

新型コロナウイルスについての最新論文教材シリーズ 2

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第二回目の今日は、前回読んだ「SARS-CoV-2 Vaccines: Status Report (reported by Fatima Amanat and Florian Kramer)」の論文のコロナウイルスについての記述を読みます。この導入部分ではコロナウイルスについてその詳細が書かれています。生物の授業で習った知識を元に一読し、問いに答えてみてください。訳と問いの答えは週明けに up します。辞書を使ってもかまいません。

Coronaviruses, in Brief

SARS-CoV-2 is part of the **Coronaviridae** family, whose members are **named after** their **crown-like** appearance under the electron microscope caused by the surface **glycoproteins** that decorate the virus. The family includes two **subfamilies**: **Letovirinae** and **Orthocoronavirinae**. **Orthocoronavirinae** includes the **genera** **Alphacoronavirus**, **Betacoronavirus**, **Gammacoronavirus**, and **Deltacoronavirus**. **Alphacoronaviruses** and **betacoronaviruses** typically infect only mammals, whereas **gammacoronaviruses** and **deltacoronaviruses** typically infect **avian** species and sometimes mammals. Coronaviruses are common human **pathogens**; two types of **alphacoronaviruses** (229E and NL63) and two types of **betacoronaviruses** (OC43 and HKU1) circulate in humans and cause common cold. More pathogenic coronaviruses for humans include SARS-CoV-1, the Middle Eastern respiratory syndrome coronavirus (MERS-CoV), and now SARS-CoV-2, which are all **betacoronaviruses**.

Coronaviruses have a large (30+ kb) **single-stranded positive-sense RNA genome** **encoding** for several open reading frames. One frame **encodes** the **spike protein (S protein)**, a class I fusion protein that mediates attachment of the virus to cell surface receptors followed by uptake into **endosomes** (for most coronaviruses). **Proteolytic cleavage** of the S protein and fusion of viral and endosomal **membranes** trigger release of viral RNA into the **cytosol**. The RNA contains a **5' cap structure** and a

3' poly(A) tail that allows expression of the replicase, which is encoded by approximately two-thirds of the genome. The other third codes for the structural and accessory proteins. The replicase is expressed as two polyproteins: ppla and pplab; these include up to 16 nonstructural proteins (nsps). The nsps are generated by processing of ppla and pplab by 2-3 viral proteases encoded within the replicase. Many nsps then assemble into the replicase-transcriptase complex that—in the host cell cytosol—produces anti-sense genome, new viral genome, and subgenomic RNA that serves as mRNA. Structural proteins (S), matrix (M) protein, and envelope (E) are then generated and inserted into the endoplasmic reticulum and follow the secretory pathway to the endoplasmic reticulum-Golgi intermediate compartment (ERGIC). A minority of coronaviruses also encode a hemagglutinin esterase (HE). In many coronaviruses, the S protein is cleaved into two subunits, S1 and S2, often by furin-like proteases. The RNA genome associates with nucleoprotein and then buds into the ERGIC, forming virus particles. After assembly, virions are transported to the cell surface in vesicles and are exocytosed. Several accessory proteins, which seem to be important for pathogenesis, are also expressed but not all are functionally characterized.

注（黄色マーカーされている単語の意味）

※水色マーカーは学術名称なのでそのままカタカナで訳出します。

	単語	意味
1	coronaviridae	コロナウイルス
2	name after	~にちなんで名づける
3	crown-like	王冠のような
4	glycoproteins	糖タンパク質
5	subfamilies	下位分類
6	genera	属
7	avian	鳥類

	単語	意味
2 1	3' poly(A) tail	3 'ポリ A テール
2 2	Expression	発現
2 3	Replicase	ポリメラーゼ
2 4	accessory proteins	アクセサリータンパク質
2 5	polyprotein	ポリタンパク質
2 6	nonstructural protein(nsps)	非構造タンパク質
2 7	protease	プロテアーゼ (タンパク質分解酵素)

8	pathogen	病原体
9	respiratory syndrome	気管支症候群
10	single-stranded positive sense RNA genome	一本鎖プラス鎖 RNA ゲノム
11	encoding	コードしている； (情報) もって いる
12	spike protein	スパイクタンパク 質
13	class I fusion protein	クラス I 融合タン パク質
14	mediate	仲介する
15	uptake	吸収する
16	endosome	小胞
17	proteolytic cleavage	タンパク質分解； ペプチド結合の切 断プロセス
18	membrane	膜
19	cytosol	細胞質基質
20	5' cap structure	5'キャップ

28	transcriptase	転写酵素
29	cytosol	細胞質基質
30	anti-sense genome	アンチセンスゲノム
31	subgenomic RNA	サブゲノム RNA
32	matrix (M) protein envelope	マトリックスタンパク質
33	envelope	袋
34	endoplasmatic reticulum	小胞体
35	Endoplasmic eticulum-Golgi intermediate partment (ERGIC)	小胞体—ゴルジ体中間区 間.
36	hemagglutinin esterase	糖タンパク質
37	Subunit	サブユニット
38	nucleoprotein	核タンパク質
39	virion	ビリオン (ウイルス粒子)
40	exocytosed	エキソサイトーシスされ る；細胞外分泌.

問1 コロナウイルスファミリーの中で、ヒトで感染が拡大しているものは以下のどれか。

- ① Alphacoronavirus ② Betacoronavirus ③ Gammacoronavirus ④ Deltacoronavirus

問2 コロナウイルスの遺伝情報はどのように細胞内に入ってくるのか。過程を説明せよ。

問3 コロナウイルスの遺伝情報を細胞内で組み立てるものはどれか。

- ① S protein ② ERGIC ③ Nonstructural proteins ④ 5' cap structure

次回は4月21日火曜日に更新予定です。

参考文献

Fatima. A & Florian. K (2020). SARS-CoV-2 Vaccines; Status Report, Immunity 52, April 14, 2020, cited from [https://www.cell.com/immunity/fulltext/S1074-7613\(20\)30120-5](https://www.cell.com/immunity/fulltext/S1074-7613(20)30120-5) at the date of April 15, 2020.

山中伸弥 (2020). 「山中伸弥による新型コロナウイルス情報発信」. 2020年4月15日

<https://www.covid19-yamanaka.com/index.html> より引用