Sulfonated azo dyes enhance the genome release of enterovirus A71 VP1-98K variants by preventing the virions from being trapped by sulfated glycosaminoglycans at acidic pH

Enterovirus A71 (EV-A71) is a causative agent of hand, foot and mouth disease and occasionally causes death in children. Its infectivity and pathogenesis, however, remain to be better understood. Three sulfonated azo dyes, including acid red 88 (Ar88), were identified to enhance the infectivity of EV-A71, especially isolates with VP1-98K,145E (-KE), by mainly promoting viral genome release *in vitro*. Enzymatic removal of sulfated glycosaminoglycans (GAGs) or knockout of xylosyltransferase II (XT2) responsible for biosynthesis of sulfated GAGs weakened the Ar88 enhanced EV-A71 infection. Ar88 is proposed to prevent the -KE variants from being trapped by sulfated GAGs at acidic pH and to facilitate the viral interaction with uncoating factors for genome release in endosomes. The results suggest dual roles of sulphated GAGs as attachment factors and as decoys during host interaction of EV-A71 and caution that these artificial dyes in our environment can enhance viral infection.