acid chlorides prepared from the carboxylic acids were condensed with secondary amines to give the corresponding 3-carbamoyl derivatives in good yield, respectively.

Diethylamine, pyrrolidine, piperidine, and morpholine were used as secondary amines.

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182. Torahiko Kishikawa,*1 Tsuyoshi Yamazaki,*2 and Hidetaka Yuki*3 : Studies on Chemotherapeutic Agents. I. A Synthesis of Pyrimidine Nucleosides of D-glucuronic Acid and Its Derivatives.[1]

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A large number of papers dealing with investigation of nucleosides have appeared, since some of synthetic nucleosides and antibiotic nucleosides isolated from various species have been shown to exhibit the anti-bacterial, -viral, and -tumor activities. From chemotherapeutic point of view, it is of great interest and importance to synthesize their analogues as well as biologically active nucleosides.

On these lines, antibiotic nucleosides, *e.g.* cordycepin,[2~4] angustmycin,[5~6] puromycin[7~8] etc. have been extensively studied and elucidated to contain a variety of pentoses or hexoses as sugar moiety, and syntheses of them and of their analogues have been presented.

But there had been no report of pyrimidine nucleoside containing hexuronic acid or its derivatives as sugar component, except Goodman's[9] report for the synthesis of nucleosides of uracil and thymine containing glucuronic acid and galacturonic acid by Hilbert-Johnson reaction,[10] he did not give any results of this reaction.

On the other hand, Kanzaki, *et al.*[11] isolated a new type antibiotic, gougerotin from *Streptococcus gougerotii* in 1962, and showed that it exhibited a broad spectrum anti-bacterial activity. The structure of this antibiotic was deduced to be a cytosine nucleoside[12,13] containing an aminouronic acid as the sugar component. Therefore, hexuronic acid and amino hexuronic acid nucleosides of pyrimidines and purines have now turned out to be particularly interesting and important from biological view

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points. In order to investigate the biological activities of purine and pyrimidine nucleosides of hexuronic acid and its derivatives, the authors have been engaged in the syntheses of these nucleosides as a part of studies on chemotherapeutic agents. Previous studies have been restricted to uracil and cytosine nucleosides. This paper deals with pyrimidine glucuronic acid nucleosides including previously synthesized nucleosides.

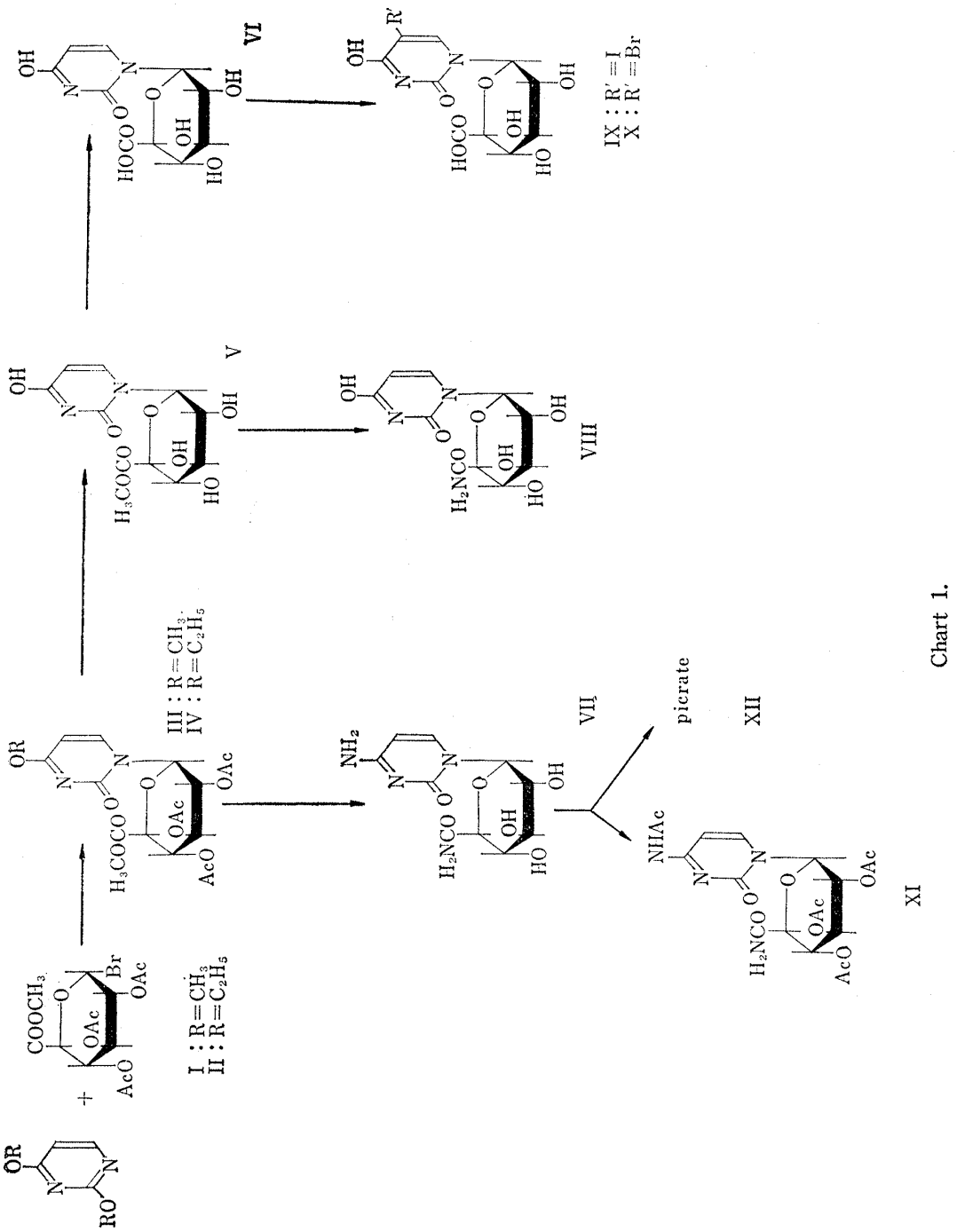

Chart 1.

Many nucleosides have been prepared by fusion reaction[14~19] for the synthesis of pyrimidine nucleosides deviced originally by Hilbert and Johnson.[10] The method of Hilbert and Johnson for the synthesis of pyrimidine nucleosides was followed with a slight modification. The authors' attempts to condense 2,4-dimethoxypyrimidine (I),

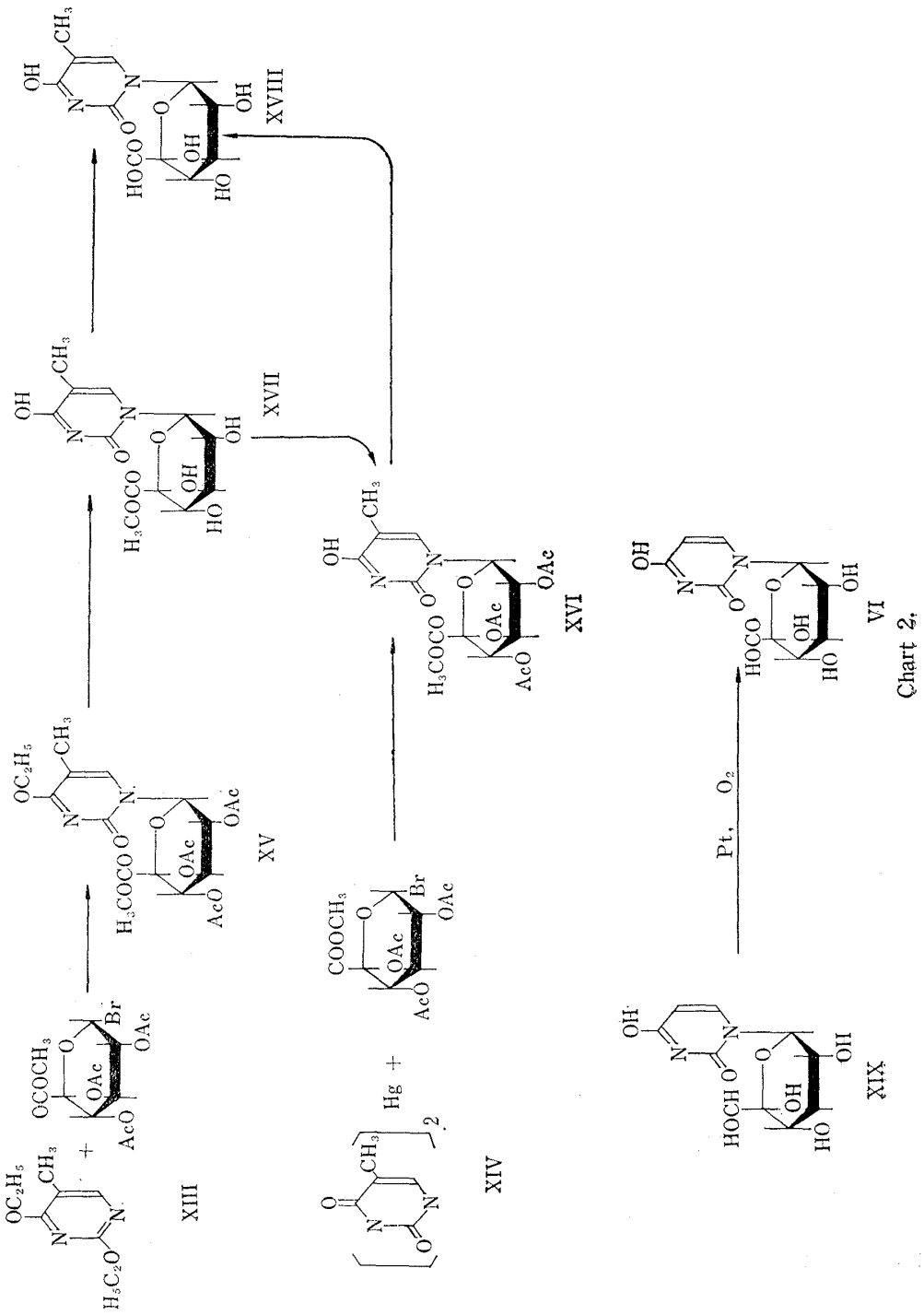

Chart 2.

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2,4-diethoxypyrimidine (II) or 5-methyl-2,4-diethoxypyrimidine (XIII) with methyl 1-bromo-1-deoxy-2,3,4-tri-O-acetyl-α-D-glucopyranuronate at 75° for 70~96 hours were also effected (Chart 1 and 2), and colorless crystalline masses separated. After treatment with absolute ether, methyl 1-deoxy-1-(2-oxo-4-methoxy-1,2-dihydro-1-pyrimidinyl)-2,3,4-tri-O-Acetyl-β-D-glucopranuronate (III), methyl 1-deoxy-1-(2-oxo-4-ethoxy-1,2-dihydro-1-pyrimidinyl)-2,3,4-tri-O-acetyl-β-D-glucopyranuronate (IV) and methyl 1-deoxy-1-(2-oxo-4-ethoxy-5-methyl-1,2-dihydro-1-pyridinyl)-2,3,4-tri-O-acetyl-β-D-glucopyranuronate (XV) were obtained in 58.5, 54.7 and 41.6%, respectively, based on acetobromoglucuronic acid. III, IV and XV were then treated with dried hydrogen chloride in anhyd. methanol. After the solvent was completely removed *in vacuo*, methyl 1-deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronate (V) and methyl 1-deoxy-1-(5-methyl-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronate (XVII) were crystallized from ethanol and water. The yields were 88% from III, 90% from IV, and 83% from XV.

V and XVIII were hydrolyzed with 0.1*N* sodium hydroxide at room temperature followed by passing through a column of Amberlite IR-120 (H^+) and evaporating the effluent, leaving an amorphous powder of 1-deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronic acid (VI) and 1-deoxy-1-(5-methyl-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronic acid (XVIII). XVIII could be also obtained by alkaline hydrolysis as described above of methyl 1-deoxy-1-(5-methyl-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-2,3,4-tri-O-acetyl-β-D-glucopyranuronate (XVI). XVI was formed from acetobromoglucuronic acid by application of dithyminylmercury procedure of Fox and co-workers,[20] which involved addition of 2-moles of the bromosugar to a suspension of dithyminylmercury in refluxing toluene. 1-Deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronamide (VIII) was obtained from V by treatment with methanolic ammonia in a quantitative yield.

On treatment with ammoniacal ethanol at 80° for 96 hours, IV was simultaneously deacetylated and ammonolyzed to afford 1-deoxy-1-(2-oxo-4-amino-1,2-dihydro-1-pyrimidinyl)-β-D-glucopyranuronamide (VII) in 92% yield. Colorless crystals with ethanol and water of crystallization separated. VII readily yields its picrate (XII) and acetylated derivative (XI).

Bromination of VI was carried out with bromine water.[10] 1-Deoxy-1-(5-bromo-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronic acid (X) separated as colorless needles in 62.5% yield.

VI was also readily iodinated by Prusoff method,[21] which was used for the synthesis of 5-indo-uridine. After the iodination had been complete, extraction of aqueous layer with ether several times, and concentration of the colorless solution *in vacuo* gave a residue which was recrystallized from water as needles in 59% yield.

As to the position and configuration of the glycosidic linkage in the pyrimidine nucleosides of glucuronic acid and its derivatives mentioned above, it seems likely that these nucleosides have structures of 1-β-D-glycosides, because synthetic methods of these nucleosides are analogous to those of 1-β-D-glycosyluracil and -cytosine, whose structures have been unambiguously established. Furthermore, this is supported by the generally accepted C-1, 2-trans rule,[22] which is applicable to the synthesis of nucleosides by Hibert-Johnson and Fischer-Helferich's reactions. This assumption was confirmed by obtaining exactly the same compound by O_2-oxidation of 1-β-D-glycosyluracil in the presence of Pt-catalyst, identifying by measurements of melting point, $[\alpha]_D$ and infrared spectra of those prepared by two different synthetic routes.

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21) W. H. Prusoff, *et al.*: Cancer Research, **13**, 221 (1953).
22) W. Pigman: "The carbohydrate," p. 188 (1957), Academic Press Inc., New York.

Though these nucleosides prepared are a type of N-glucuronide, they are very stable for the acidic and alkaline hydrolysis. For example, no uracil was released from VI after refluxing for 30 minutes in 1*N* hydrochloric acid or 1*N* sodium hydroxide solution. Hydrolysis of VI with beef's liver and bacterial β-glucuronidases was also studied because it was suggested[23,24] that sulfonamide-N^1-glucuronides were slowly hydrolysed by β-glucuronidase, but a detectable amount of uracil was not formed. Ultraviolet spectra of them closely resemble those of naturally occurring uridine, cytidine and thymidine at various pH ranges. The details of biological evaluation for the compounds synthesized will be reported elsewhere.

Experimental*4

Methyl 1-Deoxy-1-(2-oxo-4-methoxy-1,2-dihydro-1-pyrimidinyl)-2,3,4-tri-O-acetyl-β-D-glucopyranuronate (III)——2,4-Dimethoxypyrimidine (4 g.) was added to methyl 1-bromo-1-deoxy-2,3,4-tri-O-acetyl-α-D-glucopyranuronate (4 g.) and heated in an oven at 75° for 70 hr.

After about 20 hr., colorless needles bagan to separate and the reaction mixture solidified to a light brown crystalline mass. The crystalline mass was then triturated with 10 ml. of anhyd. ether and cooled. The crystals were collected and washed three times with 10 ml. portions of water to remove 1-methyluracil. Recrystallization from EtOH afforded 2.5 g. (58.5%) of colorless needles, m.p. 247～248°: $[\alpha]_D^{23}$ +46° (c=1.01, $CHCl_3$); UV: λ_{max}^{EtOH} 276.5 mμ (ε, 5690); λ_{min}^{EtOH} 238.5 mμ (ε, 1420). *Anal.* Calcd. for $C_{18}H_{22}O_{11}N_2$: C, 48.87; H, 5.01; N, 6.33. Found: C, 49.04; H, 4.86; N, 6.13.

Methyl 1-Deoxy-1-(2-oxo-4-ethoxy-1,2-dihydro-1-pyrimidinyl)-2,3,4-tri-O-acetyl-β-D-glucopyranuronate (IV)——Methyl 1-bromo-1-deoxy-2,3,4-tri-O-acetyl-α-D-glucopyranuronate (4 g.) was suspended in 2,4-diethoxypyrimidine (4 g.) and heated at 75° for 70 hr. The suspension became a clear solution in 2 hr. and solidified to a colorless crystalline mass. After trituration with absolute ether, the insoluble material was recrystallized from EtOH in colorless needles. Yield, 2.3 g. (54.7%), m.p. 208～209°; $[\alpha]_D^{23}$ +57.3° (c=1.16, MeOH); UV: λ_{max}^{EtOH} 276.5 mμ (ε, 5490); λ_{min}^{EtOH} 240 mμ (ε, 1550). *Anal.* Calcd. for $C_{19}H_{24}O_{11}N_2$: C, 49.99; H, 5.29; N, 6.14. Found; C, 49.90; H, 5.07: N, 5.94.

Methyl 1-Deoxy-1-(2-oxo-4-ethoxy-5-methyl-1,2-dihydro-1-pyrimidinyl)-2,3,4-tri-O-acetyl-β-D-glucopyranuronate (XV)——Methyl 1-bromo-1-deoxy-2,3,4-tri-O-acetyl-α-D-glucopyranuronate (4 g.) and 5-methyl-2,4-diethoxypyrimidine (4. g) were mixed and heated at 75° under a reduced pressure (2～3 mm.Hg) for 96 hr. In this case crystals were not separated and a pasty mass was obtained. Recrystallization from aq. EtOH gave 2 g. (41.6%) of colorless fine needles. m.p. 88～91°; $[\alpha]_D^{23}$ + 33° (c=1.00, MeOH), UV: λ_{max}^{MeOH} 283 mμ (ε, 5990); λ_{min}^{MeOH} 240 mμ (ε, 1520). *Anal.* Calcd. for $C_{20}H_{26}O_{11}N_2 \cdot H_2O$: C, 50.10; H, 5.85; N, 5.85. Found: C, 50.28; H, 5.68; N, 5.72.

Methyl 1-Deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronate (V)——a) A solution of 1.5 g. of IV in 15 ml. of hot absolute MeOH was treated with 5 ml. of 25% HCl in EtOH and allowed to stand at room temperature overnight.

The solvent and HCl were fairly well removed *in vacuo* at 40° and the resulting amorphous powder was recrystallized from EtOH or water. Colorless needles were obtained. Yield, 0.98 (90%), m.p. 149～152°; $[\alpha]_D^{23}$ −2.2 (c=2.69, MeOH); UV; λ_{max}^{MeOH} 258.5 mμ (ε, 8400): λ_{min}^{MeOH} 228.5 mμ (ε, 2370). *Anal.* Calcd. for $C_{11}H_{14}O_8N_2 \cdot H_2O$: C, 41.26; H, 5.06: N, 8.75. Found: C, 41.10; H, 4.86; N, 8.56.

b) V was also obtained in 88% yield from III by the same procedure described above.

1-Deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronic Acid (VI)——V (1.0 g.) was dissolved in 50 ml. of 0.2*N* sodium hydroxide and left standing at room temperature for several hr. followed by passing through a column of 15 ml. of Amberlite IR-120 (H^+). The effluent and washings were concentrated to a small volume at 40° to afford 0.8 g. (84%) of an amorphous powder. On recrystallization from water, a white crystalline mass was separated. m.p. 277～278° (decomp.); $[\alpha]_D^{23}$ +12.8° (c=1.08, H_2O). UV: $\lambda_{max}^{H_2O}$ 260 mμ (ε, 12240); $\lambda_{min}^{H_2O}$ 228.5 mμ (ε, 2410). *Anal.* Calcd. for $C_{10}H_{12}O_8N_2$: C, 41.67; H, 4.20; N, 9.72. Found: C, 42.03; H, 4.24; N, 9.96.

1-Deoxy-1-(2-oxo-4-amino-1,2-dihydro-1-pyrimidinyl)-β-D-glucopyranuronamide (VII)——A mixture of IV (1.5 g.) and 15 ml. of anhyd. EtOH saturated with NH_3 at 0° was heated in a sealed glass tube at 78° for 80° hr. The reaction mixture was cooled and the supernatant was discarded by decantation. The residual sirup (which in part separated as colorless clusters of prism) was dissolved in a small volume of water and EtOH was added to this solution until a faint turbidity occurred. Upon standing at room temperature for several days, colorless crystals with EtOH and water of crystallization separated. Yield,

*4 All melting points are uncorrected.

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24) J. W. Bridges, M. R. Kibby, R. T. Kibby, R. T. Williams: Biochem. J., **96**, 829 (1965).

0.97 g. (92%) m.p. 233~237° (decomp.); $[\alpha]_D^{23}$ +15.0° (c=0.92, H_2O); UV : $\lambda_{max}^{H_2O}$ 269 mμ (ε, 8250), 238.5 mμ (ε, 7950); $\lambda_{min}^{H_2O}$ 253 mμ (ε, 7410); $\lambda_{max}^{pH\ 1.2}$ 276.5 mμ (ε, 12100); $\lambda_{min}^{pH\ 1.2}$ 240.5 mμ (ε, 2370); $\lambda_{max}^{pH\ 12.6}$ 269 mμ (ε, 8210); 236.5 mμ (ε, 7790); $\lambda_{min}^{pH\ 12.6}$ 253 mμ (ε, 7220). *Anal.* Calcd. for $C_{10}H_{14}O_6N_4 \cdot 1/2\ H_2O \cdot 1/2$ EtOH : C, 41.51; H, 5.70; N, 17.60. Found : C, 41.32; H, 5.64; N, 17.81.

Picrate of VII (XII)——A solution of picric acid (1.5 g.) in 60% EtOH (50 ml.) was added to a solution of VII (1.0 g.) in water (1~2 ml.). The solution was allowed to stand at room temperature and then cooled, yellow needles separated. Recrystallization from aq. EtOH afforded 1.5 g. (90%) of yellow needles. m.p. 242~243° (decomp.). *Anal.* Calcd. for $C_{16}H_{17}O_{13}N_7$: C, 37.30; H, 3.32; N, 19.03. Found : C, 37.37; H, 3.56; N, 19.22.

Tetra-acetate of VII (XI)——VII (1.0 g.) was suspended in a mixture of Ac_2O (4 ml.) and pyridine (5 ml.) at room temperature. VII gradually dissolved and a clear solution was obtained for two days. The solution was poured onto 20 g. of crushed ice, crystalline materials precipitated. This precipitate was collected, washed with a small volume of cold water and then dried. Recrystallization from EtOH gave 1.2 g. (80%) of fine needles. m.p. 262~263° (decomp.); $[\alpha]_D^{20}$ +74.9° (c=0.90, 50% EtOH); UV : $\lambda_{max}^{50\%\ EtOH}$ 300 mμ (ε, 7060), 250.5 mμ (ε, 16880); $\lambda_{min}^{50\%\ EtOH}$ 277 mμ (ε, 5240), 226 mμ (ε, 4960). *Anal.* Calcd. for $C_{18}H_{22}O_{10}N_4 \cdot H_2O$: C, 45.77; H, 5.13; N, 11.86. Found : C, 45.91; H, 5.13; N, 12.01.

1-Deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronamide (VIII)——V (1.6 g.) was dissolved in 20 ml. of MeOH and saturated with dried NH_3 at 0°. The solvent and NH_3 were completely removed *in vacuo* at 40°, a white amorphous powder was obtained. Recrystallization from aq. EtOH gave 1.57 g. (98%) of VIII in colorless needles. m.p. 76~78°; $[\alpha]_D^{23}$ + 30.1° (c=1.06, H_2O); UV : $\lambda_{max}^{H_2O}$ 258.5 mμ (ε, 10560), $\lambda_{min}^{H_2O}$ 228.5 mμ (ε, 2630). *Anal.* Calcd. for $C_{10}H_{13}O_7N_3 \cdot 2H_2O$: C, 37.15; H, 5.30; N, 13.00. Found : C, 36.90; H, 5.34; N, 13.40.

1-Deoxy-1-(5-iodo-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronic Acid (IX)——A mixture of 1.0 g. of VI, 1.0 g. of I_2, 10 ml. of 1*N* HNO_3 was refluxed for 3 hr. After cooling and filtering the reaction mixture to remove excess I_2, the aq. layer was separated from $CHCl_3$ layer and extracted free of I_2 with ether. The colorless solution was evaporated to dryness *in vacuo* at 40~45° and the gummy residue was dissolved in water and evaporated. Water addition and removal were repeated three times. Finally, the residue was dissolved in hot water, treated with charcoal, concentrated to 1~2 ml. under a reduced pressure at temperature below 50° and allowed to stand in a refrigerator. Colorless needles separated. Yield, 0.9 g. (62.5%). m.p. 257~259°; $[\alpha]_D^{22}$ +15.4° (c=1.40, H_2O) : UV : $\lambda_{max}^{H_2O}$ 283 mμ (ε, 7090); $\lambda_{min}^{H_2O}$ 240 mμ (ε, 2770). *Anal.* Calcd. for $C_{10}H_{11}O_8N_2I$: C, 29.00; H, 2.68; N, 6.77. Found : C, 28.81; H, 2.50; N, 6.88.

1-Deoxy-1-(5-bromo-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronic Acid (X)——VI (1.0 g.) was treated with Br_2 water saturated at 5° until the solution had a permanent pale yellow color. Air was bubbled through the solution to remove excess Br_2 and the resulting colorless solution was evaporated to dryness under a diminished pressure. Sirupy residue remained, which was dissolved in a small volume of hot water and allowed to stand in a refrigerator. 0.75 g. (58.7%) of X was obtained in needles. m.p. 213~219°; $[\alpha]_D^{22}$ +10.3° (c=1.30, H_2O); UV : $\lambda_{max}^{H_2O}$ 277 mμ (ε, 9100); $\lambda_{min}^{H_2O}$ 241 mμ (ε, 2060) *Anal.* Calcd. for $C_{10}H_{11}O_8N_2Br$: C, 32.71; H, 3.00; N, 7.63. Found : C, 32.34; H, 2.80; N, 7.18.

Methyl 1-Deoxy-1-(5-methyl-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-2,3,4-tri-O-acetyl-β-D-glucopyranuronate (XVI)——a) Pulverized dithyminylmercury (9. g) was suspended in 300 ml. of anhyd. toluene and dried azeotropically by distillation of approximately 100 ml. of the solvent. Methyl 1-bromo-1-deoxy-2,3,4-tri-O-acetyl-α-D-glucopyranuronate (16 g.) was in three portions added to above suspension with vigorous stirring and refluxed for 3 hr. Within 1 hr. most of the suspension had dissolved. The hot solution with a pale brown color was filtered from trace of dithyminylmercury and the cooled filtrate was treated with petr. ether. The precipitate was collected, dissolved in $CHCl_3$ and filtered from small amount of insoluble materials. The $CHCl_3$ solution was washed with 30% KI solution and with water three times respectively and dried over Na_2SO_4. Removal of the solvent on a water bath *in vacuo* left a sirupy residue which was recrystallized from MeOH in a yield of 27% (5 g.), m.p. 232~233°; $[\alpha]_D^{22}$ +3.6° (c=2.50, $CHCl_3$); UV : λ_{max}^{MeOH} 261.5 mμ (ε, 10150); λ_{min}^{MeOH} 232.5 mμ (ε,3470). *Anal.* Calcd. for $C_{13}H_{22}O_{11}N_2$: C, 48.87; H, 5.01; N, 6.33. Found : C, 49.26; H, 4.68; N, 6.09.

b) XVII (0.5 g.) was dissolved in a mixture of pyridine (2 ml.) and Ac_2O (2 ml.) and left standing overnight. The reaction mixture was added to 10 ml. of ice water. The precipitate was collected and recrystallized from MeOH in fine needles. Yield, 0.45 g., m.p. 234~235°, which undepressed on admixture with the product prepared by Fox's dithyminyl mercury procedure described above. $[\alpha]_D^{23}$ +4.1° (c=1.34, $CHCl_3$).

1-Deoxy-1-(5-methyl-2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranuronic Acid (XVIII)——a) A solution of XV (2.0 g.) in warm absolute MeOH (20 ml.) was treated with 6.5 ml. of 25% HCl in EtOH and left standing at room temperature overnight. Complete removal of the solvent and HCl gave an amorphous powder which was dissolved in 0.2*N* NaOH solution (14 ml.) for 6~7 hr. followed by passing through a column of 30 ml. of Amberlite IR-120 (H^+). The effluent and washings were combined and evaporated to dryness at 40° *in vacuo*, leaving a crude product of XVIII which on recrystallization from EtOH~ether~water was separated as white crystalline crops. Yield, 0.9 g. (61.5% from XV). m.p. 268~

269° (decomp.); $[\alpha]_D^{22}$ +11° (c=1.00, H_2O); UV; $\lambda_{max}^{H_2O}$ 265 mμ (ε, 11890); $\lambda_{min}^{H_2O}$ 233.5 mμ (ε, 3060). *Anal.* Calcd. for $C_{11}H_{14}O_8N_2 \cdot C_2H_5OH \cdot 1/2H_2O$: C, 43.60; H, 5.77; N, 7.82. Found: C, 43.73; H, 5.91; N, 8.18.

b) XVIII was also obtained from XVI in a yield of 80% by the same procedure described for the synthesis of VI by alkaline hydrolysis of V.

Oxidation of 1-Deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranose (XIX) with a Stream of Oxygen——A solution of XIX (0.28 g.) in water (100 ml.) was oxidized with a stream of purified O_2 in the presence of a Pt-catalyst (prepared from Adam's platinum-oxide (0.15 g.) by hydrogenation in an usual procedure) at 60~65° for 50 hr., neutrality or mild alkalinity being maintained by addition of 0.5*N* $NaHCO_3$ until the reaction was completed. The catalyst was removed by filtration, and the filtrate was passed through a column of Amberlite IR-120 (H^+). The effluent and washings were combined and evaporated at 40° *in vacuo*, giving a crude gummy product which on twice recrystallization from water had m.p. 277~278° (decomp.). Yield, 0.12 g. (42%). $[\alpha]_D^{23}$ +11.3 (c=0.82, H_2O). No depression of melting point was observed on admixture with VI prepared by Hilbert-Johnson's method in Chart 2, IR spectra and $[\alpha]_D$ of both compounds were identical.

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Summary

D-Glucuronic acid nucleotides of uracil (VI, VIII), thymine (XVIII), cytosine (VII), 5-bromo- and 5-iodo-uracil (IX, X) were prepared by Hilbert-Johnson and Fox's procedures for the syntheses of pyrimidine nucleosides. VI was also obtained from 1-deoxy-1-(2,4-dioxo-1,2,3,4-tetrahydro-1-pyrimidinyl)-β-D-glucopyranose by O_2-oxidation in the presence of Pt-catalyst. The structure and properties of the nucleosides synthesized were briefly discussed.

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183. Torahiko Kishikawa*1 and Hidetaka Yuki*2 : Studies on Chemotherapeutic Agents. II.*3 A Synthesis of Purine Nucleosides of D-Glucuronic Acid.

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A new nucleoside-type antibiotic, gougerotin, which had been recently isolated from *Streptococcus gougerotii*[1] was found to show a broad spectrum anti-bacterial activity and to contain an amino-uronic acid as the sugar moiety in cytidine-like structure.[2]

Though it has been well known that some of synthetic nucleosides and antibiotic nucleosides exhibit biological activities against various bacteria, viruses and tumors, there has been little report on a study of nucleosides containing hexuronic acid or their derivatives[3] as a sugar component.

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