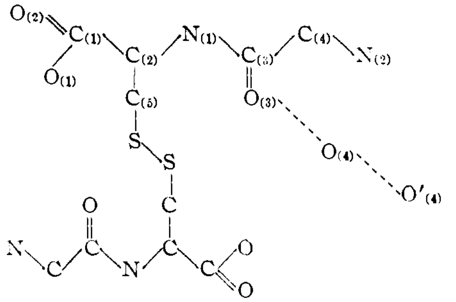
coördinates are given in the following tables. The numbering scheme used to identify the atoms in the asymmetric unit should be clear from the accompanying sketch.



BOND LENGTHS IN N,N′-DIGLYCYL-L-CYSTINE DIHYDRATE

Bond	R_{ij} Å.	Hydrogen bond	R_{ij} Å.
S–S	2.04	N_1—O_3	3.31
S–C_5	1.86	N_2—O_1	2.75
C_5–C_2	1.52	N_2—O_1'	2.89
C_2–C_1	1.55	N_2—O_2	2.75
C_1–O_1	1.24	O_4—O_4'	2.91
C_1–O_2	1.21	O_4—O_3	3.13
C_2–N_1	1.48		
N_1–C_3	1.35	Average probable error in distances is 0.02 Å.	
C_3–O_3	1.21		
C_3–C_4	1.55	O_4 refers to the oxygen atom of the water of hydration.	
C_4–N_2	1.46		

BOND ANGLES IN N,N′-DIGLYCYL-L-CYSTINE DIHYDRATE

Angle	θ, degrees	Hydrogen bond angle	θ, degrees
S–S–C_5	103	C_4–N_2—O_1'	85
S–C_5–C_2	105	C_4–N_2—O_1	129
C_5–C_2–C_1	117	C_4–N_2—O_2	112
C_5–C_2–N_1	118	C_1–O_1—N_2	143
C_1–C_2–N_1	109	C_1–O_1—N_2'	96
O_1–C_1–O_2	127	C_1–O_2—N_2	126
C_2–C_1–O_1	115	C_3–O_3—N_1	144
C_2–C_1–O_2	118	C_2–N_1—O_3	140
C_2–N_1–C_3	122	C_3–N_1—O_3	96
N_1–C_3–O_3	125	C_3–O_3—O_4	106
C_4–C_3–O_3	121	O_3—O_4—O_4'	118
N_1–C_3–C_4	113	Average probable error in angles is 1°	
C_3–C_4–N_2	109		

One of the many interesting features of this structure is the long hydrogen bond (3.31 Å.) existing between the respective amide groups of molecules related by the *b* repeat. Van der Waals repulsions between the molecules involved seem to be responsible for the unusual length. This weak bond is accompanied by a slight non-planarity of the amide group of the molecule. The non-planarity, which corresponds to a rotation of approximately 6° about the N_1–C_3 bond, introduces a strain energy calculated to be only 0.4 kcal./mole, however. The slightly long N_1–C_3 bond and the short C_3–O_3 bond may also be a consequence of the weak N_1–O_3 hydrogen bond.

The disposition of hydrogen bonds about the terminal nitrogen atom leaves no doubt concerning the zwitterion nature of this peptide. It may also be mentioned that the C_5–S–S–C_5' dihedral angle is calculated to be in 101° in good agreement with the value found in S_8.[2] A more complete description of this investigation will appear shortly.

The authors wish to thank Dr. E. J. Cohn of Harvard University who kindly made available a sample of N,N′-diglycyl-L-cystine for this work.

(2) B. E. Warren and J. T. Burwell, *J. Chem. Phys.*, **3**, 6 (1935).

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NEW COMPOUNDS

Salts of 5-Aminotetrazole

The salts listed in Table I were prepared by either of two methods: (1) Equivalent quantities of anhydrous 5-aminotetrazole and the appropriate anhydrous amine or free guanidine base were caused to react in a minimum volume of hot, absolute methanol or ethanol; if the product did not crystallize upon cooling, a small volume of diethyl ether was added. (2) Equivalent quantities of 5-aminotetrazole monohydrate and the appropriate carbonate or bicarbonate salt of the base were dissolved in a small volume of water; the solution was evaporated to dryness to give the salt. These salts were recrystallized from absolute methanol, ethanol or mixtures of ethanol and diethyl ether. All of these salts were very soluble in water and in general were also appreciably soluble in methanol or ethanol. Salts derived from very volatile bases were unstable and readily dissociated into the free base and a residue of 5-aminotetrazole. For example, methylamine could be completely removed from its salt by heating at 80 to 100° for a few hours or by evacuating continuously at room temperature for a few days. For this reason the melting points of some of these salts were rather indefinite even when the sample was sealed in a capillary.

TABLE I

SALTS OF 5-AMINOTETRAZOLE $[RH]^+ \left[\begin{array}{c} N—N \\ \| \quad\; \\ N—N \end{array} \!\!\!>\! C—NH_2 \right]^-$

R	Formula	M.p., °C.[a]	Nitrogen,[b] % Calcd.	Found
Hydrazine[c]	CH_7N_7	124–125	[d]	[d]
Methylamine	$C_2H_8N_6$	[e]	72.38	72.51
Diethylamine	$C_5H_{14}N_6$	[f]	53.13	53.23
Ethylenediamine	$C_4H_{14}N_{12}$	166–167	73.01	74.23
Piperidine	$C_6H_{14}N_6$	176–178	49.38	49.43
Morpholine	$C_5H_{12}N_6$	126–127	48.81	48.81
Benzylamine	$C_8H_{12}N_6$	130.5–131.5	43.72	43.71
Guanidine	$C_2H_8N_8$	126–126.5	77.74	78.45
Methylguanidine	$C_3H_{10}N_8$	109–110	70.85	70.22
Phenylguanidine	$C_8H_{12}N_8$	121–121.5	50.89	50.84
Aminoguanidine	$C_2H_9N_9$	93–95	79.21	79.10
Benzalaminoguanidine	$C_9H_{13}N_9$	145.5–146.5	50.99	51.09

[a] The melting points are corrected. [b] Analyses by Margaret M. Mayfield. [c] This salt was first prepared by Howard W. Kruse, Inorganic Chemistry Branch, Chemistry Division, U. S. Naval Ordnance Test Station. [d] Calcd.: C, 10.25; H, 6.03. Found: C, 10.52; H, 6.17. [e] Melts 112–117° with preliminary softening from about 95°. [f] Melts 114–118° with preliminary softening from about 100°.

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