US011105796B2

(12) **United States Patent**
Fuerstenberg et al.

(10) **Patent No.: US 11,105,796 B2**
(45) **Date of Patent: Aug. 31, 2021**

(54) **METHODS FOR NON-INVASIVE PROFILING OF STEM CELL DIFFERENTIATION**

(71) Applicant: **Bio-Techne Corporation**, Minneapolis, MN (US)

(72) Inventors: **Richard Karl Fuerstenberg**, St. Paul, MN (US); **Joy Lynn Aho**, Maple Grove, MN (US); **Fabrizio Rinaldi**, Minneapolis, MN (US)

(73) Assignee: **BIO-TECHNE CORPORATION**, Minneapolis, MN (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 587 days.

(21) Appl. No.: **15/622,937**

(22) Filed: **Jun. 14, 2017**

(65) **Prior Publication Data**

US 2017/0363617 A1 Dec. 21, 2017

Related U.S. Application Data

(60) Provisional application No. 62/352,752, filed on Jun. 21, 2016.

(51) **Int. Cl.**

G01N 33/50	(2006.01)
A61K 35/12	(2015.01)
A61K 39/395	(2006.01)
C12N 5/10	(2006.01)
C12N 5/0735	(2010.01)
C12Q 1/06	(2006.01)
C12N 5/077	(2010.01)
C12N 5/074	(2010.01)
C12N 5/071	(2010.01)
G01N 33/68	(2006.01)
A61K 48/00	(2006.01)

(52) **U.S. Cl.**

CPC ***G01N 33/5073*** (2013.01); ***A61K 35/12*** (2013.01); ***A61K 39/395*** (2013.01); ***C12N 5/0606*** (2013.01); ***C12N 5/067*** (2013.01); ***C12N 5/0657*** (2013.01); ***C12N 5/0696*** (2013.01); ***C12N 5/10*** (2013.01); ***C12Q 1/06*** (2013.01); ***G01N 33/5005*** (2013.01); ***G01N 33/6863*** (2013.01); *A61K 48/00* (2013.01)

(58) **Field of Classification Search**

CPC A61K 35/12; A61K 39/395; A61K 48/00; C12N 5/0606; C12N 5/0657; C12N 5/067; C12N 5/0696; C12N 5/10; C12Q 1/06; G01N 33/5005; G01N 33/5073; G01N 33/6863

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

2003/0153013	A1*	8/2003	Huang	G01N 33/6842 435/7.9
2011/0045606	A1*	2/2011	Kennedy	G01N 33/538 436/501
2013/0071931	A1*	3/2013	Ishikawa	C12N 5/067 435/377
2013/0309245	A1*	11/2013	Lombardi	G01N 33/6869 424/158.1
2015/0368713	A1*	12/2015	Bharti	C12N 5/0621 506/9

OTHER PUBLICATIONS

Amable et al., "Gene expression and protein secretion during human mesenchymal cell differentiation into adipogenic cells," BMC Cell Biology, vol. 15, 2014, 10 pages.

* cited by examiner

Primary Examiner — Blaine Lankford
(74) *Attorney, Agent, or Firm* — Mueting Raasch Group

(57) **ABSTRACT**

A method for characterizing stem cell differentiation includes harvesting differentiation media supernatant containing secreted analytes from key time points during a stem cell differentiation, performing at least one of a qualitative and a quantitative analysis of the differentiation media supernatant with respect to at least one secreted analyte, and identifying trends in analyte expression based on at least one of the qualitative and quantitative analysis of the differentiation media supernatant.

20 Claims, 14 Drawing Sheets