



Commentary

Anaphylactic reactions to mRNA COVID-19 vaccines: A call for further study



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1. Introduction

Several highly effective vaccines are available just over a year since the emergence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the etiologic agent of coronavirus disease 2019 (COVID-19). COVID-19 has claimed more than two million lives globally and over 450,000 in the United States. Two of the leading vaccines, which have provided hope that an end to the devastating effects of the pandemic may be in sight, are messenger RNA (mRNA)-based vaccines, a novel vaccine platform that has received authorization for emergency use by the US Food and Drug Administration (FDA) and the European Medicines Agency (EMA).

To overcome the inherent instability of the mRNA molecule under physiological conditions, mRNA is first modified and then encapsulated in lipid nanoparticles (LNPs) that effectively deliver the mRNA into cells at the injection site and the draining lymph nodes for translation into viral protein by the host protein synthe-

sis machinery [1–3]. Placing the mRNA, which contains N¹-methylpseudouridine instead of uridine, between two untranslated regions (UTRs) protects it from degradation, and its polyadenylation, or the addition of adenosine monophosphates, at the 3' end, further stabilizes the molecule; at the 5' end, the addition of a trinucleotide cap 1 analog ((m₂^{7,3'-O})Gppp(m^{2'-O})ApG) serves as a recognition signal for the efficient binding of host cellular ribosomes that translate the mRNA [4]. The transiently expressed, mainly by dendritic cells and subcapsular sinus macrophages, membrane-bound spike protein of SARS-CoV-2 is then recognized by immune cells as a foreign antigen, eliciting both T-cell and B-cell responses to generate neutralizing antibodies, which are thought to contribute to protection against COVID-19 [4].

2. Composition and role of the ingredients of the two authorized mRNA vaccines

The composition and functions of the ingredients of the two mRNA vaccines authorized for emergency use include the Moderna mRNA-1273 and Pfizer/BioNTech's BNT162b2 vaccines, and are summarized in Table 1. The mRNA contained in both vaccines

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