Molecular encryption for DNA data storage

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Inspired by its natural function as an information carrying molecule and motivated by its promising properties such as high stability [1] and high information density [2], DNA has emerged as an alternative medium for the long-term storage of digital information. As with any data storage medium, protection of the encoded information is desired for DNA data storage. Previous work has focussed on hiding DNA in objects [3], drowning out the signal of a message with a high background signal [4], or permanently deleting all data upon heating [5]. However, these methods either greatly decrease the information density of DNA or lead to loss of the stored data. Hence, we present a method of physical encryption in the form of a molecular locker. The locker consists of a DNA strand that is complementary to part of the data encoding strands of the file and contains a 3'-inverted T base. Due to sequence overlap, the locker competes with primers during an attempted amplification of the DNA file, greatly reducing the presence of the locked strands in the amplification product. This artificially creates drop-out when attempting to read the file using next-generation sequencing, preventing the data from being decoded. The locker can be removed by adding a password strand that is complementary to the locker. This allows for the repeated locking and unlocking of a DNA file without the loss of data.

References

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