

MAQC data were used for comparison. Results were expressed as log ratio (lr) of averaged UHRR and HBRR data.

[0175] Tables A and B shown in FIG. 43 show aRNA yields for the bench- and chip-generated samples. FIG. 44 shows BioAnalyzer electropherograms of the samples before and after fragmentation. The key results of the experiment are summarized in FIG. 45, which shows a 4x4 matrix comparing the four log-ratio samples defined in FIG. 42.

[0176] FIG. 44 shows UHRR and HBRR aRNA Electropherograms. FIG. 44 Top shows Before Fragmentation. FIG. 44 Bottom shows After Fragmentation.

[0177] As noted above, the primary purpose of this experiment was to compare Bench and Chip aRNAs. The results in FIG. 45 and FIG. 46 clearly show that these two samples are very highly correlated (Pearson Correlation Coefficient=0.99712). The data also appear to show that MAQC Affymetrix samples are more highly correlated to MAQC TaqMan (0.92431) than either of the samples; Bench (0.87036) or Chip (0.86823). However, additional bootstrap re-sampling analysis has shown that this difference is not statistically significant.

[0178] FIG. 45 shows Microarray Results 4x4 Comparison Matrix. Four data sets are compared: MAQC TaqMan (lr_TAQ_1), MAQC Affymetrix (lr_atx_1), Bench (lr-bench), and Chip (lr_chip). Each matrix entry has three components (top-to-bottom): Pearson Correlation Coefficient, Prob>|r|, and Number of Observations. Prob>|r| is the probability that the corresponding correlation is zero. Number of Observations (469) is the number of transcripts in the MAQC study detected in both TaqMan and Affymetrix data sets.

[0179] FIG. 46 shows Chip vs Bench Comparisons. FIG. 46 Left shows Over 468 MAQC-Common Transcripts. FIG. 46 Right shows Over 20,689 Common Transcripts.

G. Fragmentation

[0180] In addition, we have also recently implemented the fragmentation step of the microarray workflow (FIG. 24A) on the system using Ambion Message Amp III chemistry. Briefly, purified aRNA from E12 was mixed with Fragmentation Buffer (4:1 ratio) from Ras4B into Out2. Fluorinert was then pumped behind the mixture, and mineral oil was layered on top. The mixture was then incubated at 94C for 35 minutes, removed from the pipette tip, and analyzed. The results shown in FIG. 31 show that chip- and bench-fragmentation are indistinguishable.

[0181] FIG. 47 shows On-Chip Fragmentation. FIG. 47 Left shows aRNA Before Fragmentation. FIG. 47 Right shows aRNA After Fragmentation.

[0182] While preferred embodiments of the present invention have been shown and described herein, it will be obvious to those skilled in the art that such embodiments are provided by way of example only. Numerous variations, changes, and substitutions will now occur to those skilled in the art without departing from the invention. It should be understood that various alternatives to the embodiments of the invention

described herein may be employed in practicing the invention. It is intended that the following claims define the scope of the invention and that methods and structures within the scope of these claims and their equivalents be covered thereby.

What is claimed is:

1. A device comprising:
 - (a) a cartridge;
 - (b) a microfluidic chip having one or more microfluidic diaphragm valves, fluidically interfaced with the cartridge; and
 - (c) a base comprising a support structure, one or more temperature controlling devices that are in thermal contact with the cartridge, and pneumatic lines for pneumatically actuating the microfluidic chip.
2. The device of claim 1, wherein the base further comprises a pneumatic floater that is positioned within the support structure.
3. The device of claim 2, wherein the pneumatic floater is supported by springs that force the pneumatic floater toward the microfluidic chip.
4. The device of claim 2, wherein the pneumatic floater is supported by springs that allow for an air-tight seals between the pneumatic floater and the microfluidic chip.
5. The device of claim 1, wherein the support structure is rigid.
6. The device of claim 1, wherein the base further comprises a pneumatic insert that is fluidically connected with the cartridge.
7. The device of claim 1, wherein the cartridge comprises a thermistor.
8. The device of claim 1, wherein the cartridge is formed from cyclic olefin copolymer.
9. The device of claim 1, wherein the cartridge is injection molded.
10. The device of claim 1, wherein the support structure is a heat sink.
11. The device of claim 1 wherein the device further comprises a pneumatic manifold mounted on the base, wherein the pneumatic manifold comprises vias or channels that are in pneumatic communication with the pneumatic lines and with pneumatic ports on the microfluidic chip to deliver pressure or vacuum to the chip to actuate the diaphragm valves, and wherein the pneumatic manifold is mounted on the support in a configuration biased to engage the chip and to allow the temperature controlling devices also to be in thermal contact with the cartridge.
12. A device comprising:
 - (a) a microfluidic chip having one or more pneumatically actuated valves and one or more chambers; and
 - (b) a cartridge, wherein the cartridge comprises one or more reservoirs that are fluidically connected with the chambers and the reservoirs are sized such that a material can be directly pipetted into the chamber.

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