

Plantibody as a component of high profile functional food

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One of our collaborative researches is a project toward production of high profile functional food containing therapeutic antibodies. Immunoglobulin A (IgA) is the most suitable class for oral administration, however, production of monoclonal antibodies (mAbs) of IgA class has been challenging. We succeeded in production of IgA mAbs by means of intranasal immunization and hybridoma production using nasal-associated lymphoid tissues from mice. As one of such mAbs, we obtained a clone specific to Shiga toxin carbohydrate binding subunit (Stx1B). Shiga toxins are virulence factors of enterohemorrhagic *Escherichia coli* (EHEC) such as serotype O157:H7. The established IgA mAb (clone G2G7) has a high affinity ($K_d = 10^{-10}$ M) as revealed by surface plasmon resonance analyses and it efficiently blocks binding of carbohydrate ligands to the immobilized Stx1B. We cloned cDNA encoding IgA heavy, light and joining chains. We verified that recombinant IgA bound to Stx1B through the expression of these cDNAs in mammalian CHO cells. Toward application to high profile functional food, we are planning to express G2G7 cDNA in edible plant. It is desirable not to use promoter and selection markers of viral or bacterial origin. We cloned the promoter and terminator of chlorophyll a/b binding proteins (CAB) from *Arabidopsis thaliana* genomic DNA. This promoter allows bidirectional and simultaneous transcription of two genes. We were able to prepare expression cassette in which IgA heavy and light chain cDNA are inserted between promoter of CAB and one of the terminator in an opposite direction, respectively. We are trying to insert this expression cassette into a binary vector that is applicable to *Agrobacterium tumefaciens* to produce transgenic plant. Antibody produced by plant is called plantibody that is named after plant plus antibody. IgA class plantibodies may be served as a high profile functional food such as salad. It will contain edible vegetables, such as lettuce and cabbage containing plantibodies, together with dressing that contains IgA antibodies in a form of emulsion. In addition, plant system is promising in the sense of productivity. We hope that our collaborative efforts will culminate in creation of a new field spanning pharmaceutical sciences and food sciences in near future.