The role of the Ebola virus proteins, VP 40 and GP in the viral particle formation

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Ebola virus virions are pleomorphic, appearing as long filamentous, U-shaped, 6-shaped, or circular forms and enveloped. It is known that in many enveloped viruses, the matrix proteins contribute to virus particle formation. The matrix protein of Ebola virus, VP 40, is thought to play an important role in virus assembly and budding. Ebola virus GP mediates virus entry into the cells. However, the mechanisms of the particle formation of Ebola virus is not well analyzed. In the present study, to elucidate the role of the VP 40 and GP of Ebola virus for the assembly of the viral particle and its budding from the host cell membrane, wild-type VP 40, a series of VP 40 mutants and GP were expressed by plasmid vector in human kidney cells and examined biochemically and morphologically.

By western-blot analysis, two molecular species of the proteins were detected as 35 Kd and 33 Kd forms in the supernatant and inside the cells expressing wild-type VP 40. The mutant VP 40 lacking the PPXY motif was released from the cells less efficiently than the wild-type VP 40. Truncation of the N- or C-terminal of VP 40 affected on the efficiency of release and the expressed protein was localized only in the cells. These findings indicate that the PPXY motif and both N- and C-terminal of VP 40 are important for the release of this protein from the cells.

Electron microscopy of ultra-thin sections revealed that VP 40 formed particle-like structures of 65 nm in diameter both inside and on the surface of the cells. The GP formed particle-like structures with spikes on the cell surface. Negative staining and immuno electron microscopy of the supernatant revealed that VP 40 formed filamentous particles. Round-shaped and filamentous particles containing densely arrayed spikes on their surfaces were observed in the supernatant of GP-expressing cells. Co-expression of VP 40 and GP induced Ebola virus-like filamentous particles with the spikes.

The present results, thus, indicate that both VP 40 and GP play important roles in the particle formation of Ebola virus.