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DNA barcode profiling: a new platform for the investigation of genome integrity

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The term 'DNA barcode' has been used in various contexts. Here we use it to describe short (8-14 bases) single stranded DNA molecules of a fixed length (either 8, 9 bases long) that were isolated in various ways from a biological sample with the purpose of making a digital profile of expressed mRNAs, miRNAs, 16S RNAs, for example, or other information-relevant nucleic acids in a biological sample. Thus, no *a priori* assumptions or prior knowledge is required when using the DNA barcode technology. A single stranded DNA barcode can be detected and quantified by ligation from both ends simultaneously on a digital microarray, it can be detected as one unit in a single nanopore event, or it can be sequenced on a genome sequencer.

Every detection/quantification method has pros and cons in terms of cost and efficiency. Genomic Expression Inc has developed its first universal digital microarray-based product for detection and quantification of DNA barcodes. Detection on the universal digital microarray is based upon ligation of the DNA barcodes to complementary overhang sequences of partly double stranded probes at one end of the DNA barcodes and ligation to the complementary overhang of another probe in solution that is coupled to a fluorochrome at the other end of the DNA barcode. Specialized software is designed to enhance the extraction of information from a profile of DNA barcodes and translate this information to the original sample depending upon how the DNA barcodes were extracted from the sample.

The poster will provide a few examples of how a profile of DNA barcodes can be obtained from a biological sample and also show some data from a 'SAGE- on-a-chip' experiment. These data show that the DNA barcode technology using a universal digital array has the potential of being significantly more sensitive than a conventional SAGE profile. A lot of expressed DNA barcode tags found at relatively high abundance using the DNA barcode technology are not picked up by a SAGE profile.

The DNA barcode technology offers a new type of cost-effective open-ended solution for such diverse applications as genome-wide methylation profiling, environmental microbiome profiling, expression profiling and single gene mutation detection, with only minor adjustments in how the DNA barcodes are obtained from a biological sample.

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