(30%, calculated on the uracil taken for the reaction). It was crystallized from ethanol.

N_1-(α-Butyrolactono)-5-chlorouracil (IV). A suspension of 1 g (0.005 mole) of I in 60 ml of glacial acetic acid containing 1.2 ml of acetic anhydride was heated at 80° C until the I had dissolved and was then cooled to 55° C and treated with 0.8 g (0.006 mole) of N-chlorosuccinimide, after which the mixture was kept at 50°-55° C for 9 hr and cooled, and the precipitate that deposited was filtered off. Yield 0.74 g (60%). It was crystallized from water.

N_1-(α-Butyrolactono)-5-bromouracil (V). A suspension of 1 g (0.005 mole) of I in 50 ml of acetic acid was heated to 55° C and a solution of 1 g (0.006 mole) of bromine in 5 ml of glacial acetic acid was added, after which the mixture was kept at 55° C for 1 hr and was cooled and the precipitate that deposited was filtered off. Yield 1.1 g (71%). It was crystallized from water.

N_1-(α-Butyrolactono)-5-iodouracil (VI). To a solution of 1 g (0.005 mole) of I in 20 ml of dioxane containing 5 ml of 0.5 N nitric acid was added 2.6 g (0.01 mole) of iodine, and the reaction mixture was heated at 100° C for 1 hr. The solvent was distilled off in vacuum and 10-ml portions of ethanol were added to the residue and evaporated three times. It was crystallized from water. Yield 0.8 g (50%).

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THE CHEMICAL NATURE OF THE PRODUCTS OF THE MICROBIOLOGICAL TRANSFORMATION OF LATHYRINE

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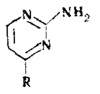
The chemical nature of the compounds formed in the microbiological transformation of α-amino-β-(2-amino-4-pyrimidyl)propionic acid (lathyrine) under the action of soil microorganisms capable of using pyrimidine bases as sources of carbon and nitrogen has been studied.

Recently, a new amino acid which has been given the name of lathyrine has been isolated from a number of plants of the family Leguminosae (*Lathyrus tingitanus*, *Lathyrus japonicus*, *Lathyrus variegatus*, etc.) [1-3]. From the chemical point of view, this amino acid is α-amino-β-(2-amino-4-pyrimidyl)propionic acid (I) [4-7]. Recently, we have carried out an investigation of the routes of the microbiological transformation of I under the action of soil microorganisms capable of using pyrimidine derivatives as sources of carbon and nitrogen. In the present communication we give some information on the chemical nature of the compounds formed in this process.



I $R = CH_2CH(NH_2)CO_2H$;
II $R = CH_3$,
III $R = CH_2COCO_2H$

As the starting material in the experiments on microbiological transformation we used racemic I obtained by chemical synthesis [8]. As the transforming organism we used a strain of *Mycobacterium sp.* 47 isolated from soil by the method of accumulative cultures [9]. The bacterial cells were incubated at 28° C under conditions of forced aeration in a synthetic medium of the following composition: DL-lathyrine—0.1%, KH_2PO_4—0.01%, $MgSO_4 \cdot 7H_2O$—0.02%, glycerol—0.4%, succinic acid—0.1%, yeast autolyzate—0.01%, distilled water—to 100% (pH 7.2). A 24-hour culture of the strain mentioned grown on MPA slopes was used as the seed material. The growth of the cultures was followed nephelometrically and the changes in the composition of the incubates were determined by chromatography and electrophoresis on paper.

The experiments performed showed that in the incubation of DL-lathyrine with growing cultures of *Mycobacterium sp.* 47 there is a gradual disappearance of part of the initial amino acid (I), although the degree of utilization of the latter does not exceed half its initial amount, and the remainder of the amino acid exhibits the optical activity characteristic for the D-form. These facts permit the conclusion that only the L-form of I undergoes microbiological transformation.

It was also established that as a result of the incubation three new substances (A, B, and C) regularly appear in the culture medium, these substances, in

Characteristics of the Substances Obtained

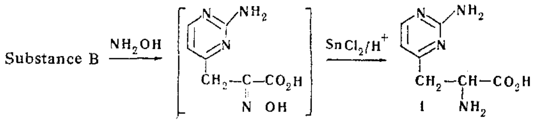
Compound	R_f in system*				EM × 10^6, $cm^2 \cdot V^{-1} \cdot sec^{-1}$ (pH 11)**	UV absorption, nm			
						pH 1		pH 11	
	1	2	3	4		λ_{max}	λ_{min}	λ_{max}	λ_{min}
I	0.34	0.32	0.62	0.48	+2.1	298	246	292	250
II (A)	0.80	0.85	0.60	0.82	−1.1	298	247	289	249
III (B)	0.38	0.42	0.55	0.40	+2.7	300	249	290	248
C	0.11	0.30	0.47	0.26	+4.3	—	—	—	—

* System 1: isopropanol—25% ammonia—water (14 : 1 : 5); system 2: isopropanol—saturated aqueous ammonium sulfate (2 : 1); system 3: ethyl acetate—formic acid—water (7 : 1 : 2); system 4: n-butanol—acetic acid—water (2 : 1 : 1).

** Borate buffer; the plus and minus signs show the migration of the substance to the anode and to the cathode, respectively.

contrast to the initial I, not giving a positive reaction with ninhydrin but possessing strong absorption in the near UV region.* The study of the chromatographic characteristics, electrophoretic mobility, and UV spectra of substance A permitted its identification as 2-amino-4-methylpyrimidine (II) (see table).

The investigation of the properties of substance B led to the assumption that it is a keto acid formed as a result of the oxidative deamination of I. To confirm this assumption, we carried out a special control experiment in which substance B was isolated from the culture liquid by chromatography and was then subjected to oximation and reduction, which re-formed I. These results



are in agreement with the hypothesis mentioned above and permit the conclusion that substance B has the structure of α-oxo-β-(2-amino-4-pyrimidyl)propionic acid (III). The constants of this compound are given in the table.

The question of the structure of substance C, also formed as a result of the microbiological transformation of I but giving an ill-defined UV spectrum, still remains open.

In the course of this investigation we also established that p-dimethylaminobenzaldehyde may be used to detect I and II on chromatograms and phoregrams, giving a bright yellow coloration with I and a bright red coloration with II.

We are continuing our investigation of the processes of the microbiological transformation of lathyrine.

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*In addition to the compounds mentioned, the presence of substances giving an intense green fluorescence in UV light was found on chromatograms.