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Poster presentation

P19-16. Potential of an HIV-1 Tat fusion protein expressed in tomato as a plant-based HIV vaccine

ME Cueno*[1], Y Hibi[1], K Karamatsu[2], Y Yasutomi[3], AC Laurena[4] and T Okamoto[1]

Address: [1]Department of Molecular and Cellular Biology, Nagoya City University Graduate School of Medical Sciences, Nagoya City, Japan, [2]Tsukuba Primate Research Center, Tsukuba, Japan, [3]Tsukuba Primate Research Insitute, Tsukuba, Japan and [4]University of the Philippines Los Banos, Los Banos, Philippines

* Corresponding author

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Background

Utilizing plants to produce pharmaceutical products, including antigens for AIDS, is a new way to produce vaccines. HIV-1 Tat plays a major role in viral replication and is essential for AIDS disease development making it an ideal vaccine target provided that both humoral and cellular immune responses are induced. Previous attempts to express Tat in tomato only reported successful humoral immune responses induction while certain physiological abnormalities were also observed in tomato which would be detrimental to furthering plant-based HIV vaccine development. In this study, an in-depth understanding of the effects of Tat expression in tomato and its immunogenicity was determined.

Methods

Codon-optimized Tat gene was synthesized and introduced into tomato plant through bombardment. Recombinant tomato extracts were tested for Tat expression and introduced intradermally to Balb/c mice. Immunogenic responses were measured through ELISA and ELISPOT. Concurrently, strategies were made to understand and hinder the toxic effects of Tat protein in tomato plant.

Results

Tat-GUS fusion protein was preferentially expressed over the Tat-only protein among bombarded samples, of which, noticeable physiological abnormalities were observed in tomato regardless of developmental stage. Further analyses reveal that plant cytokinin oxidase is apparently affected by Tat. Interestingly, we found that the RGD and Arg-rich motifs of Tat have common functional use in tomato explaining our observed abnormalities and mutating these regions easily avoided such abnormalities. Nevertheless, when extracts were obtained from the transgenic tomato lines and intradermally introduced to Balb/c mice, both humoral and cellular immune responses were induced.

Conclusion

Tat fusion protein is preferentially expressed over the Tat only protein in tomato plant, though physiological abnormalities exists in tomato plant when Tat is expressed, it is still capable of inducing both humoral and cellular immune responses proving the feasibility of producing a plant-based vaccine for HIV provided appropriate mutations on Tat are made.