

Four Simple Biomimetic Mineralization Methods to Improve the Thermostability and Immunogenicity of Virus-like Particles as a Vaccine against Foot-and-Mouth Disease

Mengnan Guo ^{1,†}, Jiajun Li ^{1,†}, Zhidong Teng ¹, Mei Ren ¹, Hu Dong ¹, Yun Zhang ¹, Jiaxi Ru ¹, Ping Du ¹, Shiqi Sun ^{1,2} and Huichen Guo ^{1,2,3,*}

¹ State Key Laboratory of Veterinary Etiological Biology, National Foot-and-Mouth Disease Reference Laboratory, Lanzhou Veterinary Research Institute, Chinese Academy of Agricultural Sciences, Lanzhou 730030, China; guomengnan2021@163.com (M.G.); jiajunli@163.com (J.L.); tengzhidong163@163.com (Z.T.); Mei.Ren@student.uliege.be (M.R.); donghu.0608@163.com (H.D.); zhangyun03@caas.cn (Y.Z.); rujiaxi@caas.cn (J.R.); westernboydp555@163.com (P.D.); sunshiqi@caas.cn (S.S.)

² College of Animal Science, Yangtze University, Jingzhou 434025, China

³ Yunnan Tropical and Subtropical Animal Virus Diseases Laboratory, Yunnan Animal Science and Veterinary Institute, Kunming 650000, China

* Correspondence: guohuichen@caas.cn

† These authors contributed equally to this work.

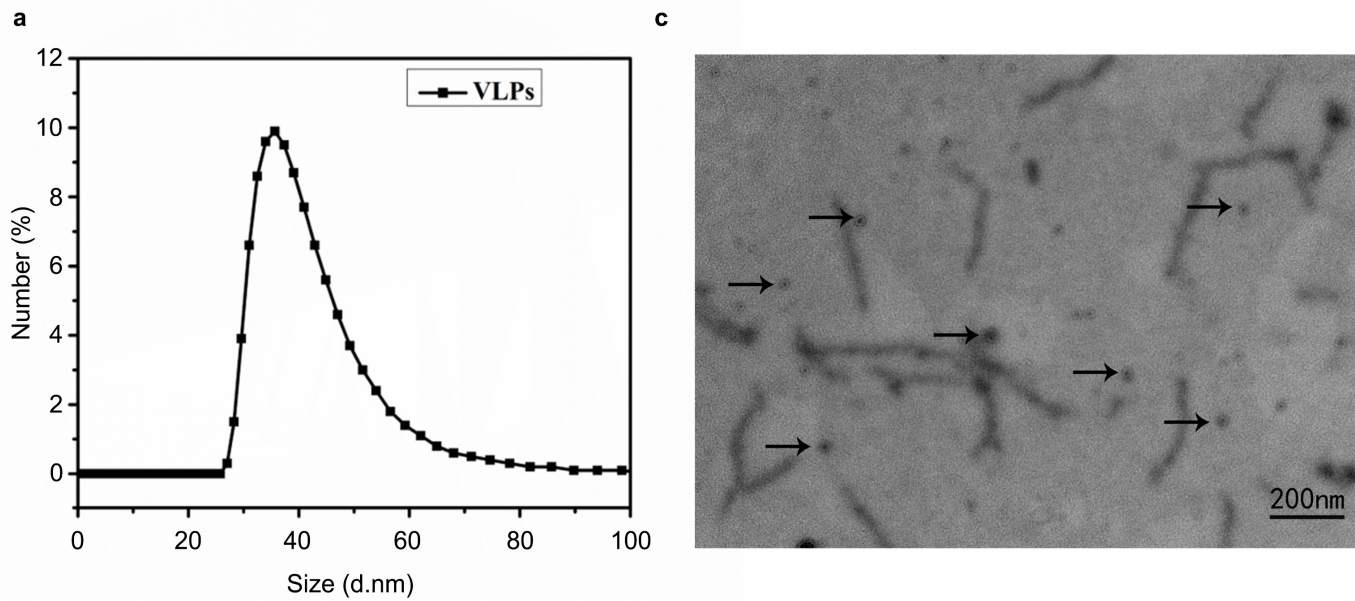


Figure S1. Characterization of VLPs. **(a)** The particle size distribution of FMD VLPs. **(b)** TEM image of phosphotungstic acid negatively stained FMD VLPs.

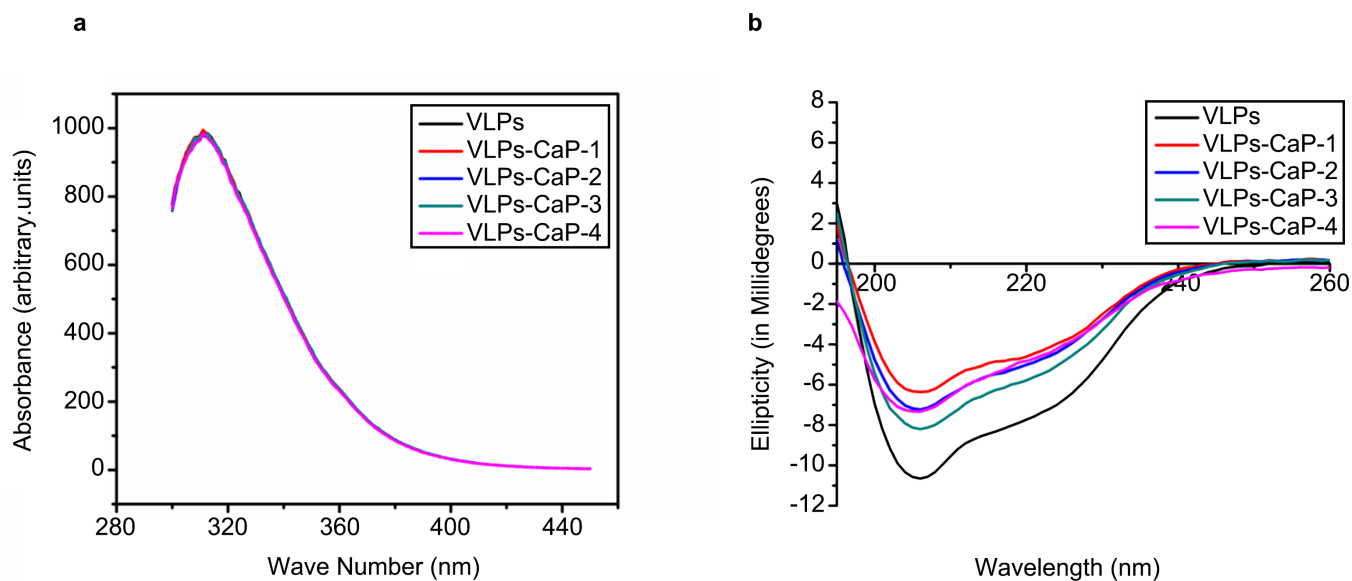


Figure S2. Characterization of VLPs and different VLPs-CaP. (a) Ultraviolet-visible (UV-vis) absorption spectrum of VLPs, VLPs-CaP-1, VLPs-CaP-2, VLPs-CaP-3 and VLPs-CaP-4. (b) electronic circular dichroism (ECD) of VLPs, VLPs-CaP-1, VLPs-CaP-2, VLPs-CaP-3 and VLPs-CaP-4.

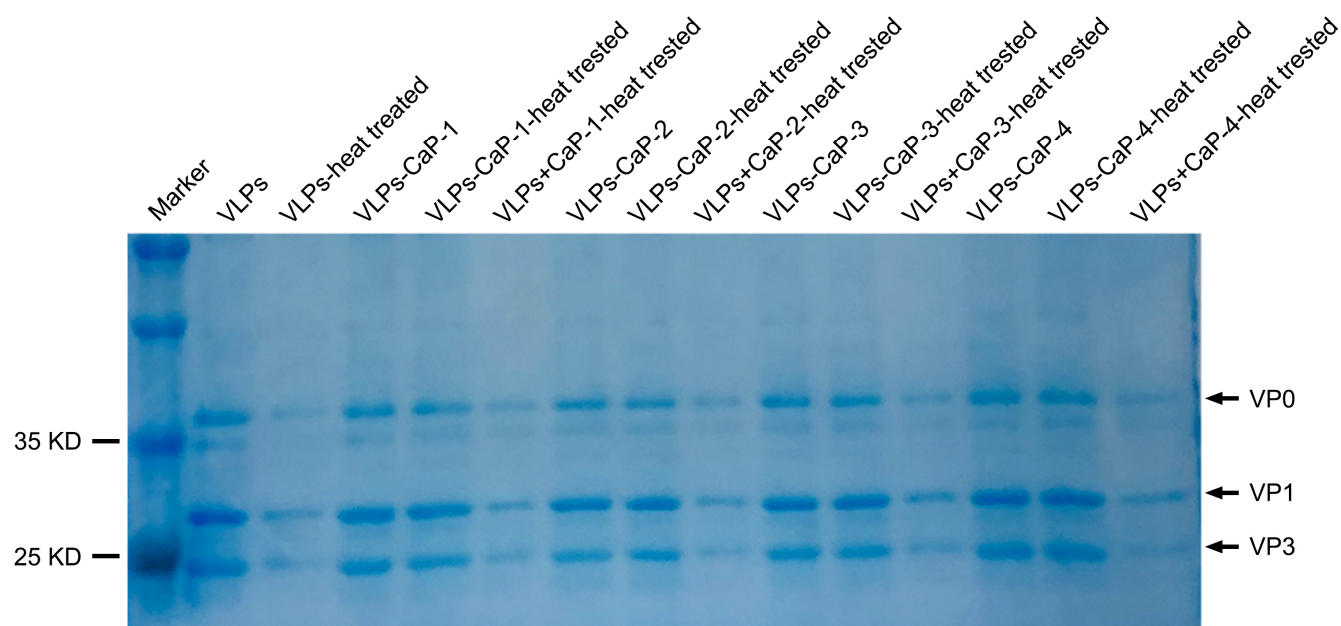


Figure S3. Characterization of VLPs, different VLPs-CaP and different VLPs+CaP.