國立成功大學
111學年度碩士班招生考試試題

編　號：272

系　所：微生物及免疫學研究所

科　目：免疫學

日　期：0220

節　次：第 3 節

備　註：不可使用計算機

※ 考生請注意：本試題不可使用計算機。　請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Please read the abstract and answer the following questions:

Adjuvants are critical for improving the quality and magnitude of adaptive immune responses to vaccination. Lipid nanoparticle (LNP)-encapsulated nucleoside-modified mRNA vaccines have shown great efficacy against severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), but the mechanism of action of this vaccine platform is not well-characterized. Using influenza virus and SARS-CoV-2 mRNA and protein subunit vaccines, we demonstrated that our LNP formulation has intrinsic adjuvant activity that promotes induction of strong T follicular helper cell, germinal center B cell, long-lived plasma cell, and memory B cell responses that are associated with durable and protective antibodies in mice. Comparative experiments demonstrated that this LNP formulation outperformed a widely used MF59-like adjuvant, AddaVax. The adjuvant activity of the LNP relies on the ionizable lipid component and on IL-6 cytokine induction but not on MyD88- or MAVS-dependent sensing of LNPs. Our study identified LNPs as a versatile adjuvant that enhances the efficacy of traditional and next-generation vaccine platforms. (*Immunity*. 2021 Dec 14;54(12):2877-2892.e7. doi: 10.1016/j.immuni.2021.11.001.)

a. What is the goal of vaccination? (5%)

b. Please describe how this LNP-SARS-CoV-2 mRNA vaccine may elicit immune responses in your body. (15%)

c. Please discuss how T follicular helper cells help to select high-affinity B cells against SARS-CoV-2 in the germinal center after vaccination. (15%)

d. Please discuss the roles of MyD88 and MAVS in innate immunity. (15%)

e. In your opinion, what are the contributions of this research? (10%)

2. Please discuss the positive and negative selection of T cells. (15%)

3. Complement is a major component of innate immunity. Please briefly discuss the three pathways of complement activation. (15 %)

4. Please briefly explain the following terms (2% each)

a. antigenic drift

b. complementary-determining regions of antibody

c. original antigenic sin

d. epitopes

e. opsonization