Scientists in China have recently discovered the secret behind the unusually high wheat yield on the Qinghai-Tibet Plateau, a phenomenon that had been perplexing them for some time, and have concluded that coordinated photosynthesis is one of the key factors.

The Plateau is located 4000 meters above sea level, and as such would not seem to be such an ideal place for crops to grow. The air is thin, the weather unpredictable and often extremely cold, and the local farmers have never employed any special techniques in their crop cultivation. Nevertheless, in terms of yield per unit, the area consistently outperformed the rest of China when it came to wheat production. Naturally, scientists’ interests were sufficiently aroused to conduct a lengthy investigation.

The scientists found that the total amount of the sun’s radiation reaching the Plateau is higher than in other areas, due to the thinness of the air. As a result, heat from the sun, essential for the crops to grow, surpassed that received in inland areas, despite the apparent cold temperatures of the Plateau. Perhaps more significantly, as radiation energy from the sun is greater than elsewhere in China, the crops benefited from more complete exposure to all spectral wavelengths.

Different wavelengths of the sun’s radiation have a different effect upon the growth of the crop. For example, ultraviolet light affects the shape of the crop, while bluish violet light promotes photosynthesis. Infrared violet light has an important role to play in the formation of seeds, and in maintaining the temperature of crops. Green violet light and yellowish violet light are highly beneficial to crop maturation. Because of the Plateau’s unusual environment, the conditions were just right for a suitable distribution of light waves.

Other than this, the scientists also found that the Plateau’s special environment caused the crops to have a very low reflex rate, especially during the period when the wheat is in the milk, thus leading to fatter wheat seeds.

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**China Leads in Research on in vitro Fertilization in Pigs**

The Chinese research on in vitro fertilization in pigs began in 1990. It has been attested by experts from the Chinese Academy of Sciences to have topped international standards. The study, headed by Professor Qin Pengchun (秦鹏春), helps to promote livestock breeding and to develop artificial insemination and genetic engineering techniques.

Researchers extracted a large number of eggs from sows. After the eggs had attained maturity in vitro to form transplantable embryos, the embryos were transplanted back into the sows.

This study also has tremendous impact on a related field of research which concerns the breeding of superior quality pigs with lean meat and resistance to diseases by incorporating genes for weight reduction and disease resistance, respectively. Eggs from these superior breeds can then be collected for in vitro fertilization experiments. A shorter propagation time is expected for pigs bred using this method. This procedure will help to raise pig farming and heredity studies of pigs to a higher level.

At the same time, in vitro fertilization technique also complements current research in human genetic engineering. For example, anti-repulsor genes from humans can be incorporated into the pig embryos, which are then transplanted into sows. This will result in transgenic pigs with organs that are similar to a human's in size and shape. These organs may be used for transplantation purposes. Similarly, hemoglobin produced by the transgenic pigs can be used to treat anemia in humans.
New Drug Developed for Diagnosis of Stomach Cancer

The Japanese Sanyo Chemical Industry Company recently announced its development of a diagnostic drug which can detect cancer of the stomach in its early stages. The drug works by estimating the concentration of pepsin by ELISA, to establish whether the patient has chronic atrophic gastritis, generally thought to be an early symptom of stomach cancer. The drug is quick working, yielding results within an hour, and with an accuracy two or three times better than that of endoscopy with a barium meal. The drug went on the market in April this year.

Etiology of Chronic Atrophic Gastritis

Chronic atrophic gastritis is a common, recurrent illness of the digestive system. It has been considered to be of a pre-cancerous state.

Based on recent advances in modern medicine as well as analysis of the literature on traditional Chinese medicine, Professor Li Delin(栗德林) of the Heilongjiang and University of Traditional Chinese Medicine, has postulated a theory to explain the etiology of chronic atrophic gastritis. According to the theory, a weak digestive system is the basic cause, while bad dietary habits and depression are the inducing factors. The traditional way of treatment takes into account the overall analysis of the problem in addition to the particular patient’s condition. Accordingly, ‘Yan Shen Jan Wei’ capsules (延參健胃膠囊) have been proposed for use in chronic atrophic gastritis treatment, and the results obtained so far have indicated a success rate of 90%.

CAS Develops Refined Peanut Oil of International Standard

The Fujian Industrial Development Institute of the Chinese Academy of Science has developed a refined peanut oil technology that produces oil of a standard that reaches or even exceeds the criteria laid down for a ‘first class’ oil by national authorities. The technology is currently in use in two oil refining factories.

The technology, developed by Senior Engineers Yang Wenhao (楊文火), Chen Changzhang (陳長章) and their colleagues, set out to overcome many of the problems typically encountered in traditional peanut oil refinery. For example, the old method of soda refining destroyed such nutritious elements as the vitamin E, and caused the smell and the coloration of the oil to become faint. In developing this new technology, the scientists were able to solve six traditional problems involved in peanut oil refinery all in one process.

Tests conducted on the new refined peanut oil were administered by the Fujian Food Hygiene Inspection Institute, the Central Inspection Laboratory of the Fujian Food and Oil Center, and Fujian Medical University. All the tests confirmed that the new oil did indeed meet the requirements laid down for a first class oil, in some respects even exceeding them. The levels of aflatoxin B2 and saponin are actually lower than those permitted in a first class oil, and undesirable properties such as the presence of phosphates, a low pH value, discoloration of the oil, and a slightly unpleasant taste, have all been overcome. At the same time, heavy metal impurities in the oil have been reduced.
Currently, there are some 100 million hepatitis B virus carriers in China, that is, about one in every ten people is a carrier. Some patients suffering from the disease may recover after the acute phase; however, in other patients the infection may progress to the chronic state, eventually resulting in cirrhosis (scarring of the liver) and even cancer of the liver.

The vaccines used in the country, including blood-derived and genetically-engineered vaccines, consist essentially of the same main protein as in the hepatitis B virus (HBV) surface antigen. At the Shanghai Institute of Biochemistry, Academia Sinica, a research group headed by Wang Yuan (汪堰) and Li Guangdi (李光地), has been engaged in studies on a new hepatitis B vaccine.

The outer membrane of the HBV is composed of the following three protein species: small molecular weight proteins (SHBs), medium molecular weight proteins (MHBs) and large molecular weight proteins (LHBs). These are generally called HBV surface antigen (HBsAg).

The ratio between the three proteins depends on the replication states of the virus: very little or no LHBs are found in the outer membrane of non-replicating virus; however, when HBV is replicating, the amount of LHBs in the outer membrane can be as much as 20%. The peptide segment 21-47 of the PreS region (PreS1(21-47)) in LHBs has been shown to be the hepatocyte receptor binding site, and is related to infection of hepatocytes by the virus. This peptide segment possesses strong immunogenicity, and antibodies to PreS1(21-47) are produced even at the early stages of HBV infection. The PreS1 antigen and its antibodies are considered as new HBV markers, important for both the onset and prognosis of hepatitis B.

The B cell and T cell antigenic determinants in the PreS region of the large and middle proteins of the surface antigen of hepatitis B virus have also been shown to be highly immunogenic. Thus, a new hepatitis B vaccine with PreS may raise the immunogenic effect of the vaccines.

**Design and Expression of HBV Surface Antigen Fusion Protein with PreS Region**

It is difficult to express native large protein containing complete PreS region, which is largely unsecretable and unstable. To improve PreS expression, the retarded sequences of the PreS1 region were removed, while as many protease-sensitive sites as possible of the PreS2 region were reduced. The hepatocyte receptor-binding site in the PreS region, PreS1(21-47), as well as the PreS2 polypeptide containing B and T cell epitopes(120-146) were selected. The gene fragments encoding these two polypeptides were then synthesized by PCR. They were fused, simultaneously or separately, to the 5' and 3' termini of the main protein gene to form three fusion genes and to express three HBV surface antigen fusion proteins: S2S protein with 2X PreS2 at terminal N; SS1 protein with 2X PreS1 at terminal C; and S2SS' Protein with PreS2 and PreS‘one’ antigenic determinants simultaneously.

The three fusion genes were inserted into vaccinia expression vectors to form recombinant vaccinia viruses, and the fusion genes were expressed in the vaccinia system. The SS1 antigen has also been expressed successfully in the CHO cells and yeast system (This work was carried out in collaboration with the Institute of Viruses, Chinese Academy of Preventive Medicine, Beijing, and the Institute of Genetics, Fudan University, Shanghai, respectively.)
Characterization of the Expressed Fusion Proteins

ELIZA and western blots showed that the fusion proteins expressed in animal cells possess not only S antigenicity, but also PreS2 and PreS1 antigenicity, respectively. These proteins can be secreted into culture medium. CsCl density gradient centrifugation and electron microscopy indicated that these three fusion proteins could form chimera particles with similar density and size as the main proteins. What is more important is that, when Balb/C mice were immunized with purified fusion antigens, the respective antibodies were produced. The S2S protein could produce high titer antibodies to PreS2, apart from high titer antibodies to S; the SS1 protein could induce high titer antibodies to both S and PreS1; while the S2SS1 protein could produce antibodies to PreS1, PreS2 and S. These indicate, therefore, that the antigenicity of the fusion antigens is strong, and that the HBV surface fusion proteins with a PreS region are promising candidates for a new HBV vaccine.

DNA Immunization Using HBV Surface Antigen Fusion Genes

In contrast to vaccines used today, DNA immunization involves an entirely new pathway, whereby the introduction of HBV surface antigen gene results in the production of antibodies. The immunization of mice with plasmids containing native large proteins produced merely antibodies to S and PreS. No antibodies to PreS1 were detected. Very good results were achieved, however, when plasmids containing SS1 genes were used. The immunized mice not only produced antibodies to S, but also high titer antibodies to PreS1, evidence of the advantage of the fusion gene structure.

PreS1 Antigen Assay Kit

Following their research into the PreS1 antigen and its antibodies as new HBV markers, the team at the Shanghai Institute of Biochemistry has recently produced a PreS1 antigen detection assay kit which has been approved by the Chinese Ministry of Health.

The PreS1 antigen assay kit works based on the principle of double antibodies sandwich ELISA. HBV particles in serum samples are adsorbed onto cover antibodies (which are monoclonal antibodies to SHBs), and are allowed to react with monoclonal antibodies to PreS1(21-47) labeled with horseradish peroxidase. The color of the peroxidase substrate is a measure of the concentration of the PreS1 antigen in the blood samples.

One hundred and five normal human serum samples, which were assayed with the kit, were shown to be negative. However, from 200 samples containing HBsAg, HBeAg and HBeAg, 167 were shown to be positive, with the positive rate of 83% being very similar to the positive rate of 85% obtained using PCR.

Research has shown that the PreS antigen appeared at the early phase of HBV infection, and can be detected during the latent period of acute hepatitis B. The PreS1 turns negative during the recovery period; a persistent positive PreS1 would suggest that the disease has progressed to the chronic state. Systematic determination of the changes in PreS1 is clinically important in order to evaluate the efficacy of therapy as well as the prognosis of the disease.

PreS1 Antibody Assay Kit

This kit works based on the principle of indirect ELISA. The antibodies to PreS1(21-47) in the blood samples are adsorbed on to the cover antigen, a genetically engineered PreS1(21-47)/glutathione fusion protein, and are then allowed to react with peroxidase-labeled sheep anti-human IgG. The resultant color of the peroxidase substrate shows the concentration of the antibodies to PreS1 in the blood samples.

The antibodies to PreS1 can be detected in the early phase of HBV infection, appearing even earlier than the anti-HBV, the common index used clinically. The antibodies to PreS1 are, moreover, protective antibodies, and can be used as an index on the state of infection or recovery of the patient.

Both the PreS1 antigen and Pres1 antibody kits are easy to use, are highly sensitive, and have been shown to achieve reproducible results. They are also not expensive to manufacture. Both kits should prove of good commercial value.