

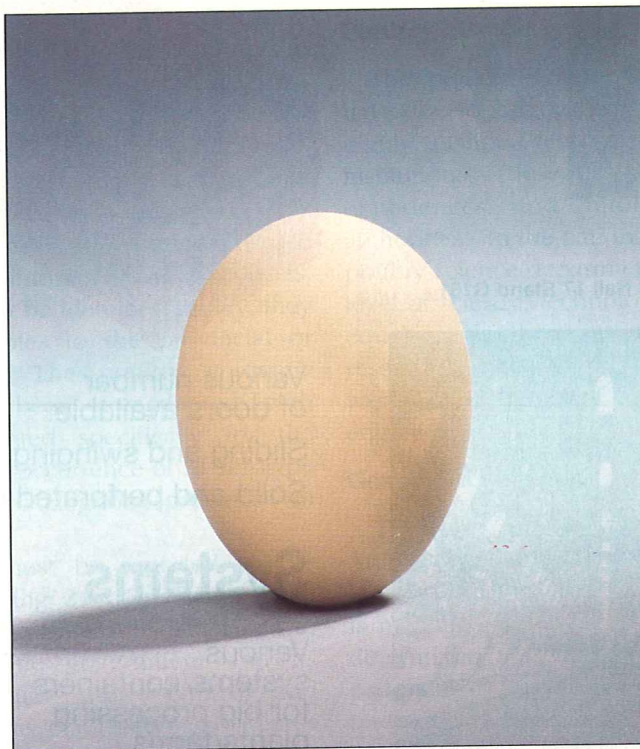
# "Golden" Eggs - Nutraceuticals Or Antibody Rich Value-Added Egg Products

*Eggs can contain beneficial pharmaceutical compounds or beneficial antibodies, produced naturally in the hens' oviduct and packaged safely with the natural environment of the egg contents. — By Dr Marilyn Coleman*

**N**ovel uses for eggs was one of the areas of development selected for special consideration at the recent Egg Technology Symposium held in Banff, Canada. Dr. S. Nakai from the University of British Columbia demonstrated the work that they have done to separate various enzymes and other important functional proteins for utilization. These proteins have numerous biological significance such as cystatin with potent antimicrobial/antiviral activities; antigen binding fragments of gamma-immunoglobulin(IgY)

produced by using a fungal protease which can be used in antibody:antigen reactions; enhanced phosphatidylcholine production which improved the antioxidant activity, emulsifying properties and heat stability and ultrafiltration process for isolating IgY from egg yolk and cystatins which are the protease inhibitors potentially effective in preventing the metastasis of cancer cells. He has been involved with the continuous, economic elution of the components of eggs and described in detail what has been done to make this more economical and efficient.

There is also an opportunity to use the hen as a production unit for pharmaceuticals which can be made in the oviduct and packaged neatly in the egg. These "golden" eggs would improve quality of life of patients needing the compounds. Dr Ann Gibbins of U of Guelph described her work with transgenic embryos.



As we get into the 21st century more emphasis is being placed on more controlled genetic engineering which would provide the proper genes for a super chicken.

Dr. Yoshinori Mine from University of Guelph discussed many applications of IgY. He pointed out the specific nature of the antibodies which could be manufactured by the hen and the degree of success obtained when cattle and fish were fed these antibodies. He worked with pure antibodies removed from the yolk granules. He found that there was no efficacy to

remote diseases, but diseases in the gut were neutralized with the purified antibody. He produced antibodies not only to the whole organisms but also to certain components of the antigen. Some antigenic components do not have good antigenicity and therefore do not provide good IgY titers. Orally administered IgY were completely degraded by acidic pH and protease present in the fish stomach. He concluded that research must be focused on developing oral dosage forms of IgY which can protect against the proteolytic and denaturing conditions of the GI tract. He suggested that encapsulation of the purified antibody provided successful treatment of rainbow trout remote from the intestines.

Dr. Marilyn Coleman of MAC Associates described her work with antibodies to treat diseases. There are two major patents in the antibody area - a "contact"

## "Golden" Eggs - Nutraceuticals . . .

patent held by Stolle (1983) and Ghen (1992). It seems that both of these inventors found that egg antibodies can treat diseases upon contact. They both used the treatment of dental carries in rats as their examples. OvImmune has a "remote" patent which found that eggs eaten can treat diseases remote from the gastrointestinal tract. This was further demonstrated by treating mastitic cows with egg antibodies raised against two mastitis causing agents. After nine weeks, the cows were "cleared" of the specific antigens for which the egg antibodies were raised. They were not cleared of the other mastitis causing organisms which were not included in the special eggs. This experiment shows that even though the egg antibodies are digested, some portion of the egg antibody passes into the blood barrier and seeks out the causative agents for which it is produced. Eggs someday will be produced to treat many diseases especially those autoimmune diseases which are so difficult to treat now such as AIDS, rheumatoid arthritis, Crohn's Disease and Type II Diabetes.

Clare Hasler of University of Illinois discussed the

many functional egg products which are on the market and those likely to be available in the future. Since chickens can be induced to putting many beneficial components into the egg, more consumers should become interested in the incredible egg not just as a nutritional complete protein, but also the source of other hard to get supplements such as Vitamin E and Omega 3 FA.

The egg industry is following the broiler industry in the increase consumption of further processed products. Egg shells are one of the byproducts of this processing which provide some opportunity for utilization. The industry needs to find ways to utilize the tons of egg shells produced daily in these breaking plants. Currently many companies are having to pay to put the residue in landfills. Recycling is encouraged and landfills will one day refuse to take the egg shell residue. We must as an industry find a use for this byproduct. Dr. Naoko Suguro of QP Corp discussed research ongoing in Japan to provide greater utilization of this resource. QP has developed ground eggshell products as calcium supplements. Egg shell calcium provides a higher absorption rate than many other calcium supplements. They have also developed products using the collagen from the egg shell membranes in cosmetics to soften skin. They found that the phosphatidylcholine found in egg shell membranes combined with vitamin B12 may slow the progress of or contribute to the prevention of Alzheimer's disease. As an industry, we need to investigate more utilization of these byproducts in our daily lives in the Western world.

Further knowledge of IgY utilisation was described by Dr. Lekh Juneja of Taiyo Kagaku Co, Japan. He and his colleagues investigated the functional carbohydrate moieties in hen's egg yolk Sialyloligosaccharides, found in egg yolk, are also present at high levels in natural mother's milk at the time of the baby's birth. It is likely to be the first line of defence against pathogens, viruses and toxins. Rotavirus is a major pathogen of infectious gastroenteritis and kills more than 3 million infants a year. A preparation of egg yolk Sialyloligosaccharides (SGS) was found to inhibit rotavirus both in vitro and in vivo. The suckling mice group administered with SGS showed a significant lower diarrhea compared with control groups. SGS also showed a strong inhibition against *Helicobacter pylori* which causes gastric ulcers. These compounds are safe which were tested by acute, subacute and mutagenicity tests and have been used in infant formulations and baby food in Japan. — *Dr Marilyn Coleman, MAC Associates, 2532 Zollinger Road, Columbus, Ohio 43221, USA.*

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