Microfluidics Device For Digestion Of Tissues Into Cellular Suspension

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BRIEF DESCRIPTION

A microfluidic device that separates single cells from whole tissue in a rapid and gentle manner using hydrodynamic fluid flow. The separated single cell suspensions can then be used in tissue engineering applications, regenerative medicine and the study of cancer.

FULL DESCRIPTION

Techniques to dissociate individual cells from biopsied tissues are used universally towards diagnosis, treatment, and research of various diseases. Recently there has been a profound interest to identify various cell types within diseased tissue to better understand the inner workings of the disease. Current manual methods of cell separation such as mincing, vortexing and pipetting often cause damage to the cells, and require expensive lab equipment. Other cell-tissue dissociation approaches such as enzymatic tissue digestion is time intensive limiting the possibility of clinical applications. Based on the shortcomings of the current techniques there exists a need for a fast, automatic, non-destructive, and modular solution for cell-tissue dissociation. The presented invention describes a microfluidic device that dissociates tissue into cell suspensions mechanically through high speed fluid flow. Whole tissue samples are placed in a microfluidic device with channels that creates regions of fluid flow. This approach rapidly dissociates tissue into a cell suspension while preserving the individual cellular structure improving the number of intact cells produced. Contrary to the expensive laboratory equipment necessary for manual cell separation, the presented invention requires the microfluidic device and a peristatic pump.

APPLICATIONS

(1) Device has been constructed and tested using: beef liver samples, and fresh mouse liver and kidney tissues; (2) Device cell separation was comparable to previously developed enzymatic digestion technique. However, the presented invention preformed the cell separation task in a shorter processing time; (3) Path to commercial personalized medicine by sourcing patient cells from biopsies to tailor treatment; (4) Could shed light onto important therapeutic research findings for diseases such as cancer; (5) Device low cost and easy of operation could allow technology to be deployed in low resource settings as a point of care diagnostic; (6) Fast compared to traditional manual cell dissociation; (7) No need for conventional expensive laboratory equipment to conduct cell dissociation; and (8) Device can be easily integrated with other operations to create a complete lab-on-a-chip tissue and cell processing platform.

ADVANTAGES

PATENT STATUS

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	12,036,550	07/16/2024	2017-575

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OTHER INFORMATION

KEYWORDS

Microfluidic, device, digestion, tissue, cellular, suspension, cell separation, mincing, vortex, pipetting, dissociation, enzymatic, lab equipment, non-destructive, cell, tissue, dissociation, high, speed, fluid, flow, channel, intact, peristaltic

CATEGORIZED AS

- **Biotechnology**
  - Health
- **Materials & Chemicals**
  - Biological
- **Medical**
  - Devices
  - Diagnostics

United States Of America	Issued Patent	10,926,257	02/23/2021	2017-575	

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- » Disease: Kidneys and Genito-Urinary System
- » Research Tools
- » Screening
- » Therapeutics
- » **Nanotechnology**
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