

# PLANTS VERSUS ANIMALS IN THE DINING HALL

## CHEM-643 Intermediary Metabolism Case Study in Amino Acid Metabolism

### Page 3 -Where did it go and how did it get there?

Maura found the results of another experiment interesting, though again she didn't like the idea that animals had to be killed in the experiment. Instead of using labeled sucrose as in Table 1,  $^{15}\text{N}$ -glutamate or other  $^{15}\text{N}$ -labeled amino acids were injected into adult albino rats maintained *ad libitum* on a diet of bread, milk, oats, and carrots. Two rats were used for each  $^{15}\text{N}$ -labeled amino acid tested (100mg/100g rat weight). After eight hours, the rats were killed and the total protein isolated from their livers. After hydrolysis and chromatography, the  $^{15}\text{N}$ -content of various amino acids was determined by mass spectrometry. Table 2 that follows summarizes some of the results of that study (Aqvist, 1951).

**Table 3. Distribution of  $^{15}\text{N}$  among the amino acids of liver proteins 8 hours after intravenous injection of various amino acid sources of  $^{15}\text{N}$ . Values are normalized to the  $^{15}\text{N}$  content of the source amino acid (100) incorporated into protein (Aqvist, 1951).**

$^{15}\text{N}$ -enriched Amino Acid	Amino acids incorporated into rat liver proteins														
	Glu	Asp	Ala	Pro	Thr	Ser	Gly	Leu	Ile	Val	Phe	Tyr	Arg	Lys	His
Glutamate	100	50	74	12	3	46	19	31	nd	20	14	20	34	4	2
Aspartate	186	100	125	29	2	40	38	49	111	nd	26	38	60	15	25
Alanine	77	44	100	16	<1	23	21	38	40	29	9	10	33	4	3
Proline	23	14	18	100	1	5	3	4	5	5	1	2	11	2	<1
Threonine <sup>(1)</sup>	6	5	5	2	100	20	14	1	2	4	2	5	5	1	<1
Serine	9	9	12	2	14	100	50	3	2	2	2	6	9	1	1
Glycine	19	12	16	1	0	88	100	nd	nd	nd	3	nd	16	<1	2
Leucine	30	15	25	nd	<1	7	7	100	25	12	3	7	11	0	<1
Isoleucine	28	14	23	11	<1	9	8	34	100	15	8	12	10	4	3
Valine	34	19	29	7	0	12	10	46	41	100	5	6	14	1	2
Phenylalanine	24	12	18	2	<1	3	2	3	5	3	100	74	10	7	2
Tyrosine <sup>(2)</sup>	23	13	16	3	<1	4	4	4	5	4	44	100	9	1	1
Arginine <sup>(3)</sup>	34	23	20	18	2	6	1	nd	nd	nd	11	10	100	13	5
Lysine <sup>3</sup>	23	19	12	5	3	8	3	nd	nd	nd	6	nd	9	100	4
Histidine <sup>3</sup>	28	25	30	6	2	8	10	nd	nd	nd	9	nd	24	6	100

1. Slightly contaminated with  $^{15}\text{N}$  serine. Data from one rat only.

2. Administered by a stomach tube. Animals killed after 12 hours.

3.  $^{15}\text{N}$  excess significantly less than for other administered amino acids.

**Before you go on, make sure you understand the experimental design and the methods of analysis. What factors will influence the distribution of  $^{15}\text{N}$  from a source amino acid into other amino acids?**

**Within your group, list at least five patterns you observe in the data.**

**Considering what is now known about amino acid metabolism (see your textbook), qualitatively analyze and interpret the data. If present, please identify any discrepancies or possible errors in the data.**