

Inhibition of HIV-1 in Cell Culture by Synthetic Humate Analogues Derived from Hydroquinone: Mechanism of Inhibition

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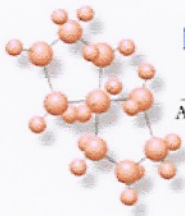
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Abstract

Humic acids are natural constituents of soil and ground water and mainly consist of mixtures of polycyclic phenolic compounds. A similar complex of compounds with a mean size of about 1000 Da, designated HS-1500, was synthesized by oxidation of hydroquinone. HS-1500 inhibited HIV-1 infection of MT-2 cells with an IC₅₀ of 50–300 ng/ml and showed a mean cell toxicity of about 600 µg/ml. Inhibition of HIV-induced syncytium formation was observed at 10–50 µg/ml. Treatment of free and cell-attached HIV with HS-1500 irreversibly reduced its infectivity, whereas the susceptibility of target cells for the virus was not impaired by treatment prior to infection. The HIV envelope protein gp120SU bound to sepharose-coupled HS-1500 and could be eluted by high salt and detergent. HS-1500 interfered with the CD4-induced proteolytic cleavage of the V3 loop of virion gp120SU. Furthermore, binding of V3 loop-specific antibodies was irreversibly inhibited, whereas binding of soluble CD4 to gp120SU on virus and infected cells was not affected. In conclusion, our data suggest, that the synthetic humic acid analogue inhibits the infectivity of HIV particles by interference with a V3 loop-mediated step of virus entry.



HIV inhibition by synthetic humate, mechanism of inhibition

A complex of compounds (HS-1500) similar to natural humic acids was synthesized by oxidation of hydroquinone at high pH. HS-1500 inhibited the HIV-1 infection of MT-2 cells with an IC₅₀ of 50-300 ng/ml, and a mean cell toxicity of about 600 µg/ml. Treatment of free and cell attached virus with HS-1500 irreversibly reduced its infectivity, whereas the susceptibility of target cells was not impaired by treatment prior to infection. HS-1500 bound to the HIV envelope protein gp120 and interfered with the CD4-induced proteolytic cleavage of the V3-loop of virion gp120. Furthermore, binding of specific antibodies 9284 and 9305 to the V3 loop was inhibited, whereas binding of soluble CD4 to gp120 on virus and infected cells was not affected. In conclusion, our data suggest, that the synthetic humic acid analogue inhibits the infectivity of HIV particles by interference with a V3 loop mediated step of virus entry.

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- Schneider J., Weis R., Maenner C., Kary B., Werner A.: Inhibition of HIV-1 in cell culture by synthetic humate analogues derived from hydroquinone: Mechanism of inhibition. *Virology*, 1996; 218: 389-395