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Increasing polymer diffusivity by increasing the contour length: The surprising effect of YOYO-1 on DNA dynamics SEUNGHWAN SHIN, KEVIN DORFMAN, XIANG CHENG, Univ of Minn - Minneapolis — Double-stranded DNA (dsDNA) labeled with cyanine dyes such as YOYO-1 has been extensively used as a model to study equilibrium and dynamic properties of semiflexible polyelectrolytes. The ability to directly visualize the polymer dynamics is an attractive feature of these experiments, but positively charged cyanine dyes affect the physical properties of dsDNA, distorting the double helix and counterbalancing the intrinsic negative charge of the backbone. A variety of studies have been conducted to reveal the effect of the dye on the contour length and the persistence length of dsDNA. However, fewer efforts have been made to directly quantify the effect of dye on the diffusion behavior of dsDNA. In order to resolve this issue, we measured the in-plane diffusion coefficient of unconfined dsDNA using confocal microscopy. Although there is widespread consensus that intercalation increases the contour length of dsDNA, we find that increasing the dye:base pair ratio for YOYO-1 actually enhances the diffusion of dsDNA. This enhancement is more significant at lower ionic strengths, which implies that the increase in the diffusion coefficient by dye-DNA intercalation is mainly due to a reduction of excluded volume effect resulting from charge neutralization on the backbone.

Seunghwan Shin
Univ of Minn - Minneapolis

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