Functional Human Blood Protein Obtained from Rice

Under a research project funded by NSFC, Dr. Yang He of College of Life Sciences, Wuhan University obtained functional human blood protein from rice, and published their research findings in an article "Large-scale production of functional human serum albumin from transgenic rice seeds" on *PNAS* in November 2011.

The report says that they have devised a way to produce large quantities of the blood protein human serum albumin, or HSA, from rice. HSA is in high demand; it is widely used in drug and vaccine production, in addition to treatments for severe burns, liver cirrhosis, or hemorrhagic shock. However, current HSA supplies are limited by the availability of donor blood from which HSA is traditionally extracted, and carry a high risk of virus contamination.

To overcome these obstacles, Yang He and colleagues engineered rice seeds to produce substantial quantities of HSA, which comprised approximately 10% of the total soluble protein in the seed. The team then developed a method to purify HSA from the rice seeds, and obtained about 2.75 grams of HSA per kilogram of rice. Biochemical tests suggested that the HSA extracted from rice was physically and chemically equivalent to blood-derived HSA. Furthermore, the authors found that rice-derived HSA was as effective as blood-derived HSA in treating liver cirrhosis in rats. The findings suggest that the transgenic rice seeds may be a cost-effective source for HSA and might help satisfy an increasing worldwide demand for the protein, according to the authors.

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How Giant Pandas Thrive on a Bamboo Diet

In a research project funded by NSFC, Dr. Wei Fuwen of Institute of Zoology, Chinese Academy of Sciences, explained how giant pandas thrive on a bamboo diet, and published their research findings in an article "Evidence of cellulose metabolism by the giant panda gut microbiome," on *PNAS* in October 17, 2011.

The report says that they have identified gut microbes that help giant pandas thrive on a bamboo diet. The dietary habits of giant pandas, whose gastrointestinal tracts are similar to those of carnivores, have long befuddled researchers. The giant panda, an omnivorous bear that consumes up to 12 kg of bamboo every day, lacks enzymes that help herbivores digest cellulose and hemicellulose—the principal components of a fibrous plant diet. Dr. Wei Fuwen and colleagues used gene sequencing techniques to identify the microbes inhabiting the digestive tracts of giant pandas in hopes of finding cellulose-digesting symbionts, which previous attempts have failed to turn up. The authors analyzed more than 5,000 ribosomal RNA sequences that served as genetic barcodes for species of microbes found in the fecal samples of wild and captive giant pandas, and compared the sequences with those found in herbivores.

The authors report that seven taxonomically distinct entities closely related to Clostridium bacteria, known to digest cellulose, were unique to the pandas' fecal samples. Further, the authors identified putative gene sequences for enzymes that digest cellulose and hemicelluose. Together with other adaptations such as pseudo-thumbs, strong teeth, chewing muscles, and copious gut mucus, the cellulose-digesting gut bacteria might help sustain pandas' dietary habit, unusual among carnivores, according to the authors.