What is claimed is:

1. A live attenuated *Bordetella pertussis* strain comprising a mutated pertussis toxin (*ptx*) gene, a deleted dermonecrotic toxin (*dnt*) gene, a heterologous *ampG* gene, an inactivated filamentous haemagglutinin (FHA) gene, and a gene encoding a hybrid protein comprising an N-terminal fragment of filamentous haemagglutinin (FHA) and a heterologous antigen, wherein the gene encoding the hybrid protein is inserted into the locus of the deleted *dnt* gene and the *Bordetella* pertussis strain lacks a native FHA protein.

2. The *Bordetella pertussis* strain of claim 1, wherein the mutated *ptx* gene comprises at least one mutation leading to an enzymatically inactive protein that retains immunogenic properties.

3. The *Bordetella pertussis* strain of claim 1, wherein the *ampG* gene is replaced with a heterologous ampG gene leading to a residual tracheal cytotoxin (TCT) activity of less than 5%.

4. The *Bordetella pertussis* strain of claim 3, wherein the heterologous *ampG* gene is from E. coli.

5. The *Bordetella pertussis* strain of claim 1, wherein the heterologous antigen comprises at least one epitope of a protein expressed by a pathogen responsible for an infection of the respiratory tract.

6. The *Bordetella pertussis* strain of claim 1, wherein the hybrid protein comprises the N-terminal fragment of FHA fused to the extracellular domain of the matrix protein (Me2) of the influenza A virus.

7. The *Bordetella pertussis* strain of claim 1, wherein the hybrid protein comprises the N-terminal fragment of the FHA protein fused to three copies of the extracellular domain of the matrix protein (Me2) of the influenza A virus.

8. The *Bordetella pertussis* strain of claim 1, wherein the hybrid protein comprises the N-terminal fragment of the FHA protein fused to at least an antigenic fragment of the G protein of the Respiratory Syncytial Virus (SRV).

9. The *Bordetella pertussis* strain of claim 1, wherein the hybrid protein comprises the N-terminal fragment of the FHA protein fused to an antigenic fragment of the PcsB protein of *S. pneumoniae.*