**3. Alanine and Glutamate in the Blood**

Alanine: When man is taking drastic sport, muscles will generate large amount of pyruvate. The pyruvate can be converted to alanine though transaminase. Then, alanine is released in the blood and transported to liver and become the material of gluconeogenesis. Also, alanine plays an important role in transporting amino group to liver.

Glutamate: Glutamate is a kind of crucial amino carrier in body. α-ketoglutarate accepts amino group and is converted to glutamate. Glutamate transport the amino group into liver and the amino group will be used to create urea though urea cycle.

**4. Distribution of Amino Acid**

No. Alanine can be converted to pyruvate catalyzed by transaminase. Then pyruvate carboxylase catalyzes the reaction from pyruvate to oxaloacetate that can combine with amino group and form aspartate. So, the deficient in aspartate will not show signs of aspartate deficiency.

**8. Transamination and the Urea Cycle**

Aspartate acts an essential role in urea cycle, which combine with citrulline to form arginosuccinate. The amino group of aspartates ultimately become one of amino groups of urea. However, the major amino group carrier in body is not aspartate but glutamate. So, oxaloacetate should accept the amino group from glutamate to generate aspartate, and this reaction is catalyzed by aspartate aminotransferase. Therefore, it is obviously why aspartate aminotransferase has the highest activity in liver.

**9. The Case against Liquid Protein Diet**

(a) Diet without fat and saccharide means that almost all of the energy is provided with the oxidation of amino acids. In this case, ammonia from amino acids is converted to urea. So, a large amount of water is demanded to dilute urea and excrete urea out of body. If body cannot absorb enough water, the weight of body will lose.

(b) Human being needs 8 kind of essential amino acids to survive. The gelatin may not provide all kinds of amino acid demanded for the body. Also, exceeded amount of amino acid brings metabolism pressure to the hepatocyte, which is very harmful. When liver cannot undertake busy metabolism reaction, toxic ammonia will be accumulate in blood and cause further coma or death.

**Extra question:**

1. Why does a mammal go to the energetic expense of making urea from ammonia rather than simply excreting ammonia, as do bacteria?

Ammonia is toxic to organisms. For instance, accumulation of ammonia in human causes harmful neuron disorder. Also, mammals excrete extra ammonia by urine. The efficiency of excretion is relatively lower than fish that excrete through gills hence ammonia would easily be accumulated in blood if mammals had not made urea. Therefore, it is essential to convert ammonia to nontoxic urea.

Ammonia needs lots of water to dilute it to nontoxic concentration.

2. Suppose you are stranded on a desert island and have nothing but protein to eat. Outline briefly how your body will use this source of food for its energy needs.

In gastrointestinal tract, protein will be digest to amino acids by enzymes (pepsin, trypsin etc.) and then the amino acids will be absorbed in small intestine. Then, amino acids are transported to multiple tissues in body. Some of them like Trp and Ala can be converted to pyruvate and further be oxidize to release energy or be used in gluconeogenesis. Other amino acids like Leu will be oxidized like fatty acid and ultimately become acetyl-CoA that can be oxidized in citric acid or be use to synthesis fatty acid.