Claims

[Claim 1] A pharmaceutical composition comprising a human papillomavirus (HPV) vaccine and a checkpoint inhibitor agent for preventing or treating a human papillomavirus (HPV)-induced cancer.

[Claim 2] The pharmaceutical composition of claim 1, wherein the HPV vaccine comprises HPV vaccine comprising the polynucleotide of SEQ ID NO: 15 or a functional variant with sequence identity of 85% or more to SEQ ID NO: 15.

[Claim 3] The pharmaceutical composition of claim 2, wherein a dose of the HPV vaccine is 0.5 mg to 5 mg.

[Claim 4] The pharmaceutical composition of claim 2, wherein the HPV vaccine is for intramuscular injection.

[Claim 5] The pharmaceutical composition of claim 1, wherein the checkpoint inhibitor agent is a programmed death (PD)-1/PD-L1 inhibitor.

[Claim 6] The pharmaceutical composition of claim 1, wherein the checkpoint inhibitor agent is an anti-PD-1 antibody or anti-PD-1L antibody.

[Claim 7] The pharmaceutical composition of claim 1, wherein the checkpoint inhibitor agent is selected from the group consisting of pembrolizumab, nivolumab, atezolizumab, avelumab, durvalumab, cemiplimab, and a combination thereof.

[Claim 8] The pharmaceutical composition of claim 5, wherein a dose of the checkpoint inhibitor agent is 50 mg to 500 mg.

[Claim 9] The pharmaceutical composition of claim 5, wherein the checkpoint inhibitor agent is for intravenous injection.

[Claim 10] The pharmaceutical composition of claim 1, wherein the HPV vaccine and the checkpoint inhibitor agent is administered multiple times.

[Claim 11] The pharmaceutical composition of claim 1, the HPV vaccine and the checkpoint inhibitor agent is administered simultaneously, separately, or sequentially.

[Claim 12] The pharmaceutical composition of claim 1, wherein the HPV vaccine is adminstered at week 1, 2, 4, 7, 13, and 19, and further optionally at week 46.

[Claim 13] The pharmaceutical composition of claim 1, wherein the checkpoint inhibitor agent is administered at an interval of three weeks.

[Claim 14] The pharmaceutical composition of claim 1, wherein the HPV-induced cancer is cervical cancer.

[Claim 15] The pharmaceutical composition of claim 14, wherein the cervical

cancer is squamous cell carcinoma or adenocarcinoma.

[Claim 16] The pharmaceutical composition of claim 1, wherein the HPV-induced caner is metastatic, recurrent, or advanced cancer and the subject has been or is subject to an anti-cancer treatment.

[Claim 17] The pharmaceutical composition of claim 1, wherein the HPV is HPV 16, HPV 18, or a combination thereof.

[Claim 18] The pharmaceutical composition of claim 1, wherein a subject for preventing or treating the HPV-induced cancer is PD-L1 positive or PD-L1 negative.

[Claim 19] The pharmaceutical composition of claim 1, wherein the HPV is HPV 16; and a subject for preventing or treating the HPV-induced cancer is PD-L1 positive.

[Claim 20] The pharmaceutical composition of claim 1, wherein the HPV-induced cancer is cervical cancer being squamous cell carcinoma; the HPV is HPV 16; and/or a subject for preventing or treating the HPV-induced cancer is PD-L1 positive.

[Claim 21] Use of a pharmaceutical composition comprising (a) a human papillomavirus (HPV) vaccine; and (b) a checkpoint inhibitor agnet in the manufacture of a medicament for preventing or treating a human papillomavirus (HPV)-induced cancer.