Cryoarray System and Methods for Creating a Frozen Tissue Array

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Technology description

Summary of Invention

Tissue micro-arrays allow for high throughput expression profiling of pathological tissue such as tumors. Arrays consisting of 0.6 mm biopsy tissue embedded in paraffin are well validated and have been used in studies in clinical pathology. However this technique presents some limitations. The 0.6 mm biopsied tumor specimen on an array may not be representative of the whole tumor specimen because of tissue heterogeneity. Due to immunophenotype complexity, binary phenotype can be analyzed using tissue arrays if 2 to 5 core tissue specimens are analyzed. However, complex phenotype should be analyzed on full tissue sections. Also, the paraffin impacts the integrity of RNA, as well as that of lipids and some proteins setting limitations for investigative molecular science.
The present invention provides a cryo-array system consisting of frozen tissue embedded in OCT, and a method for creating such frozen tissue array that do not have the limitations of paraffin-embedded tissue arrays. The proposed device allows 48 biopsies of 3-mm Ø to be arrayed on one recipient block; therefore it may not be necessary to array more than 1 or 2 biopsies per specimen to obtain a high concordance level. Frozen tissue preserves RNA, allows the use of multiple fixatives to optimize IHC or in-situ hybridization for target probe or antibody assays, and allows the extraction of RNA to make cDNA for gene microchip analysis. The present invention also provides a method to limit the dehydration during long term storage by blocking the core samples with oil.

Application area

Such method/system may be used for preparing frozen sections with multiple tissue specimens:
• For assays such as in-situ hybridization and immunohistochemistry;
• For research to study molecular basis of tumor progression, for molecular profiling of thousands of tumor samples with hundreds of biomarkers, to validate cDNA micro-array screening data, to evaluate the diagnostic, prognostic and therapeutic potential of newly discovered genes and molecule, to test and optimize probes and antibodies, improved utilization of pathology archives and tissue bank, and for large scale collaboration for multicenter molecular profiling of tumors specimen or other tissue;
• In pathology biopsies to analyze simultaneously morphology, RNA, DNA and proteins.

Advantages

Tissue cryo-array permits parallel detection in each of the multiple specimens in the array of:
• DNA, by fluorescence in-situ hybridization,
• RNA by mRNA in-situ hybridization,
• protein by immunochemistry targets.
With the present device each micro-array block may be sectioned 200-300 times, allowing tens of thousands of tissue micro array sections to be obtained from a tissue specimen in one recipient block. Because of tissue heterogeneity, while paraffin embedded tissue arrays requires the analysis of 2 to 5 core per specimen, an analysis of only one or 2 cores of 3-mm Ø may be required to obtain a comparable concordance.

Institution

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