

Potential of the therapeutic effect of intravesical BCG through Synthetic and Biogenic Selenium Nanoparticles in an nitrosamine-induced bladder cancer mouse model

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Introduction:

Intravesical Mycobacterium Bovis bacillus Calmette-Guérin (BCG) therapy for non-muscle invasive bladder cancer has been already applied successfully to prevent metastasis and disease progression. However, some studies have reported a percentage of treatment failure and recurrence along with possible side effects. Therefore, this study has evaluated the effect of administration of synthetic (SSeNPs) and biogenic selenium nanoparticles (BSeNPs) as an adjuvant drugs in combination with intravesical BCG for treatment of mice bearing bladder tumor.

Methods:

Orthotopic bladder cancer model mice were established by 12 weeks N-butyl-N-(4-hydroxybutyl) nitrosamine oral gavage. Mice bearing bladder cancer were treated by sequential intravesical treatments with SSeNPs, BCG, BCG/SSeNPs, and BCG/BSeNPs. After immunotherapy, the status of the immune system was evaluated through quantitatively measuring mRNA expression of cytokines by Real-time qRT-PCR in the spleen samples and measuring cytokines protein level by enzyme-linked immunosorbent assay in the serum samples. As well, in the tumor microenvironment, the mRNA expression level of autophagic molecules (Beclin-1, ATG2B, and ATG5), apoptotic molecule (Caspase-3), iNOS, HMGB1, and PD-L1 were evaluated in all groups.

Results:

Immunotherapy with BCG/SSeNPs and BCG/BSeNPs elicited a considerable immune response by increasing the expression of IFN- γ , IL-12, and IL-6, and inhibiting the expression of IL-10 and TGF- β cytokines. Along with, BCG/SSeNPs and BCG/BSeNPs could increase Caspase-3 expression and decrease autophagic genes as well as PD-L1.

Conclusion:

Our results showed that synthetic and biogenic SeNPs as an effective adjuvant could enhance the efficacy and therapeutic effect of intravesical BCG for bladder cancer treatment with almost the same function.

Keywords:

BCG, Selenium nanoparticles, bladder cancer, Immunotherapy

Biography

Mohammad Hossein Yazdi got his PhD in the field of [Pharmaceutical Biotechnology](#) by 2014 from Tehran University of Medical Sciences, School of Pharmacy. His PhD work was about cancer [vaccine and immunotherapy](#). He is now working as Associate Professor at Biotechnology Research Center and Head of Recombinant Vaccine Research Center of Tehran University of [Medical Sciences](#) and pursues his interest in both vaccine and immunotherapy of cancer and infectious diseases. He has published more than 45 papers in reputed journals and has been serving as senior lecturer of advanced [immunology](#) and immunotherapy at Tehran University of Medical Sciences.

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