A novel DNA chip for single molecule analysis

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The last two decades have seen the emergence of single-molecule experiments [1]. By avoiding the ensemble averaging inherent to traditionnal bulk-phase biochemistry, the study of molecular machineries at the single-molecule level permits a better understanding of the behavior of living systems. Indeed the dynamics of the machineries processes can be characterized and rare subpopulations can be identified [2].

One of the main shortcoming of single molecule experiments is that the acquisition of statistically solid data is very time consuming, which explains the fact that they are still not widely used in laboratories.

We will present the development of a new single DNA chip, allowing the simultaneous analysis of hundreds of single DNA molecules by the Tethered Particle Motion (TPM) technique, therefore giving high-throughput capabilities to this approach.

The principle of a TPM experiment consists in tracking a bead tethered at the free end of a DNA molecule which is immobilized by the other end to a coverslip thanks to optical videomicroscopy. The amplitude of the Brownian motion of the bead is related to the effective length of the DNA molecule [3]. Any conformational change of the DNA molecule due to external factors (proteins, ions, temperature), that induces a variation of the effective length of the DNA tether, can be thus monitored by TPM [4].

References

[1] Cornish, P. V.; Ha, T., *Acs Chemical Biology* **1** (2007) 53.
[2] van Oijen, A. M., *Nature Chemical Biology,* **8** (2008) 440.
[3] Yin, H.; Landick, R.; Gelles, J., *Biophys J,* **6** (1994) 2468.
[4] Pouget, N. et *al.*; *Nucleic Acid Res.*, **9** (2004) e73