

In silico comparative study of epitopes predicted from different strains of genus parvovirus.

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Abstract

Parvoviruses are typically linear, non-segmented single-stranded DNA viruses, with an average genome size of 5000 nucleotides. Parvoviruses are some of the smallest viruses found in nature. Some have been found as small as 23 nm. Many types of mammalian species have a strain of parvovirus associated with them. Parvoviruses tend to be specific about the taxon of animal they will infect, but this is a somewhat flexible characteristic. Thus, all strains of parvovirus will affect dogs, wolves, and foxes, but only some of them will infect human. Parvovirus is treated with the help of vaccines but the traditional vaccine development process is very expensive and unsafe, with the help of insilico software tools and databases we can predict the epitopes of parvovirus species such as Canine parvovirus, Feline panleukopenia virus, H-1 virus, LU111 virus, Mink enteritis virus, Minute virus of mice, Porcine parvovirus, Raccoon parvovirus, by using Bepipred, CTLpred. These predictions will be useful for reverse vaccinology against parvoviruses infections for cattle and mankind.

Keywords

Parvovirus, Epitope, Vaccine, Insilico, Strain.

Introduction

The viral capsid of parvovirus is made up of 2-3 proteins, known as VP1, VP2, VP3 that form an icosahedral structure that is resistant to pH, solvents and temperature up to 50°C. Inside the capsid is a single-stranded DNA genome. At the 5' and 3' ends of this genome are palindromic sequences of approximately 120-250 nucleotides, that form hairpins and are essential for viral genome replication.

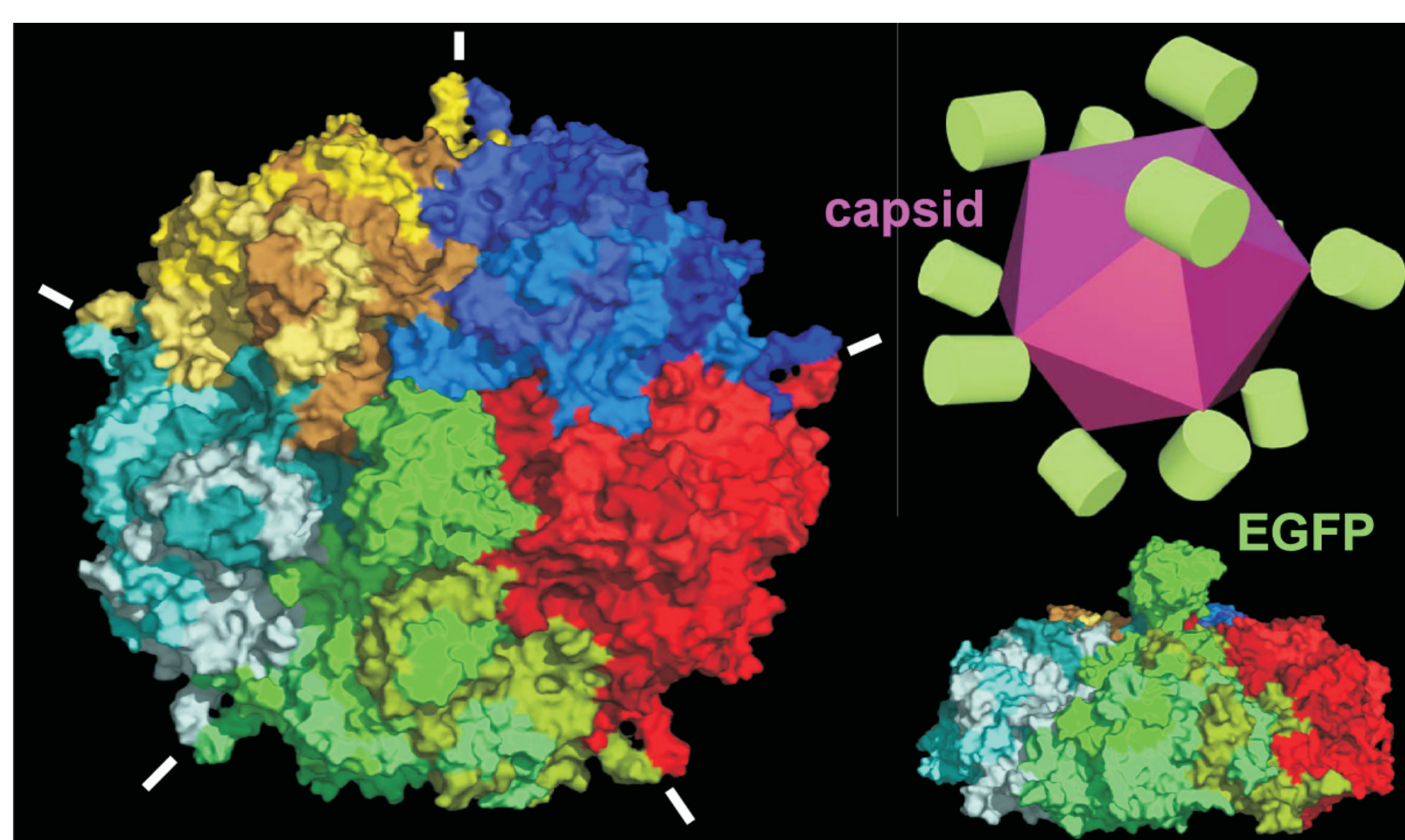


Fig1 : Structure of Parvovirus

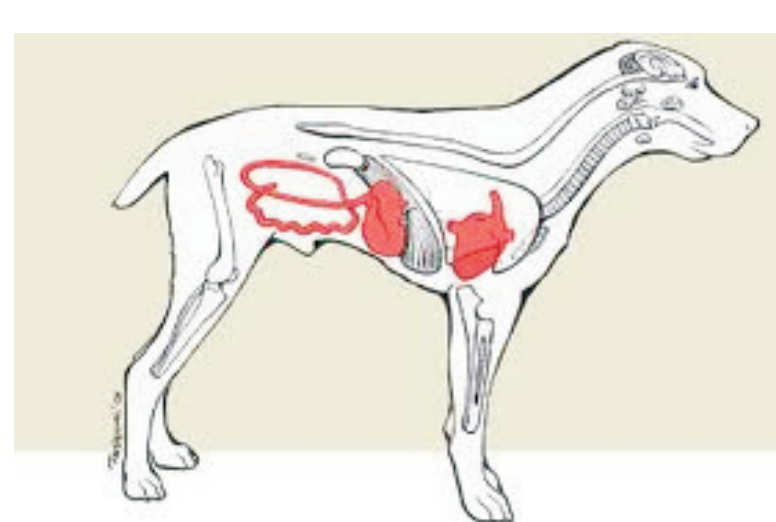


Fig 2:
A dog infected by parvovirus (Blood Diarrhea).

Methods

1. Coat protein (vp1, vp2, vp3) sequence of members of parvovirus genus retrieved from SWISS-PROT (highly annotated protein sequence database).

2. Epitope prediction done by using Bepipred (B-Cell Epitope).

Virus	Start position	End position	Peptide	Peptide length
Canine parvovirus	18	39	ERATGSGNGSGGGGGGGSGGVG	22
Feline panleukopenia virus	18	39	ERATGSGNGSGGGGGGGSGGVG	22
H-1 virus	284	300	GKQHGEDWAKQGAAPER	17
LU111 virus	22	49	RAADGPGSGGGGGSGGGVGVSTGSYDN	28
Mink enteritis virus	18	39	ERATGSGNGSGGGGGGGSGGVG	22
Minute virus of mice	13	33	SLDQGEPTNPSDAAAKEHDEA	21
Porcine parvovirus	18	41	SATGNESGGGGGGGGGRGAGGVGV	24
Raccoon parvovirus	18	39	RATGSGNGSGGGGGGGSGGVGI	22

Table-1 : Predicted antigenic peptides of parvoviruses by using Bepipred. (threshold=0.35)

3. Epitope prediction done by using CTLpred (T-Cell Epitope).

Virus	Rank	Start position	Sequence	Score (ANN/SVM)	Prediction
Canine parvovirus	1	526	RLHVNAPFV	1.00/1.3291973	Epitope
Feline panleukopenia virus	1	481	RLHVNAPFV	1.00/1.3291973	Epitope
H-1 virus	3	385	RLHVTAPFV	0.98/1.1910676	Epitope
LU111 virus	2	142	SLDQELFNV	0.99/1.2905132	Epitope
Mink enteritis virus	1	481	RLHVNAPFV	1.00/1.3291973	Epitope
Minute virus of mice	3	609	RLHITAPFV	0.98/1.3260529	Epitope
Porcine parvovirus	2	477	RLHVTAPFV	0.98/1.1910676	Epitope
Raccoon parvovirus	1	481	RLHVNAPFV	1.00/1.3291973	Epitope

Table-2 :- Predicted CTL epitopes of parvoviruses by using CTLpred. (threshold =0.51(ANN)

Result

Prediction of B-Cell antigenic peptides: The prediction of antigenicity and B-cell epitopes has been done with BepiPred server. The threshold value of each amino acids in peptide(epitope) are greater than or equal to 0.35. The same types of epitope regions are present in Canine parvovirus, Feline panleukopenia virus, Mink enteritis virus and Raccoon parvovirus (18-ERATGSGNGSGGGGGGGSGGVG-39).

Prediction of T-cell epitope: The prediction of T-cell epitope done with CTLpred server. The same types of epitope region are present in Canine parvovirus, Feline panleukopenia virus, Mink enteritis virus and Raccoon parvovirus (RLHVNAPFV). And T-cell epitope region of Porcine parvovirus and H-1 virus are similar (RLHVTAPFV). There is one amino acid change in as compare with t-cell epitope of Porcine parvovirus and H-1 virus with t-cell epitope of Canine parvovirus, Feline panleukopenia virus, Mink enteritis virus and Raccoon parvovirus, N replace by T.