

Feb 25, 2025

A Workflow Protocol to Apply Laser-Capture Microdissection (LCM) for Isolating Zone-Specific Cell Populations from Four Zones of Mandibular Condylar Cartilage (MCC) Individually and Preparing the Resultant Minute LCM Samples for Subsequent Downstream Analyses

DOI

<https://dx.doi.org/10.17504/protocols.io.n2bvj97k5lk5/v1>

Aisha M Basudan^{1,2,3}, Aisha Basudan⁴

¹Division of Orthodontics, Dental Services Department, Ministry of National Guard-Health Affairs, Riyadh, Saudi Arabia;

²King Abdullah International Medical Research Center (KAIMRC), Riyadh, Saudi Arabia;

³College of Dentistry King Saud Bin Abdulaziz University for Health Sciences (KSAUHS), Riyadh, Saudi Arabia;

⁴Division of Orthodontics, Dental Services Department, Ministry of National Guard-Health Affairs, Riyadh, Saudi Arabia King Abdullah International Medical Research Center (KAIMRC), Riyadh, Saudi Arabia College of Dentistry King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia



Aisha Basudan

Division of Orthodontics, Dental Services Department, Minist...

Create & collaborate more with a free account

Edit and publish protocols, collaborate in communities, share insights through comments, and track progress with run records.

Create free account

OPEN  ACCESS



DOI: <https://dx.doi.org/10.17504/protocols.io.n2bvj97k5lk5/v1>

Collection Citation: Aisha M Basudan, Aisha Basudan 2025. A Workflow Protocol to Apply Laser-Capture Microdissection (LCM) for Isolating Zone-Specific Cell Populations from Four Zones of Mandibular Condylar Cartilage (MCC) Individually and Preparing the Resultant Minute LCM Samples for Subsequent Downstream Analy. **protocols.io**
<https://dx.doi.org/10.17504/protocols.io.n2bvj97k5lk5/v1>

License: This is an open access collection distributed under the terms of the **Creative Commons Attribution License**, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

Protocol status: Working

We use this collection and it's working

Created: February 17, 2025

Last Modified: February 25, 2025

Collection Integer ID: 123239

Keywords: mandibular condylar cartilage (MCC), laser-capture micro dissection (LCM), homogenous cell populations, zone-specific cell populations, specimen freezing and cryosectioning, staining and dehydration of the frozen tissue sections, RNA extraction and isolation, evaluation of LCM-RNA integrity, linear amplification of LCM-RNA samples, labeling and fragmentation of amplified aRNA, zones of mandibular condylar cartilage, subsequent downstream analy mandibular condylar cartilage, mandibular condylar cartilage, capture micro dissection, multizonal heterogeneous fibrocartilage, unstained frozen tissue section, next lcm procedure, minute lcm samples in preparation, frozen tissue section, capture microdissection, lcm sample, rna extraction, microarray analysis, based minute lcm sample, evaluation of lcm, resultant minute lcm sample, rna samples for subsequent molecular analysis, specific cell population, homogenous cell population, dehydration of the frozen tissue section, rna sample

Disclaimer

DISCLAIMER – FOR INFORMATIONAL PURPOSES ONLY; USE AT YOUR OWN RISK

The protocol content here is for informational purposes only and does not constitute legal, medical, clinical, or safety advice, or otherwise; content added to **protocols.io** is not peer reviewed and may not have undergone a formal approval of any kind. Information presented in this protocol should not substitute for independent professional judgment, advice, diagnosis, or treatment. Any action you take or refrain from taking using or relying upon the information presented here is strictly at your own risk. You agree that neither the Company nor any of the authors, contributors, administrators, or anyone else associated with **protocols.io**, can be held responsible for your use of the information contained in or linked to this protocol or any of our Sites/Apps and Services.

Abstract

Mandibular condylar cartilage (MCC) is a multizonal heterogeneous fibrocartilage consisting of fibrous (FZ), proliferative(PZ), mature (MZ), and hypertrophic (HZ) zones. The protocol described below is an optimized laser-capture micro dissection (LCM) protocol that aims to describe the procedures of isolating four homogenous cell populations from each of the four mandibular condylar cartilage (MCC) zones individually. It also aims to improve the quality of RNA recovered from zonal-based minute LCM samples in preparation for the subsequent downstream analysis. The protocol illustrates the optimized procedures in three stages:

1. before-LCM stage where stained/unstained frozen tissue sections are prepared for the next LCM procedure. This includes specimen freezing and cryosectioning, followed by staining and dehydration of the frozen tissue sections.
2. LCM stage using IR laser (Arcturus PixCell® Ite Laser Capture Microdissection System, CA,USA).
3. after-LCM stage where total RNA molecules are retrieved from the LCM samples. This includes RNA extraction, RNA isolation, and evaluation of LCM-RNA integrity. We also described how to prepare the LCM-RNA samples for subsequent molecular analyses (e.g. Microarray Analysis) in terms of linear amplification of LCM-RNA samples, labeling and fragmentation of amplified aRNA, and preparation of the hybridization mix for microarray analysis.



Disclaimer

DISCLAIMER – FOR INFORMATIONAL PURPOSES ONLY; USE AT YOUR OWN RISK

The protocol content here is for informational purposes only and does not constitute legal, medical, clinical, or safety advice, or otherwise; content added to **protocols.io** is not peer reviewed and may not have undergone a formal approval of any kind. Information presented in this protocol should not substitute for independent professional judgment, advice, diagnosis, or treatment. Any action you take or refrain from taking using or relying upon the information presented here is strictly at your own risk. You agree that neither the Company nor any of the authors, contributors, administrators, or anyone else associated with **protocols.io**, can be held responsible for your use of the information contained in or linked to this protocol or any of our Sites/Apps and Services.

Files

 SEARCH

Protocol

NAME
Before-LCM (Laser-Capture Microdissection) procedure

VERSION 1

CREATED BY

**Aisha Basudan**
Division of Orthodontics, Dental Services Department, Ministry of National Guard-Health Affairs, Riyadh, Saudi Arabia King Abdullah International Medical Research Center (KAIMRC), Riyadh, Saudi Arabia College of Dentistry King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia

OPEN →

Protocol

NAME
LCM (Laser-Capture Microdissection) procedure

VERSION 1

CREATED BY

**Aisha Basudan**
Division of Orthodontics, Dental Services Department, Ministry of National Guard-Health Affairs, Riyadh, Saudi Arabia King Abdullah International Medical Research Center (KAIMRC), Riyadh, Saudi Arabia College of Dentistry King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia

OPEN →

Protocol

NAME
After-LCM (Laser-Capture Microdissection) procedure

VERSION 1

CREATED BY

**Aisha Basudan**
Division of Orthodontics, Dental Services Department, Ministry of National Guard-Health Affairs, Riyadh, Saudi Arabia King Abdullah International Medical Research Center (KAIMRC), Riyadh, Saudi Arabia College of Dentistry King Saud Bin Abdulaziz University for Health Sciences (KSAU-HS), Riyadh, Saudi Arabia

OPEN →

Protocol references

D. M. Kube, C. D. Savci-Heijink, A.-F. Lamblin et al., "Optimization of laser capture microdissection and RNA amplification for gene expression profiling of prostate cancer," *BMC Molecular Biology*, vol. 8, no. 1, p. 25, 2007.

C. Y. Pietersen, M. P. Lim, and T. U. Woo, "Obtaining highquality RNA from single cell populations in human post-mortem brain tissue," *Journal of Visualized Experiments*, no. 30, pp. 1–9, 2009

We used this protocol in the following studies:

- Optimizing laser-capture microdissection protocol for isolating zone-specific cell populations from mandibular condylar cartilage.

Citation: Aisha M. Basudan and Yanqi Yang, "Optimizing Laser Capture Microdissection Protocol for Isolating Zone-Specific Cell Populations from Mandibular Condylar Cartilage," *International Journal of Dentistry*, vol. 2019, Article ID 5427326, 13 pages, 2019. <https://doi.org/10.1155/2019/5427326>.

- Implications of zonal architecture on differentially gene expression and altered pathway expressions in mandibular condylar cartilage.

Citation: Basudan, A.M., Aziz, M.A. & Yang, Y. Implications of zonal architecture on differential gene expression profiling and altered pathway expressions in mandibular condylar cartilage. *Sci Rep* 11, 16915 (2021). <https://doi.org/10.1038/s41598-021-96071-7>

- GSE162823 study at the GEO repository.

<https://www.ncbi.nlm.nih.gov/geo/query/acc.cgi?acc=GSE162823>