

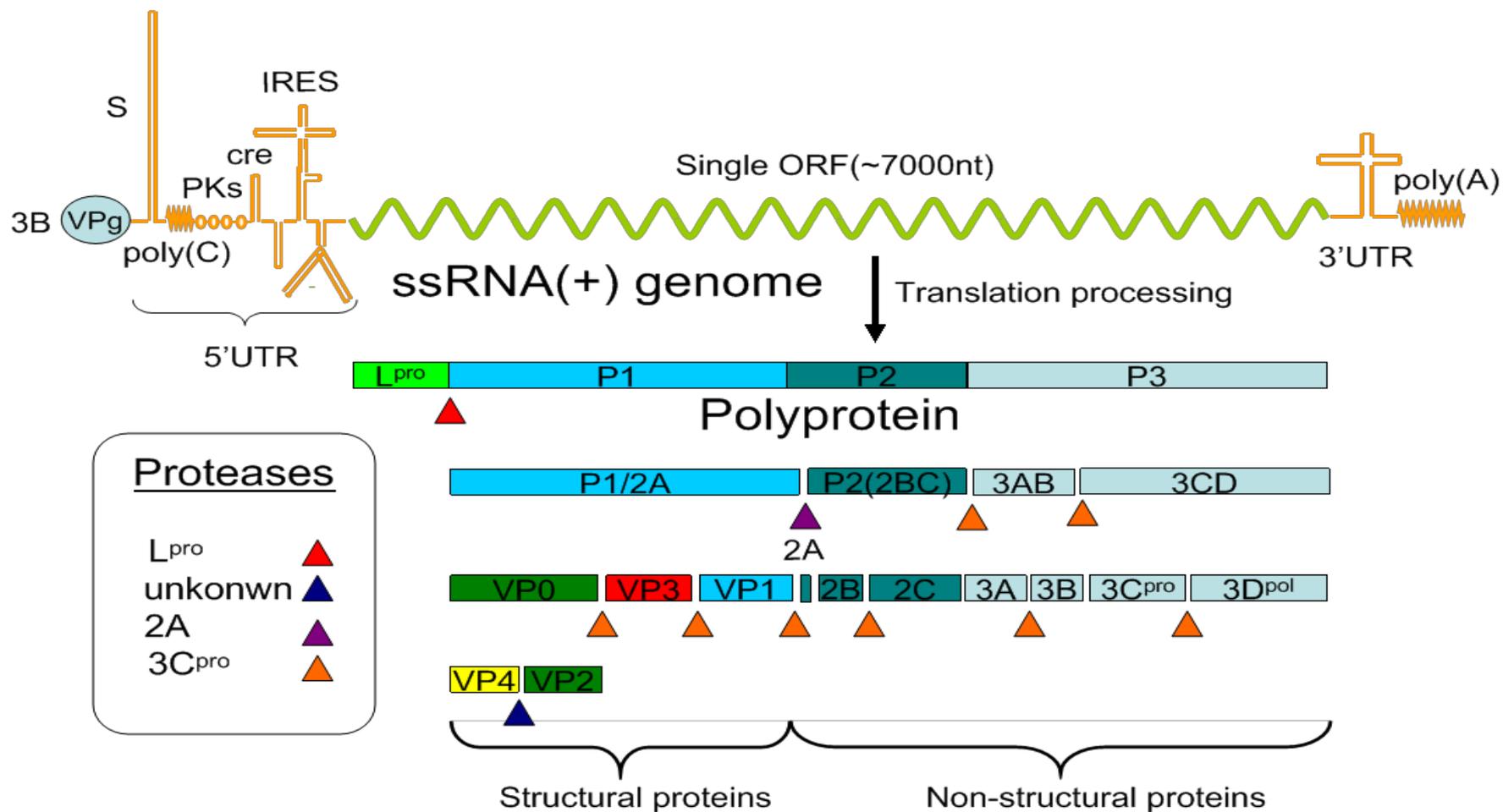
口蹄疫病毒结构蛋白的结构功能分析  
Structural and functional analysis of  
structural proteins of foot-and-mouth  
disease virus

G04

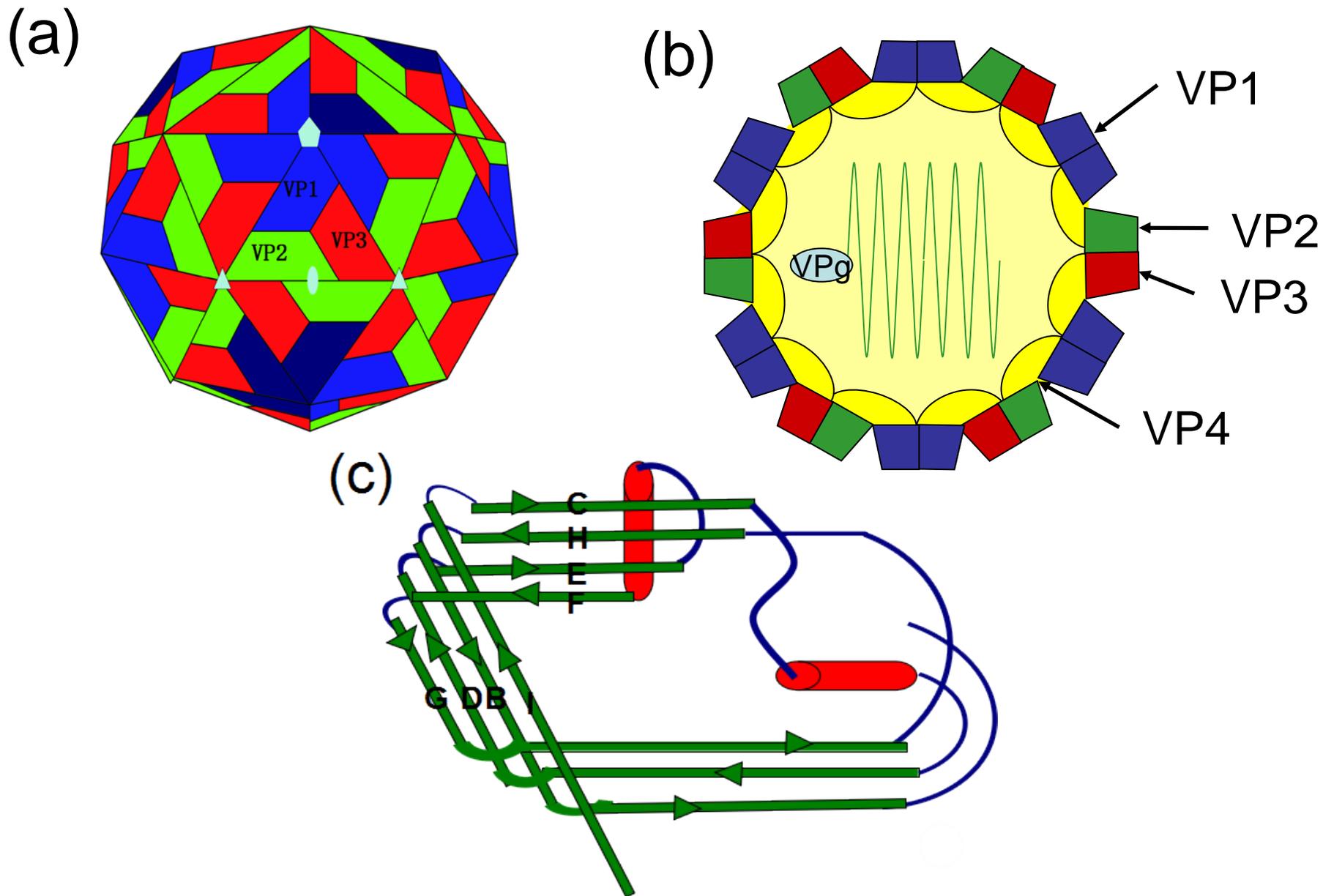
王迪 王金磊 肖星星 韩世充

# 1. 研究背景

## 1.1 FMDV的基因组结构



## 1.2 FMDV的模式结构



## 2. 研究目的

2.1. 比较不同亚型的FMDV结构蛋白

2.2. 分析VP1 GH环的结构学特性

# 3. 研究流程

## 3.1 检索不同亚型FMDV的P1多肽序列

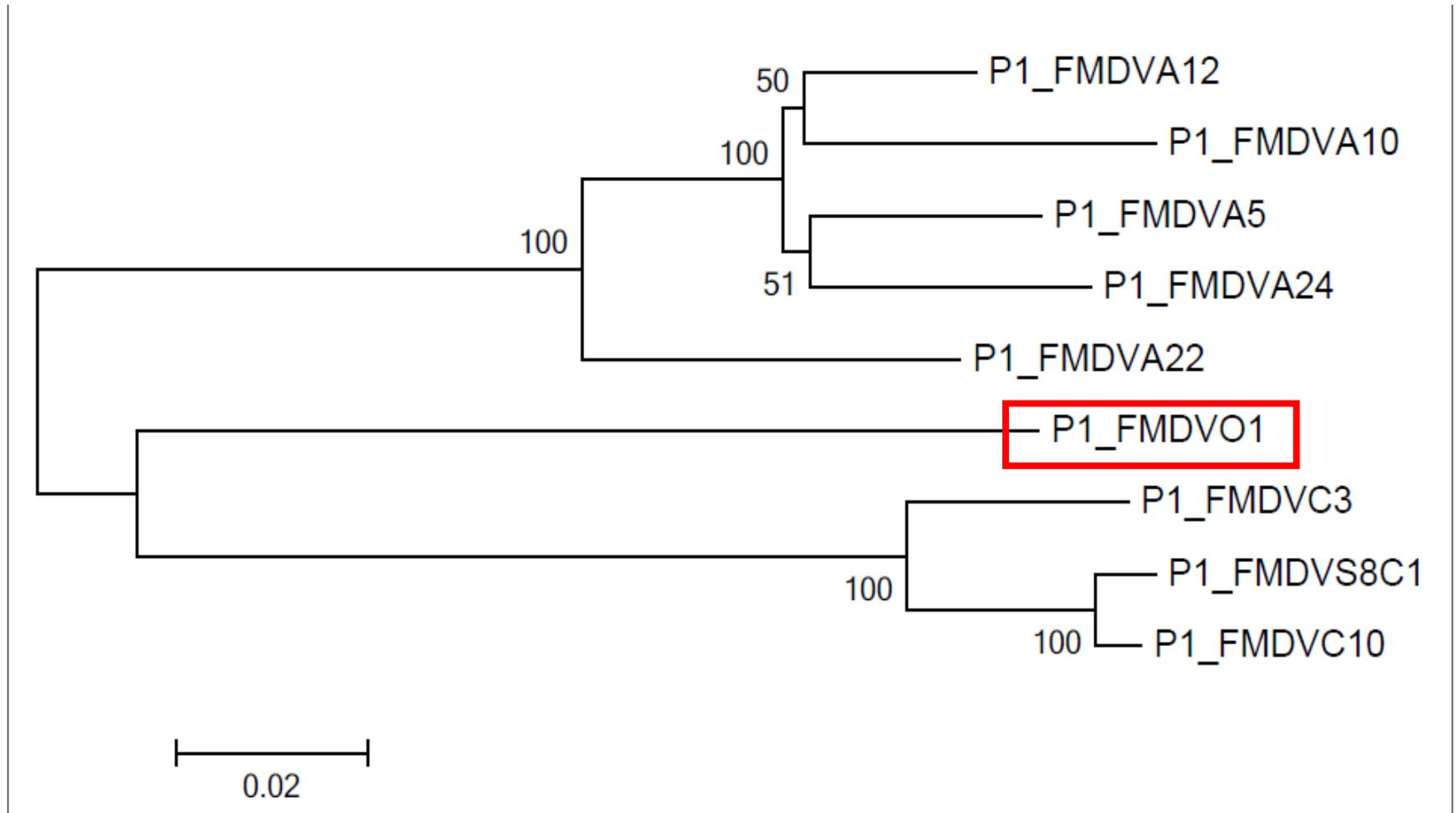
**Search in** Protein Knowledgebase (UniProtKB) ▾ **Query**

> Show only [reviewed \(9\)](#) ★ (UniProtKB/Swiss-Prot) or [unreviewed \(4,728\)](#) ☆ (UniProtKB/TrEMBL) entries

	Entry	Entry name	Status	Organism	Length
<input type="checkbox"/>	P03305	POLG_FMDVO	★	Foot-and-mouth disease virus (isolate Bovine/Germany/O1Kaufbeuren/1966 serotype O) (FMDV)	2,332
<input type="checkbox"/>	P03308	POLG_FMDVA	★	Foot-and-mouth disease virus (isolate Bovine/United Kingdom/A12Valle119/1932 serotype A) (FMDV)	2,333
<input type="checkbox"/>	P03311	POLG_FMDVS	★	Foot-and-mouth disease virus (isolate -/Spain/S8c1SantaPau/1970 serotype C) (FMDV)	2,327
<input type="checkbox"/>	P15072	POLG_FMDVT	★	Foot-and-mouth disease virus (isolate -/Germany/C1Oberbayen/1960 serotype C) (FMDV)	2,327
<input type="checkbox"/>	P03306	POLG_FMDV1	★	Foot-and-mouth disease virus (strain A10-61) (Aphthovirus A) (FMDV)	2,332
<input type="checkbox"/>	P03307	POLG_FMDV5	★	Foot-and-mouth disease virus (isolate -/Germany/A5Westerwald/1951 serotype A) (FMDV)	2,332
<input type="checkbox"/>	P03309	POLG_FMDVC	★	Foot-and-mouth disease virus (isolate Bovine/Brazil/A24Cruzeiro/1955 serotype A) (FMDV)	2,333
<input type="checkbox"/>	P03310	POLG_FMDVI	★	Foot-and-mouth disease virus (isolate -/Brazil/C3Indaial/1971 serotype C) (FMDV)	2,328
<input type="checkbox"/>	P49303	POLG_FMDVZ	★	Foot-and-mouth disease virus (isolate -/Azerbaijan/A22-550/1965 serotype A) (FMDV)	2,336



### 3.3 根据P1序列构建进化树





# 3.5 VP1 GH环的二级结构预测

利用WebLab garnier(v6.0.1)

```
..
      .   10   .   20
      RNAVPNLRGDLQVLAQKVARTLP
helix      HHH HHHH
sheet      E   EEEE
turns TT   T TT
coil   CCC C           CC
```

FMDV-O1

```
..
      .   10   .   20
      ASDSRSGDLGSIAARVATQLP
helix
sheet      EEEEEEEEE
turns      T TTTT
coil CC C   CC           CC
```

FMDV-A10

```
..
      .   10   .   20
      AGGMGRRGDLEPLAARVAAQLP
helix      HHHHHHHHH
sheet
turns      T
coil CC CCCCCCCC       CC
```

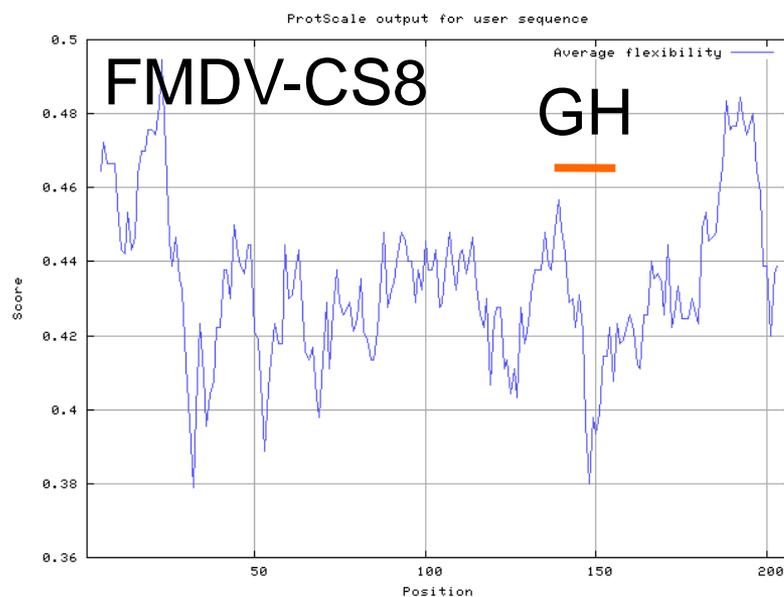
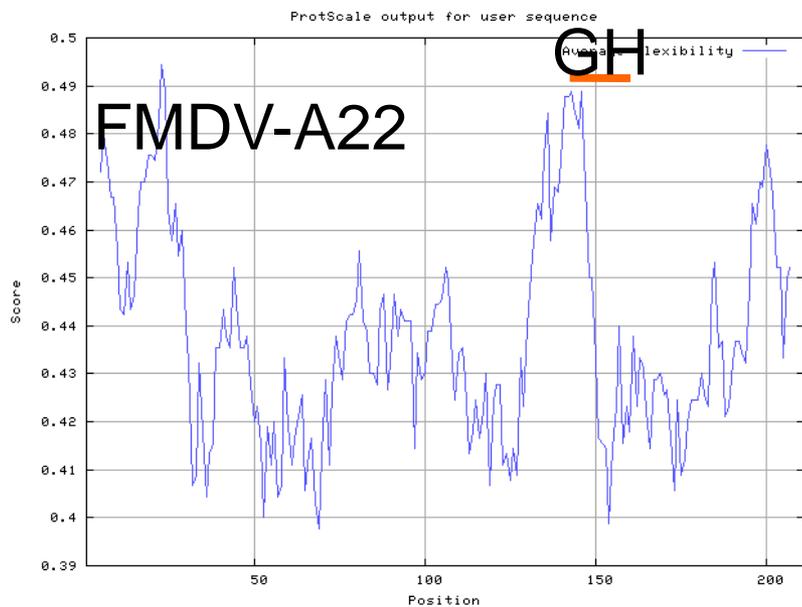
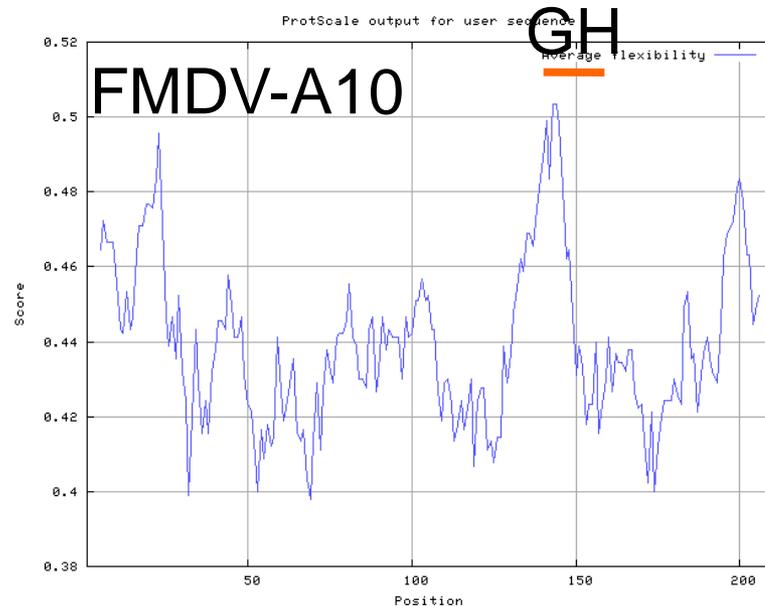
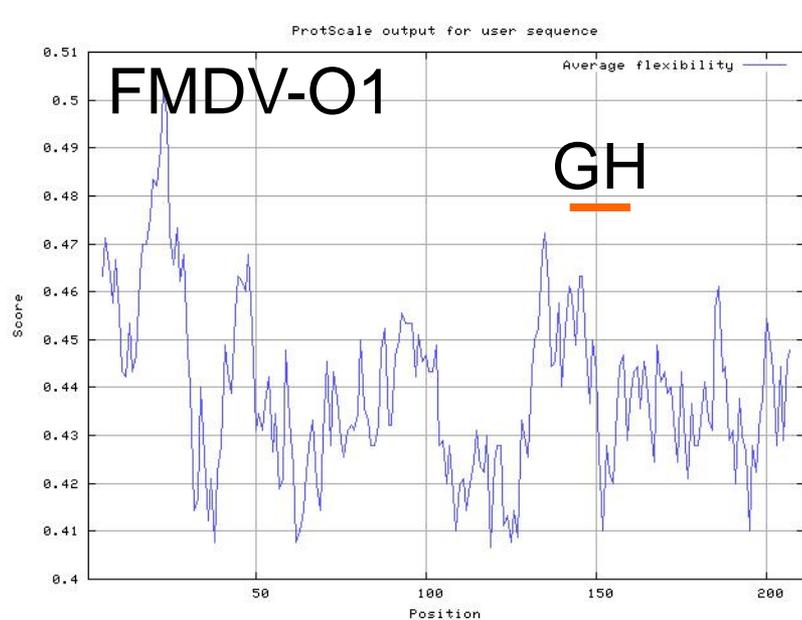
FMDV-A22

```
..
      .   10
      ASARGDLAHLTTTHARHLP
helix HHHHHHHHHHHHHHH
sheet
turns
coil           T
              C CCC
```

FMDV-CS8

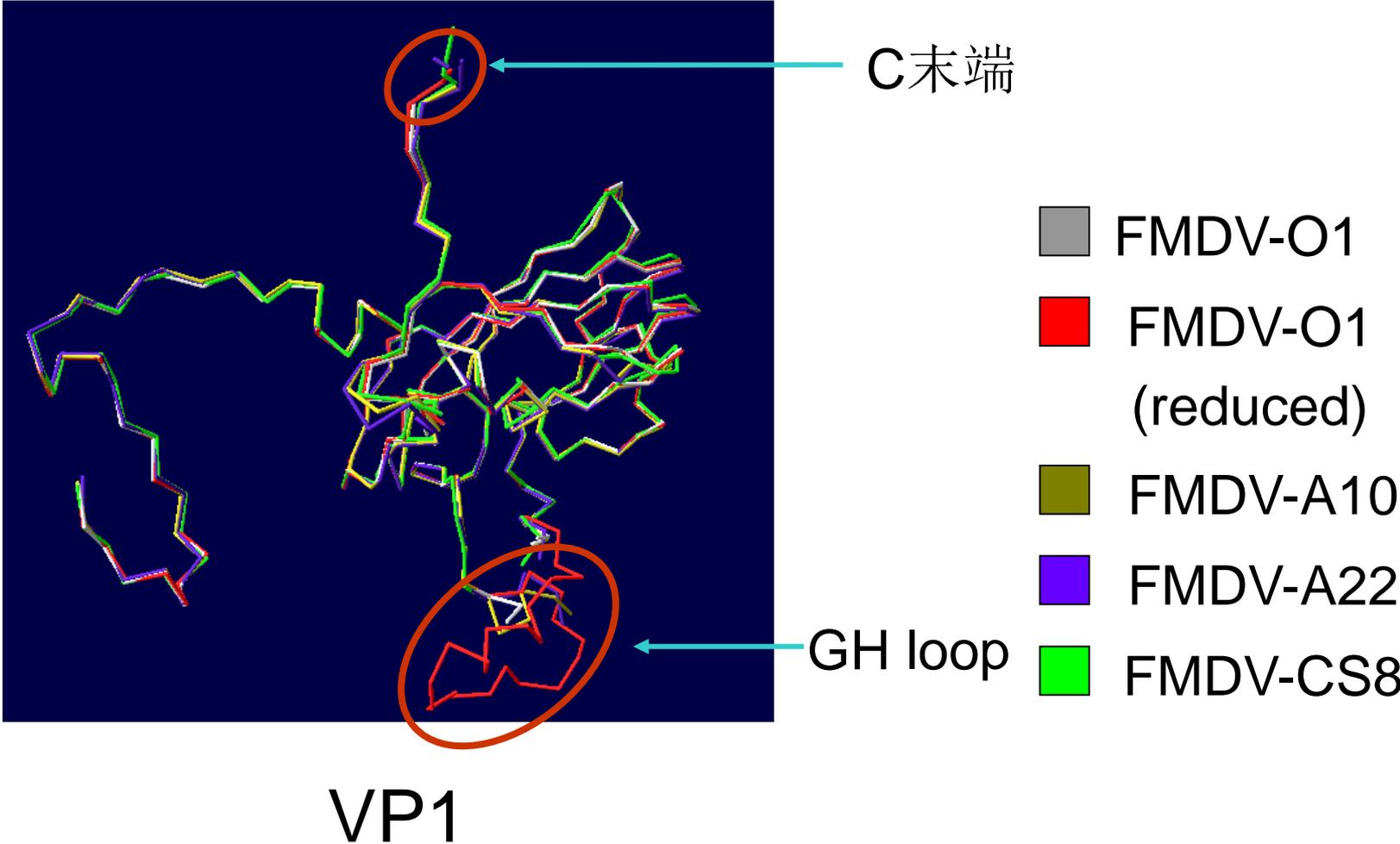
预测结果：各亚型间GH环二级结构存在差异

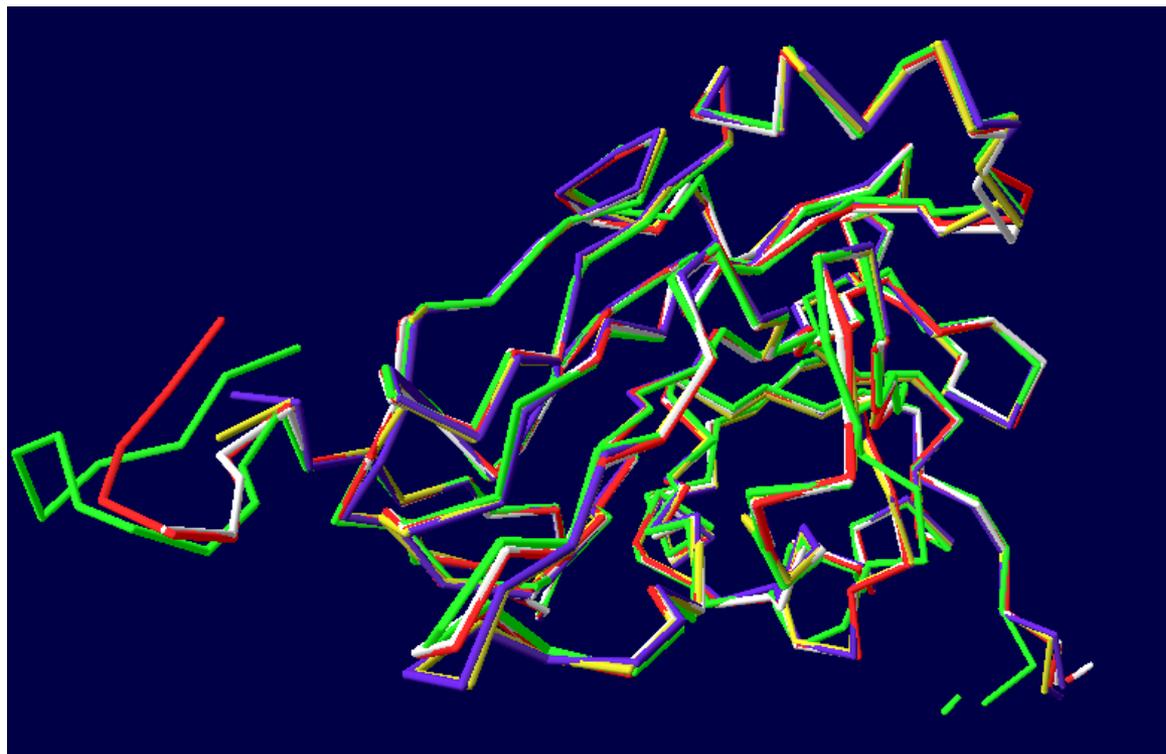
# 3.6 VP1 GH环的柔性分析



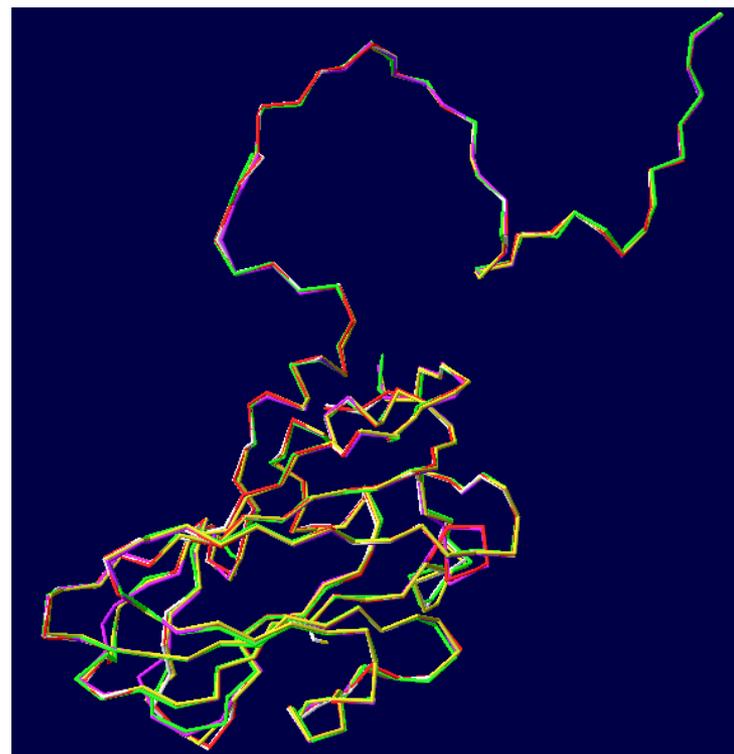
预测结果：GH环入口处的氨基酸残基柔性较大

# 3.7 FMDV不同亚型间的VP1-VP3结构比对





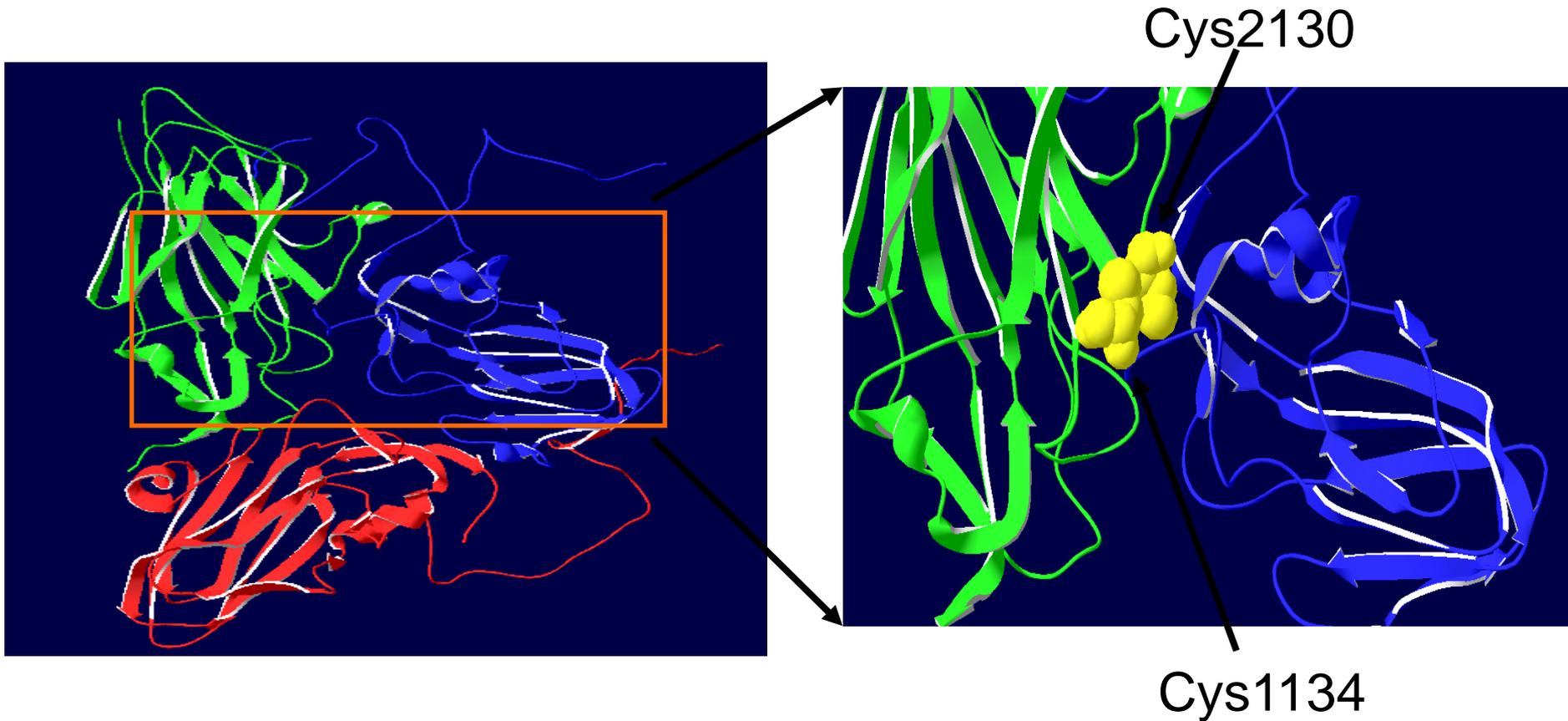
VP2



VP3

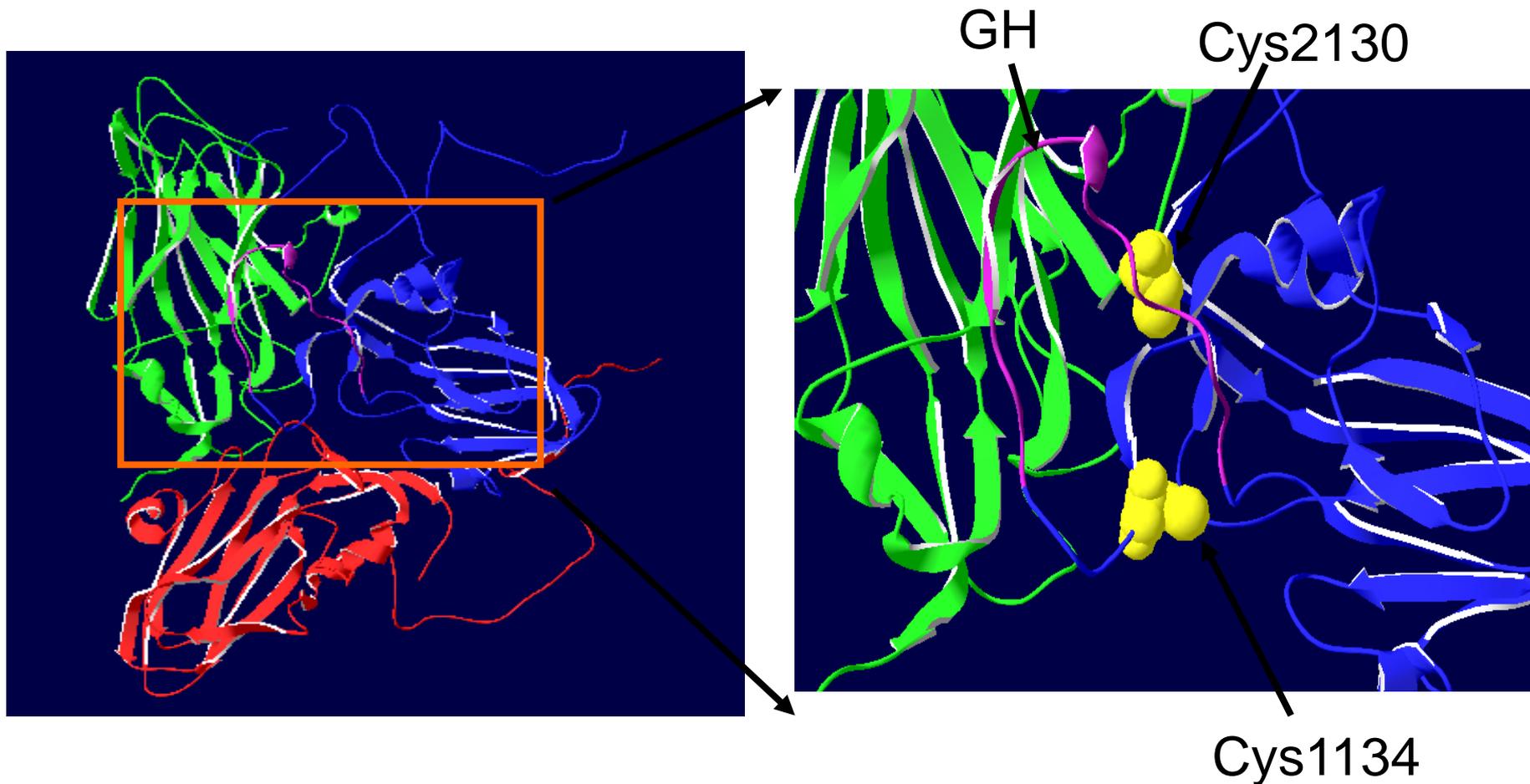
(利用Swiss-PDB Viewer构建，不同亚型的PDB ID分别为1BBT、1FOD、1ZBE、4GH4、1FMD)

### 3.8 FMDV-O1和FMDV-O1(reduced)的结构比较



FMDV-O1的单体结构（其VP1 134位Cys和VP2 130位Cys形成二硫键，VP1 GH环结构混乱）

软件：Swiss-PDB Viewer； PDB ID:1BBT



FMDV-O1(reduced)的单体结构（其VP1 134位Cys和VP2 130位Cys不形成二硫键，VP1 GH环结构稳定）

软件：Swiss-PDB Viewer； PDB ID:1FOD

## 4. 研究结论

- 4.1 FMDV不同亚型间VP1结构差异较大，尤其是VP1 GH环和C末端。
- 4.2 GH环具有较高的柔性。

## 5. 致谢

- 感谢罗老师为我们打开了实用生物信息学技术这扇窗，您严谨的治学态度和谦逊的治学精神将影响我们一生。

Thanks for your attention!