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(54) **Title:** CORONAVIRUS VACCINE FORMULATIONS

Fig. 1

MEVFLVLLPLVSSQCVNLTRTQLPPAYTNSFTRGVYYPDKVFRSSVLHSTQDLFLPFFSN
VTWFHAIHVSCTNGTKRFDNPVLPFNDGVYFASTEKSNIIRGWIFGTTLDSTQSLIVNN
ATNVVIKVCFCNDPFLGVYIHKNNKSWMESEFRVYSSANNCTFEYVSQPFLLMDLEG
KQGNFKNLREFVFKNIDGYFKIYSKHTPINLVRDLPQGFSALEPLVDLPIGINITRFQTLAL
HRSYLTGPDSSSGWTAGAAAYVGYLQPRITFLKYNNENGTTDAVDCALDPLSETKCTLK
SFTVEKGITYQTSNFRVQPTESIVRFPNITNLCPFGEVFNATRFASVYAWNKRISNCVADYS
VLYNSASFSTFKCYGVSPTKLNDLCFTNVYADSFVIRGDEVRIAPGQTGKIADYNYKLP
DDFTGCVIAWNSNNLDSKVGNGYNYLRLFRKSNLKPFERDISTEYQAGSTPCNGVEGF
NCYFPLQSYGFQPTNGVGYQPYRVVLSFELLHAPATVCGPKKSTNLVKNKCVNFNFG
LTGTGVLTESNKKFLPFQGFGRDIADTTDAVRDPQTLILDITPCSFGGVSVITPGTNTSNQ
VAVLYQDVNCTEVPVAIHADQLIPTWRVYSTGNSVVFQTRAGCLIGAHEVNNSYECDIPIG
AGICASYQTQTNSPRRARSVASQSIIAYTMSLGAENSVAYSNNISAIPTNFTISVTTEILPVS
MTKTSVDCTMYICGDSTECNLLLQYGSFCTQLNRALTGIAVEQDKNTQEVFAQVKQIYK
TPPIKDFGGFNFSQILPDPSKPSKRSFIEDLLFNKVTLDAGFIKQYGDCLGDIAARDLCA
QKFNGLTVLPLLTDEMIQYTSALLAGTTTSGWTFGAGAALQIPFAMQMAYRFNGIGVT
QNVLYENQKLIANQFNSAIGKIQDLSSTASALGKLQDVVNQNAQALNTLVKQLSSNFGA
ISSVLNDILSRLDKVEAEVQIDRLITGRLQSLQTYVTQQLIRAAEIRASANLAATKMSECV
LGQSKRVDFCGKGYHLMSFPQSAPHGVVFLHVTYVPAQEKNF TAPAICHGDKAHFPRE
GVFVSNNGTHWVFTQRNFYEPQIITTDNTFVSGNCDVIGIVNNTVYDPLQPELDSFKEEL
DKYFKNHTSPDVLGDISGINASVNNIQRKEIDRLNEVAKNLNESLIDLQELGKYEQYKWP
WYIWLGFIAGLIAIVMTIMLCMTSCCSCSGSCCKFDEDDSEPVLKGVKLHYT

(57) **Abstract:** Disclosed herein are coronavirus Spike (S) proteins and nanoparticles comprising the same, which are suitable for use in vaccines. The nanoparticles present antigens from pathogens surrounded to and associated with a detergent core resulting in enhanced stability and good immunogenicity. Dosages, formulations, and methods for preparing the vaccines and nanoparticles are also disclosed.

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