figure 2. Molecular structure of 4,6-diethoxy-2,5-dihydropyrimidine.

spin coupling constant of 5.5 Hz. IR data are also instructive, as two characteristic bands appear at 1600–1800 cm^{-1}, which can be assigned to the C=N stretching modes of the 2,5-dihydropyrimidines. Such bonds are dramatically dependent on ring substituents. One can easily conclude that enhancement of the electron-donating properties of the groups at positions 4 and 6 shifts the C=N absorption bands to higher wavenumbers. Undoubtedly, this characteristic IR absorption is an excellent tool for differentiation of 2,5-dihydropyrimidines from other possible isomeric dihydropyrimidines. In addition, all 4,6-dialkoxy-2,5-dihydropyrimidines exhibit a single absorption in their UV spectra between 201–205 nm. In the mass spectral (MS) determinations, the parent ion was usually not detected, but rather the M^{-1} peak, indicating the ease of hydrogen abstraction assumedly from position 5, followed by formation of a stable "homoaromatic" 6π-electron system.

2,5-Dihydropyrimidines containing electron-donating substituents at positions 4 and 6 exist as stable solid and liquid compounds that can be stored for long periods without deterioration. Under the influence of oxygen and/or light, they undergo slow decomposition. One interesting feature of these compounds is their ease of sublimation, even at room temperature. For this reason, there is a marked difference between the isolated and spectroscopically or chromatographically measured yields.

In order to understand the unusual ease of sublimation of most 2,5-dihydropyrimidines, as well as to precisely define their molecular structures, it was desirable to perform X-ray diffraction analysis. After numerous attempts, we successfully prepared single crystals of 4,6-diethoxy-2,5-dihydropyrimidine by repeated room temperature, slow vacuum sublimation across a small temperature gradient (10–15 °C). Low-temperature, X-ray diffraction (liquid nitrogen) showed the molecule to be planar (Figure 2). No hydrogen bonding or other interaction between the stacked planes was observed, presumably leading to the ease of sublimation of this family of compounds.

The chemical properties of 2,5-dihydropyrimidines are presently under investigation. Preliminary results indicate that their p*K*a's are very similar to those of malonic esters, thus enabling the easy regiospecific preparation of five mono- and/or disubstituted derivatives. Another interesting feature of 4,6-dialkoxy derivatives is lactim–lactam-type rearrangement observed during thermolysis (230–270 °C). This rearrangement also operates in the case of crown ether analogues of 2,5-dihydropyrimidines, representing an entirely new avenue in the synthesis of novel host–guest ligands.[29]

Experimental Section

Melting points were taken on a modified Fisher-Johns apparatus fitted with a thermocouple and digital thermometer (Lauda) and are uncorrected. UV spectra were recorded on a Uvikon 810

UV-Kontron spectrophotometer. Infrared spectra were measured with a Nicolet MX-1 Fourier transform spectrometer. Proton NMR spectra were measured with Varian FT-80A and WH-270 Bruker Fourier transform spectrometers. All chemical shifts are reported in units downfield from the internal standard Me_4Si, and the J values are given in hertz. Mass spectra were determined with an Atlas MAT-731 or MAT-CH-4 spectrometer. Microanalyses were performed by the microanalytical laboratory at the Weizmann Institute of Science.

4,6-Diphenyl-1,2-dihydropyrimidine (3A). Five grams (20 mmol) of 4,6-diphenylpyrimidine-2(1*H*)-one (1) was added with constant stirring to a suspension of 1.8 g (45 mmol) of $LiAlH_4$ in 50 mL of dry ether and 100 mL of dry dioxane. The ether was evaporated and the reaction mixture was boiled at 130 °C for 15 h, during which the formation of compound **3A** was monitored hourly by TLC (SiO_2, ethyl acetate). The reaction mixture slowly changed color to gray-green. The solvent was evaporated under reduced pressure, ether was added, and the unreacted $LiAlH_4$ was destroyed by the usual procedure. The ethereal layer evaporated and 4.5 g of brown-yellow solid was purified by column chromatography on SiO_2 (benzene–ethyl acetate). The yellow fraction was quickly evaporated at room temperature under reduced pressure. The yellow solid of **3A** was recrystallized from hexane, mp 110–111 °C: λ_{max}^{EtOH} (ϵ) 207 nm (17 000), 253 (15 000), 377 (6390). Single crystals of **3A** were grown by slow evaporation from hexane for X-ray diffraction study.[23] Anal. Calcd for $C_{16}H_{14}N_2$: C, 82.02; H, 6.0. Found: C, 82.05; H, 6.04.

General Procedure for Preparation of 2,5-Dihydropyrimidines. A 10-mmol solution of the starting pyrimidine in 15 mL of dry tetrahydrofuran (THF) was slowly added dropwise to a preheated suspension of 25 mmol of $LiAlH_4$ in 60 mL of THF. The mixture was refluxed until complete disappearance of the pyrimidine. The progress of the reaction was monitored by TLC on silica gel plates (HPTLC Kieselgel 60F 254, Merck, mobile phase ethyl acetate). The solvent was evaporated to dryness, 100 mL of ether was added, and excess $LiAlH_4$ was destroyed by the usual procedure (subsequent addition of 1 mL of H_2O, 1 mL of 15% NaOH, and 3 mL of H_2O). After filtration, drying the ethereal layer over $MgSO_4$, and evaporation of the ether, the crude 2,5-dihydropyrimidine was obtained in nearly quantitative yield, which was further purified by column chromatography or sublimation.

4-Methoxy-6-phenyl-1,2(2,5)-dihydropyrimidine (4): 94% yield, mp 111–113 °C. ^1H NMR ($CDCl_3$): 1,2-dihydro form, 3.83 (s, 3 H), 3.83 (s, 2 H), 5.42 (s, 1 H); 2,5-dihydro form, 3.78 (3, 3 H), 3.09 (t, 2 H, 5.5 Hz), 5.55 (t, 2 H, 5.5 Hz); the ratio between 1,2/2,5 is 1:6. $(CH_3)_2SO$-d_6: 1,2-dihydro form, 3.69 (s, 3 H), 4.71 (s, 2 H), 5.24 (s, 1 H); 2,5-dihydro form, 3.58 (s, 3 H), 3.22 (t, 2 H, 5.5 Hz), 5.43 (t, 2 H, 5.5 Hz); the ratio between 1,2/2,5 is 8:1. In both solvents at 7.37–7.94, a multiplet of aromatic protons appeared. Mass spectrum: m/e 187 [$(M - 1)^+$]. Anal. Calcd for $C_{11}H_{12}N_2O$: C, 70.19; H, 6.43; N, 14.88. Found: C, 70.03; H, 6.28; N, 14.67.

4,6-Bis(phenylthio)-1,2(2,5)-dihydropyrimidine (5): 98% yield, mp 152–153 °C. ^1H NMR ($CDCl_3$): 1,2-dihydro form, 4.63 (s, 2 H), 5.06 (s, 1 H); 2,5-dihydro form, 2.75 (t, 2 H, 5.5 Hz), 5.25 (t, 2 H, 5.5 Hz), 7.32–7.34 (m, Ar). $(CH_3)_2SO$-d_6: 1,2-dihydro form, 4.47 (s, 2 H), 4.75 (s, 1 H), 7.38 (s, 5 H); 2,5-dihydro form, 2.93 (t, 2 H, 5.5 Hz), 5.11 (t, 2 H, 5.5 Hz), 7.38 (s, 5 H). Mass spectrum: m/e 297 [$(M - 1)^+$]. Anal. Calcd for $C_{16}H_{14}N_2S_2$: C, 64.40; H, 4.73; N, 9.39. Found: C, 64.17; H, 4.52; N, 9.11.

4,6-Bis(ethylthio)-2,5-dihydropyrimidine (6): 79% yield, mp 39–40 °C. ^1H NMR ($CDCl_3$): 1.27 (t, 6 H, 7 Hz), 2.86 (t, 2 H, 5.5 Hz), 2.97 (q, 4 H, 7 Hz), 5.34 (t, 2 H, 5.2 Hz). IR (KBr): 1662, 1627. Mass spectrum: m/e 201 [$(M - 1)^+$]. Anal. Calcd for $C_8H_{14}N_2S_2$: C, 47.49; H, 6.97; N, 13.85. Found: C, 47.22; H, 7.02; N, 13.57.

4,6-Dimethoxy-2,5-dihydropyrimidine (7): 92% yield, mp 48–50 °C. ^1H NMR ($CDCl_3$): 2.67 (t, 2 H, 5.5 Hz), 3.73 (s, 3 H), 5.22 (t, 2 H, 5.5 Hz). IR (KBr): 1676, 1723. UV (C_2H_5OH): 202 (2040). Mass spectrum: m/e 741 [$(M - 1)^+$]. Anal. Calcd for $C_6H_{10}N_2O_2$: C, 50.69; H, 7.09; N, 19.70. Found: C, 50.55; H, 7.02 N, 19.78.

4,6-Dipropoxy-2,5-dihydropyrimidine (8): 87% yield, oil. ^1H NMR ($CDCl_3$): 0.95 (t, 6 H), 1.56 (m, 4 H), 2.66 (t, 4 H, 5.5 Hz), 4.06 (t, 2 H), 5.19 (t, 2 H, 5.5 Hz). IR (film): 1676, 1719. UV (C_2H_5OH): 203 (1930). Mass spectrum: m/e 197 [$(M - 1)^+$]. Anal. Calcd for $C_{10}H_{18}N_2O_2$: C, 60.58; H, 9.15; N, 14.13. Found: C, 60.41; H, 9.02; N, 14.08.

4,6-Di-*n*-butoxy-2,5-dihydropyrimidine (9): 85% yield, oil. ^1H NMR ($CDCl_3$): 0.93 (t, 6 H), 1.18–1.74 (m, 8 H), 2.65 (t, 4 H, 5.5 Hz), 4.10 (t, 2 H), 5.19 (t, 2 H, 5.5 Hz). IR (film): 1674, 1719. UV (C_2H_5OH): 203 (2990). Mass spectrum: m/e 225 [$(M - 1)^+$]. Anal. Calcd for $C_{12}H_{22}N_2O_2$: C, 63.69; H, 9.80; N, 12.38. Found: C, 63.47; H, 9.69; N, 12.24.

4,6-Di-*tert*-butoxy-2,5-dihydropyrimidine (10): 72% yield, mp 63–64 °C. ^1H NMR ($CDCl_3$): 1.47 (s, 18 H), 2.40 (t, 2 H, 5.5 Hz), 5.12 (t, 2 H, 5.5 Hz). IR (KBr): 1670, 1709. Mass spectrum: m/e 225 [$(M - 1)^+$]. Anal. Calcd for $C_{12}H_{22}N_2O_2$: C, 63.69; H, 9.80; N, 12.38. Found: C, 63.72; H, 9.71; N, 12.29.

4,6-Bis(2′-ethoxyethoxy)-2,5-dihydropyrimidine (11): 83% yield, *oil.* ^1H NMR ($CDCl_3$): 1.14 (t, 6 H, 7 Hz), 2.69 (6, 2 H, 5.6 Hz), 3.48 (q, 4 H, 7 Hz), 3.60 (t, 4 H), 4.20 (t, 4 H), 5.10 (t, 2 H, 5.5 Hz). Mass spectrum: m/e 257 [$(M - 1)^+$]. Anal. Calcd for $C_{12}H_{22}N_2O_4$: C, 55.80; H, 8.59; N, 10.84. Found: C, 55.58; H, 8.40; N, 10.56.

4,6-Diethoxy-2,5-dihydropyrimidine (12): 95% yield, mp 72–73 °C. ^1H NMR ($CDCl_3$): 1.28 (t, 6 H, 7 Hz), 2.65 (t, 2 H, 5.6 Hz), 5.19 (t, 2 H, 5.6 Hz). IR (KBr): 1676, 1727. UV (C_2H_5OH): 202 (2160). Mass spectrum: m/e 169 [$(M - 1)^+$]. Anal. Calcd for $C_8H_{14}N_2O_2$: C, 56.45; H, 8.29; N, 16.46. Found: C, 56.42; H, 8.21; N, 16.56.

Crystal data: $C_8H_{14}N_2O_2$, M_r = 160.0, orthorhombic a = 12.809 (3), b = 17.316 (3), c = 3.918 (1) Å, V = 869 Å^3 (by least-squares refinement on diffractometer angles for 25 automatically centered reflections, λ = 0.71069 Å), space group $Pna2_1$, Z = 4, D_x = 1.20 g cm^{-3}; transparent needles of poor quality.

Data Collection and Processing. CAD4 diffractometer, $\omega/2\theta$ mode with ω scan width = 0.80 + 0.35 tan, constant ω scan speed 3.3°/min, graphite-monochromatic Mo Kα radiation; low-temperature device (82 K), 996 unique reflection measured ($2° \leq \theta \leq 27°$, h,k,l), giving 684 with $F_o > 3\ \sigma(F_o)$.

Structure Analysis and Refinement. Direct methods followed by full-matrix least-squares refinement with anisotropic temperature factors for non-hydrogen atoms and isotropic for hydrogens (found from a difference Fourier map). Due to high anisotropic mosaic spread of reflections the anisotropic scale factor was applied (refined values K_{11} = 0.853 (2), K_{22} = 1.105 (2), K_{33} = 0.997 (2), K_{12} = –0.196 (2), K_{13} = –0.235 (2), K_{23} = –0.0940 (2)). The weighting scheme $w = 4.111/[\sigma^2(F_o) + 0.00059F_o]$, with $\sigma(F_o)$ from counting statistics, gave satisfactory agreement analyses. Final R and R_w values are 0.082 and 0.087, respectively. All calculations were performed with SHELX-76 package of crystallographic programs.[30]

Supplementary Material Available: Tables of atomic coordinates (Table I), anisotropic temperature factors (Table II), hydrogen atom coordinates and isotropic temperature factors (Table III), bond lengths (Table IV), and bond angles (Table V) for 2,5-dihydropyrimidine **12** (5 pages). Ordering information is given on any current masthead page.

(30) Sheldrick, G. M. SHELX-76, Program for Crystal Structure Determinations, University of Cambridge, 1976.