

ることによる防御効果が、モルモットやマーモセットなどを用いた動物実験において確認されている^{47, 48, 49)}。また、リバースジェネティクス等の技術を利用したDNAベースの組換えウイルスを用いたワクチン開発も進められており、組換え黄熱ワクチン17D株にラッサウイルスのGPCを組み込んで発現する組換えウイルスのワクチンは、第II相、第III相試験まで行われているが⁵⁰⁾、組換え体の性状や安定性にまだ問題がある^{51, 52)}。VSVでも他の多くのウイルスでの応用^{53, 54, 55)}と同様に、VSVのエンベロップ遺伝子GをラッサウイルスのGPCに置き換えた自立複製型の組換えVSVを接種することで、霊長類を含む動物実験においてラッサウイルスの感染からの防御に有効であることが報告されている^{56, 57)}。その他、ベネズエラ馬脳炎ウイルスのレプリコンにGPCを組み込んだ非複製型組換えウイルス⁵⁸⁾やGPC, NP, Z蛋白質を培養細胞に発現させて作製されたウイルス様粒子⁵⁹⁾、GPCやNPを発現するプラスミドDNA⁶⁰⁾を用いたワクチン開発も進められている。しかしながら、こうしたワクチン候補は、ラッサウイルスの流行地であるアフリカの環境状態や経済状態を鑑みると、ヒトへの効果も含めて、実際に臨床現場で応用できるようになるにはまだ多くの課題が残されていると思われる。

おわりに

出血熱を引き起こすアレナウイルスは、ヒトが罹患した際の重篤度や危険性から、国際的にも病原体取り扱いレベルでは最高度のBSL4病原体に分類され、また国内における感染症法の分類で最も危険性が高いとされる1類感染症に指定されている。日本では、国立感染症研究所にBSL4施設が設置されているにも関わらず、BSL4としては稼働されていない。ラッサ熱をはじめとするウイルス性出血熱は、我が国では現在まで稀な感染症として対策も希薄になりがちではあるが、昨今、映画やマスメディアによる影響もあり、いったん国内で発生が確認されると大混乱を招く恐れもある。そのため、こうした事態が起こっても正しく対応できる診断体制や治療・予防方法の確立が求められている。ウイルスそのものを理解するための基礎研究やそれを基にした治療法やワクチン開発などの応用研究、そして、国内において感染者が発生した際に診断、対応が迅速に行えるように、他のウイルス同様、アレナウイルスを含む出血熱ウイルスに関してもハード面を含めた研究環境が整うことが期待される。

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Arenavirus infections

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Arenaviruses are the collective name for viruses, which belong to the family *Arenaviridae*. They replicate in the cytoplasm of cells, and were named after the sandy (Latin, *arenosus*) appearance of the ribosomes often seen in thin sections of virions under electron microscope. Several arenaviruses, such as Lassa virus in West Africa, and Junin, Guanarito, Sabia, Machupo, and Chapare viruses in South America, cause severe viral hemorrhagic fevers (VHF) in humans and represent a serious public health problem. These viruses are categorized as category 1 pathogens thus should be handled in a BSL4 laboratory. Recently, Lujo virus was isolated as a newly discovered novel arenavirus associated with a VHF outbreak in southern Africa in 2008. Although, we have no VHF patients caused by arenaviruses in Japan, except for a single imported Lassa fever case in 1987, it is possible that VHF patients occur as imported cases as for other VHF in the future. Therefore, it is necessary to develop the diagnostics and therapeutics in consideration of patient's severe symptoms and high mortality even in the disease-free countries. In this review, we will broadly discuss the current knowledge from the basic researches to diagnostics and vaccine developments for arenavirus diseases.

