Production and purification of recombinant HBcAg and investigation of its structural and functional characteristics

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Abstract

Hepatitis B, as a major healthcare problem and a potentially life-threatening infection, is caused by Hepatitis B virus (HBV). Nucleocapsid of HBV is composed of a single polypeptide chain known as core antigen, HBcAg. As a highly immunogenic subviral particle, HBcAg has been used as a carrier platform for heterologous proteins. Anti-HBc antibody, as one of the serological markers for HBV infection, is the best marker for documenting prior exposure to HBV. Here, we produced, purified and characterized HBcAg. pColdI vector, containing a histidine tag, was used for the first time to clone *HBcAg* gene. The highest level of HBcAg expression was achieved in Tuner strain, followed by BL21 and Rosetta-gami. Histidine-tagged HBcAg was purified using Ni-NTA resin, and its structural and antigenic similarity with natural HBcAg was confirmed by ELISA and western blot. Then, recombinant HBcAg was used to produce anti-HBc polyclonal antibodies in rabbits, and specific anti-HBcAg polyclonal antibodies were purified by the HBcAg-CNBr sepharose column. Specific anti-HBcAg polyclonal antibodies were able to detect recombinant HBcAg up to 0.15 ng/ml in an optimized sandwich ELISA.
The results of this study provide valuable information for the production of recombinant HBcAg and specific anti-HBcAg polyclonal antibodies for further research and diagnostic applications.

Keywords: Hepatitis B virus (HBV), HBcAg, Anti-HBc polyclonal antibody

An overview of the antimicrobial strategies to combat prevention and treatment of urinary tract infections caused by bacterial biofilms

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Abstract

Urinary tract infections (UTIs) are one of the most common bacterial infections, particularly in women and children, which are often treated with antibiotics. Bacterial biofilms play an important role in persistent and recurrences of UTIs. A catheter-associated UTI (CA-UTI) caused by biofilm constitute a high percentage of nosocomial infections. Increasing antibiotic resistance is a serious threat to the treatment of these infections. Antibiotic resistance is an important and topical issue, which refers to the situation where antibiotics that usually kill bacteria no longer do so. Patients infected with resistant bacteria will manifest symptoms for a longer time, and the chances of the conditions getting worse will be higher. The main causes of antibiotic resistance are their incorrect use: either empirical treatment is performed (without performing antibiotic susceptibility testing); strong antibiotics are prescribed for infections that could be treated with simple antibiotics; or administration is in too small amounts, for too short a period, or at too long intervals. Therefore, alternative strategies for the prevention and treatment of UTIs caused by bacterial biofilm are needed. In the present study, a review of these new therapeutic approaches is provided including medicinal plants, probiotics, antimicrobial peptides, nanoparticles, and phages.

Keywords: urinary tract infection, biofilm, medicinal plants, probiotics, antimicrobial peptides, nanoparticles, phage

Evaluation and investigation of long-term and late complications of covid-19 infection and/or COVID-19 vaccination of different platforms

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Abstract

After the outbreak of SARS-CoV-2, another crisis has come to attention with the progression or persistence of symptoms of COIVD-19, known as long-COVID, which is very important due to the increasing number of reports of late-detected symptoms and their potential impact on the quality of life. In this study, long-term disorders were investigated in people who received three doses of the vaccines in order to distinguish between the side effects caused by COVID or the vaccine and the factors affecting it.

Vaccinated people of four different vaccination regimens who received two doses of Sinopharm or AstraZeneca vaccines and got a booster dose of PastoCovac/Plus were followed from the first vaccine dose to 6 months after the booster shot. All adverse events were recorded through an in-depth interview using a researcher-made questionnaire, as well as COIVD-19 history and other demographics.

Out of a total of 329 follow-up subjects, 30 cases (9.1%) were identified with long-term complications during the follow-up, who had at least one recorded history of COIVD-19 disease. The average age of these people was 40.5±9.3 and the average BMI was 27.23±4.6. The most common underlying diseases in this group were thyroid disorders (20%), hyper lipedema (10%) and hypertension (6%). The examination of registered complications showed that menstrual problems in women (30%), hair loss (20%), joint disorders (20%), headache (13%) and skin manifestations (10%) were the most common complications, respectively, and the identified symptoms were mainly stable until the end of the study with an average duration of 154 days.

In 19 of these people, the vaccine was diagnosed as the main cause of the complication though there was no significant difference between the vaccine regimens. In the other 11 people, infection with SARS-CoV-2 was considered as the main trigger of the complication, although the role of the vaccine as a trigger for the exacerbation of complications cannot be neglected. In the current timeframe in which the vast majority of the world's population have got vaccinated against COIVD-19, it is difficult to identify late-onset disorders as side effects of vaccines or prolonged manifestations of COIVD-19. Therefore, some complications, though late, may be a possible consequence of SARS-CoV-2 infection or vaccination. This study has the advantage of long-term follow-up, which provides different forms of late events compared to the date of infection and vaccination of COIVD-19. The rate of late-onset disorders in the present study also highlights the importance of long-term follow-up studies in populations worldwide.

Investigating serum levels of IL-10 and IL-12 in patients with Helicobacter pylori infection (case-control study) in Miondoab city

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Abstract

Background and Aim: Measuring the amount and production of cytokines, especially IL-10 and IL-12, is an important tool in investigating immune responses against stimuli such as pathogens, including *Helicobacter pylori*. This study aims to investigate the level of interleukins 10 and 12 in patients with *Helicobacter pylori* and compare it with healthy people to find the relationship between their levels and the incidence and spread of the disease.
Materials and methods: The serum samples of 66 patients were analyzed for IgM serology against *Helicobacter pylori* by ELISA method. In total, 61 patients with conditions were measured serum concentration of IL-10 and IL-12 in specific ELISA kits. In this study, T-test and two- way ANOVA tests were statistically analyzed using SPSS (version 21) statistical software.
Results: The results of this study showed that the levels of IL-12 and IL-10 in the serum of patients with *H. pylori* is more than that of healthy individuals. And this probably indicates the protective effect of these cytokines in patients.
Conclusion: According to the obtained results, it can be said that in people suffering from *Helicobacter pylori*, by increasing the serum level of IL-10 and IL-12, their biological function leads to the progress of the disease and causes disorders in the body's immune system.

Keywords: *Helicobacter pylori***,** IL-10, IL-12, Serology, ELISA

Comparison of COVID 19 vaccines adverse events between obese/overweight cases and normal-weight ones

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Abstract

Backgrounds and objectives: Data on the safety of COVID-19 vaccines in obese or overweight subjects are limited and have been conducted in several studies with a small sample size worldwide. The aim of this study was to investigate and compare the incidence of adverse events after the first and second doses of Sinopharm and COVID-19 booster in overweight and obese subjects compared to normal weight subjects.

Methods: 261 subjects who had received three doses of COVID-19 vaccine (two doses of Sinopharm + Sinopharm or PastoCovac or PastoCovac Plus booster) were enrolled in the study. Subjects' demographic characteristics and vaccine adverse events were recorded in a questionnaire during a telephone interview on days 7 and 21 after each dose of COVID-19 vaccine. Subsequently, the frequency of adverse events was compared between the 3 study groups.

Results: Of the 261 participants, 59 were obese (BMI ≥ 30), 96 were overweight (BMI = 25-29.9), and 106 were normal weight (BMI = 24.9-18). The overall frequency of adverse events after all three doses of the COVID-19 vaccine was higher in obese subjects than in overweight or normal-weight subjects. Pain at the injection site was the most common adverse event reported within seven days of booster vaccination in all groups. No adverse events occurred after receiving the PastoCovac booster in obese/overweight subjects, and the incidence of adverse events after PastoCovac plus booster and Sinopharm booster administration was similar. Overall, no serious vaccine-related adverse events were observed in the three groups.

Conclusion: The results of this study indicate that the inactivated and protein-based COVID -19 vaccines are safe and did not cause serious adverse events in obese or overweight individuals. In addition, the PasteCovac booster is more suitable for these people because it has no adverse effects. Therefore, further studies with a larger sample size are needed to identify a more effective booster with fewer adverse events in obese subjects.

Keywords: obesity, body mass index, covid-19, vaccine, safety