

## DAFTAR PUSTAKA

- Abbas AK, Lichtmen AH, Pillai S. 2021. *Imunologi Dasar Abbas Fungsi dan Kelainan Sistem Imun*. edisi ke 6. Elsevier. Hal 44-48.
- Abul KA, Andrew HL, Shiv P. 2015. *Cellular and Molecular Immunology* 8<sup>th</sup> ed. Philadelphia: Elsevier Saunder. Pp.2, 13-14.
- Achmad H, Djais AI, Mardiana AA, Oktawati S, Rieuwpassa I, Samad R, *et al.* 2020. The Effectiveness of *Channa striata* Extract Antimicrobial Effect on Periopathogen Bacteria (*Porphyromonas gingivalis* and *Aggregatibacterium actinomycetemcomitans*). *Sys Rev Pharm*; 11(4):319-323.
- Adams G. 2007. *The Principles of Freeze-Drying*. Chapter 2, From: *Methods in Molecular Biology*, vol. 368: 2<sup>th</sup> ed. Humana Press Inc. Totowa, NJ. Pp.15-38. Doi: 10.1007/978-1-59745-362-2\_2.
- Agustin R, Dewi N, Rahardja SD. 2016. Efektivitas ekstrak ikan haruan (*Channa striata*) dan ibuprofen terhadap jumlah sel neutrophil pada proses penyembuhan luka, *Journal Kedokteran Gigi* vol. 1 no.1.68-74. doi: 10.30649/denta.v12i2.170.
- Al-Hiyasat AS, Barrieshi-Nusair KM, Al-Omari MA. 2006. The radiographic outcomes of direct pulp-capping procedures performed by dental students. A retrospective study. Vol. 137. 1699-1705. Doi: 10.14219/jada.archive.2006.0116.
- Asfar M, Tawali AB, Pirman, Mahendradata M. 2019. Ekstraksi Albumin Ikan Gabus (*Channa striata*) Pada Titik Isoelektriknya (Extraction of Albumin of a Snakehead Fish (*Channa striata*) At Its Isoelectric Point). *Jurnal Agercolere* Vol. 1(1): 6-12.
- Bjorndal L, Simon S, Tomson PL, Duncan HF. 2019. Management of deep caries and the exposed pulp. *International Endodontic Journal*, 52, 949-973. Doi: 10.1111/iej.13128.
- Brizuela C, Meza G, Mercade M, Hernandez M, Inostroza C, A. Chaparro A, *et al.* 2020. Inflammatory biomarkers in dentinal fluids as an approach to molecular diagnostic in Pulpitis. *International Endodontic Journal*. Pp.5-20. Doi: 10.1111/iej.13343.
- Bruno KF, Silva JA, Silva TA, Batista AC, Alencar AH, and Estrela. 2010. Characterization of Inflammatory Cell Infiltrate in Human Dental Pulpitis. *Inter Endod J*. 43. pp1013-1021.
- Castejon GL, Brough D. 2011. Understanding the mechanism of IL-1 $\beta$  secretion. *Cytokine & Growth Factor Reviews* 22, 189-195. Doi: 10.1016/j.cytogfr.2011.10.001.

- Chang MC, Lin SI, Pan YH, Lin LD, Wang YL, Yeung SY, *et al.* 2018. IL-1b-induced ICAM-1 and IL-8 expression/secretion of dental pulp cells is differentially regulated by IRAK and p38. *Journal of the Formosan Medical.*
- Chasanah E, Nurilmala M, Purnamasari AR, Fithriani D. 2015. Komposisi Kimia, Kadar Albumin Dan Bioaktivitas Ekstrak Protein Ikan Gabus (*Channa striata*) Alam Dan Hasil Budidaya. *Chemical Composition, Albumin Content and Bioactivity of Crude Protein Extract of Native and Cultured Channa striata.* JPB Kelautan dan Perikanan Vol. 10 No. 2. 123-132. Doi: <http://dx.doi.org/10.15578/jpbkp.v10i2.364>.
- Cohen S, Hargreave KM, Berman LH, Rotstein I. 2011. Cohen's Pathways of the pulp. 10<sup>th</sup> ed. St Louis: Mosby Elsevier. 532-540, 560-566.
- Dwintanandi C. 2016. Pengaruh Ekstrak Kulit Manggis (*Garcinia mengostana linn*) Terhadap Jumlah Makrofag pada Inflamasi Pulpa. *Dental Journal Kedokteran Gigi.* vol.2 no.2. 151-157.
- Fadhila FN, Karsini IS, Nafi'ah N. 2018. Efektivitas Pemberian Ekstrak Ikan Haruan (*Channa striata*) Terhadap Jumlah Neutrofil Pada Proses Penyembuhan Ulkus Trauma Tikus. *Dental Journal Kedokteran Gigi*, Vol. 12 (2):8-16. Doi: 10.30649/denta.v12i2.170.
- Figueredo CM, Junior RL, Love RM. 2019. T and B Cells in Periodontal Disease: New Functions in A Complex Scenario. *Int. J. Mol. Sci.* 20, 3949. 2-13. Doi: 10.3390/ijms20163949.
- Firlianty, Suprayitno E, Nursyam H, Hardoko, Mustafa A. 2013. Chemical composition and amino acid profile of Chanidae collected from Central Kalimantan, Indonesia. *IJSTE*, 2(4), 25-29.
- Garg N, Garg N. 2014. *Textbook of Endodontics.* 3<sup>rd</sup> ed. Jaypee Brothers Medical Publishers. Pp. 8-11, 17-19, 23-35.460-467.
- Golberg, M., Akram, N., Uzunoglu, E. 2015. Is Pulp Inflammation a Prerequisite for Pulp Healing and Regeneration? *J Hindawi Publishing Corporation.* Vol.1.No2.hh. 1-11.
- Gomes FIF, Aragão MGB, Barbosa FCB, Bezerra MM, De Pinto DPT, Chaves HV. 2016. Inflammatory Cytokines Interleukin-1 $\beta$  And Tumour Necrosis Factor-A - Novel Biomarkers for The Detection of Periodontal Diseases: A Literature Review. *J Oral Maxillofac Res.* 7(2):1-10. Doi: 10.5037/jomr.2016.7202.
- Grossman LI, Gopikrishna V. 2020. *Grossman's Endodontic Practice.* 14<sup>th</sup> ed. New Delhi. Wolters Kluwer Health. Pp. 45-46, 53-60, 189-195.
- Guyton AC, Hall JE. *Buku Ajar fisiologi kedokteran.* Edisi 9. Jakarta: EGC;1997. h.461.

- Gurcan AT, Seymen F. 2019. Clinical and radiographic evaluation of indirect pulp capping with three different materials: a 2-year follow-up study. *European Journal of Paediatric Dentistry* vol. 20/2.
- Haniastuti T, Susilowati H, Djais AA. 2007. Sintesis Interleukin-1beta Sel Makrofag Mencit Yang Diinduksi Lipopolosakarida *E. coli* Dan Minyak Atsiri Kencur. *Indones J Dent*. 14(3):194-198.
- Hargreaves KM, Goodies HE, Tay FR. 2012. *Dental pulp* 2<sup>nd</sup> ed. China: Quintessence Publishing Co, Inc.1-15, 69-83.95-122.
- Hartini P, Dewi N, Hayatie. 2014. Ekstrak ikan haruan (*Channa striata*) menurunkan jumlah makrofag pada fase inflamasi proses penyembuhan luka (Extract of haruan (*Channa striata*) decreases macrophages count in inflammation phase of wound healing process). *Journal dentomaxillofacial*. Vol.1. hh. 6-10.
- Haymann H, May KN 2019. *Sturdevant's Art and Science of Operative Dentistry*. 7<sup>th</sup> ed. St. Louis, Missouri. Elsevier. Pp.6-11.
- Izzaty A, Dewi N, Pratiwi DIN. 2014. Ekstrak haruan (*Channa striata*) secara efektif menurunkan jumlah limfosit fase inflamasi dalam penyembuhan luka (Extract of haruan fish (*Channa striata*) decreases lymphocyte count in inflammatory phase of wound healing process effectively). *Dentofacial*, Vol.13, No.3.10; 176-181. Doi: 10.15562/jdmfs.v13i3.411.
- Korbechi J, Rusinek KB. 2019. The effect of palmitic acid on inflammatory response in macrophages: an overview of molecular mechanisms. *Inflammation Research* 68:915-932.
- Kumar V, Abbas AK, Fausto N. 2013. *Robbins Buku Ajar Patologi*. Edisi 7. Jakarta: EGC; Pp.35-66.
- Louwakul, P., Lerrchirakarn, V. 2012. Incorporation of anti-Inflammatory Agent into Calcium Hydroxide Pulp Capping Material: An in Vitro Study of Physical and Mechanical Properties. *Dental Material Journal*.Vol.31. no.1. Vol.5. p. 32-39.
- Miksusanti. 2010. Proliferasi sel limfosit secara in vitro oleh minyak atsiri temu kunci dan film edibel anti bakteri. *J Penelitian Sains*; 10: 6-7.
- Mohammadi Z, Dummer PMH. 2011. Properties and applications of calcium hydroxide in endodontics and dental traumatology. *International Endodontic Journal*, 44, 697-730, 2011.
- Mount GJ, Hume WR, Ngo HC, Wolf MS. 2016. *Preservation and Restoration of Tooth Structure*. 3<sup>rd</sup> ed. New Delhi, India. Wiley & Sons, Inc. pp.193-195.
- Mustafa A, Widodo MA, Kristianto Y. 2012. Albumin And Zinc Content of Snakehead Fish (*Channa striata*) Extract and Its Role in Health.

International Journal of Science and Technology (IJSTE), Vol. 1 No. 2, 1-8.

Nugroho JJ, Sumidarti A, Farma NA, Natsir N, Rovani CA, Hikmah N. 2020a. Expression of IL-1 $\alpha$  and PMN Leukocytes in Inflamed Pulp of Wistar Rat after Application of Haruan Fish Extract (*Channa striata*). J. Dent. Con., 1 (2): 20-24.

Nugroho JJ, Sumidarti A, Siri M, Cangara MH, Natsir N, Tanumihardja M, *et al.* 2020b. Matrix Metalloproteinase-1 (MMP-1) Expression and Density of Collagen Fibers following Application of Haruan Fish (*Channa striata*) Extract in Inflamed Pulp of Wistar Rat. A Multifaceted Review Journal in the Field of Pharmacy. Sys Rev Pharm 11(9):6-9.

Orakpoghenor O, Avazi DO, Markus TP, Olaolu OS. 2019. Lymphocytes: A Brief Review. Sci J Immunol Immunother; 3(1):4-8.

Paraningrum W. 2010. The increasing of odontoblast-like cell number on direct pulp capping of *Rattus norvegicus* using chitosan. Dental Journal. vol. 43: no. 4. 168-171. Doi: 10.20473/J.DJMKG.V43.I4.P168-171.

Pettalolo SR. 2015 Efek Suplementasi Ekstrak Ikan Gabus Dan Vitamin C Terhadap Kadar Hemoglobin, Lekosit, Limfosit, Albumin Dan Imt Pada Pasien Hiv/ AidS. Gizi Indon, 38(1):41-48.

Preethanath, R. S., Ibraheem, W., & Anil, A. (2020). Pathogenesis of Gingivitis. Chapter Metrics Overview. <https://doi.org/10.5772/intechopen.91614>.

Qualtrough AJE, Satterthwaite JD, Morrow LA, Brunton PA. 2005. Principles of Endodontics in Principles of Operative Dentistry. Blackwell Co. Low. pp. 51-73.

Ren K, Torres R. 2009. Role of interleukin-1 $\beta$  during pain and inflammation. Brain Research Reviews 60, 57-64. Doi: 10.1016/j.brainresrev.2008.12.020.

Ricucci D, Loghin S, Siqueira JF. 2014. Correlation Between Clinical and histologic pulp diagnosis: Clinical Research. American Association of Endodontics. pp.1932-1938. Doi: 10.1016/j.joen.2014.08.010.

Roerink ME, Schaaf VD, Dinarello CA, Knoop H and Mee JW. 2017. Interleukin-1 as a mediator of fatigue in disease: a narrative review. Journal of Neuroinflammation; 14:16.

Sabir A. 2021. Ekspresi Interleukin-1 beta (IL-1 $\beta$ ) setelah aplikasi Propolis (*Trigona Sp*) asal Sulawesi Selatan pada pulpa gigi tikus yang terinflamasi (Suatu penelitian imunohistokimia). Tesis. Universitas Hasanuddin. Makassar. hal.20-21.

Silva AC, Faria MR, Fontes A, Campos MS, Cavalcanti BN. 2009. Interleukin -1 beta and interleukin -8 in healthy and inflamed dental pulp. J Appl Oral Sci 17(5). 527-532. Doi: 10.1590/s1678-77572009000500031.

- Simon SRJ, Smith A, Lumley P, Cooper PR. 2012. The pulp healing process: from generation to regeneration. *Endodontic Topics*. Volume: 26. Issue 1. 41-56. Doi:10.1002/9781118704509.ch13.
- Siqueira JF. 2011. *Treatment of Endodontic Infections*. Germany. Quintessence Publishing. Pp. 21-29, 40-59.
- Smith AJ. 2003. Vitality of the dentin-pulp complex in health and disease: growth factors as key mediators. *J Dent Educ*. 67(6):678-680. Doi:10.1002/j.0022-0337.2003.67.6.tb03668.x.
- Somchit MN, Solihah MH, Israf DA, Zuraini A, Arifah AK, Jais M. 2004. Effects of three local Malaysian *Channa* spp. fish on chronic inflammation. *J Orient Pharm Exp Med*;5(1);91-94.
- Syarifuddin W, Upik AM. 2016. *Immunology Lebih Mudah Dipahami*. Surabaya: Brilliant International; p.16-18, 67.
- Sugiaman VK. Peningkatan penyembuhan luka di mukosa oral melalui pemberian Aloe vera (Linn.) secara topikal JKM 2011; 11:1.
- Sumidarti A, Rovani CA, Nugroho JJ, Thahir B. 2020. Dentin Matrix Protein-1 (DMP-1) Expression after Application of Haruan Fish Extract (*Channa striata*) on Inflamed Wistar Rat Dental Pulp. A multifaceted review journal in the field of pharmacy. *Sys Rev Pharm Vol 11, Issue 10*; 31-35.
- Tamales D, Dewi N, Rosida L. 2016. Extract of haruan (*Channa striata*) extract increasing reepithelialization count in wound healing process on wistar rat's buccal mucosa. *J Dentomaxillofac Sci*. 1(1);12-5.
- Tanumihardja M, Hastuti S, Nugroho JJ, Trilaksana AC, Natsir N, Rovani CR, *et al*. 2020. Viabilities of Odontoblast Cells Following Addition of Haruan Fish in Calcium Hydroxide. *D-Dental Sciences, Dental Pathology and Endodontics*. Open Access Macedonian Journal of Medical Sciences. 8(D):58-63. Doi: 10.3889/oamjms.2020.4362.
- Taslim NA, Fitriana N, Suprapti NL, Marsella CP, Bukhari AS, Rasyid H, *et al*. 2022. Effects of *Channa striata* Extract on Albumin Serum and Neutrophil-to-Lymphocyte Ratio in Hyperglycemic Rats with Wound Injury: A Randomized Control Study. *Open Access Maced J Med Sci*. Jan 18; 10(A):450-455.
- Tawfig N. 2016. Proinflammatory Cytokines and Periodontal Disease. *J Dent Probl Solut Nada*. 3(1):12-17. Doi:10.17352/2394-8418.000026.
- Torabinejad M, Fouad AF, Shabahang S. 2021. *Endodontics Principles and Practice*. 6<sup>th</sup> ed. Oxford, New York, Elsevier. Pp.1-6, 8.
- Vinay, K., Abul, K., Abbas, Nelson, F., Richard, M. 2007. *Robbins Basic Pathology* 8th edition.

- Walton RE, Torabinejad M. 2008. Prinsip & Praktik Ilmu Endodonsia (ed 3). Jakarta: EGC. 429-430.
- Wilvia Li & Novelya Li. 2020. Uji Sitotoksik dan Anti-Inflamasi Ekstrak Buah Bengkuang (*Pachyrizus erosus (L) Urb*) terhadap Sel RAW 264.7 yang Distimulasi Lipopolisakarida. eBiomedik.8 (2):187-195. DOI: 10.35790/ebm.v8i2.31465.
- Yong D, Cathro P. 2021. Conservative Pulp Therapy in the Management of Reversible and Irreversible Pulpitis. Australian Dental Journal; 0:1-11. Doi: 10.1111/adj.12841.
- Zayyan AB, Nahzi YI, Kustiyah IO. 2016. Pengaruh Ekstrak Kulit Manggis (*Garcinia mangostana L*) Terhadap Jumlah Sel Limfosit pada Inflamasi Pulpa. Dentino Jurnal Kedokteran Gigi vol I (9). no 2. 140-145.

## LAMPIRAN

### A. Etik Penelitian



#### REKOMENDASI PERETUJUAN ETIK Nomor: 0004/PL09/KEPK FKG-RSGM UNHAS/2023

Tanggal: 10 Januari 2023

Dengan ini menyatakan bahwa protokol dan dokumen yang berhubungan dengan protokol berikut ini telah mendapatkan persetujuan etik:

No. Protokol	UH 17120743	No Protokol Sponsor	
Peneliti Utama	Drg. Risnawati Taha	Sponsor	Pribadi
Judul Peneliti	Efektivitas Ekstrak Ikan Haruan ( <i>Channa Striata</i> ) terhadap Jumlah Sel Limfosit dan Ekspresi IL-1 $\beta$ pada Pulpa Gigi Tikus yang Terinflamasi		
No. Versi Protokol	1	Tanggal Versi	28 Desember 2022
No. Versi Protokol		Tanggal Versi	
Tempat Penelitian	RSGMP UNHAS		
Dokumen Lain	<ol style="list-style-type: none"> <li>1. Laboratorium STIFA Makassar,</li> <li>2. Klinik Kedokteran Hewan Fakultas Kedokteran Hewan Universitas Hasanuddin,</li> <li>3. Laboratorium Patologi Anatomi RSPTN UNHAS,</li> <li>4. Laboratorium Biologi Molekuler Fakultas Kedokteran Universitas Brawijaya, Malang</li> </ol>		
Jenis Review	<input type="checkbox"/> Exempted <input checked="" type="checkbox"/> Expedited <input type="checkbox"/> Fullboard	Masa Berlaku 10 Januari 2023- 10 Januari 2024	Frekuensi Review Lanjutan
Ketua Komisi Etik Penelitian	Nama: Dr. drg. Marhamah, M.Kes	Tanda Tangan 	Tanggal
Sekretaris Komisi Etik Penelitian	Nama: drg. Muhammad Iktol, Sp.Pros	Tanda Tangan 	Tanggal

**Kewajiban peneliti utama:**

- Menyerahkan Amandemen Protokol untuk persetujuan sebelum diimplementasikan
- Menyerahkan laporan SAI ke Komisi Etik dalam 24 jam dan dilengkapi dalam 7 hari dan lapor SUSAR dalam 72 jam setelah peneliti utama menerima laporan.
- Menyerahkan laporan kemajuan (*progress report*) setiap 6 bulan untuk penelitian resiko tinggi dan setiap setahun untuk penelitian resiko rendah.
- Menyerahkan laporan akhir setelah penelitian berakhir.
- Melaporkan penyimpangan dari protokol yang disetujui (*protocol deviation/violation*)
- Mematuhi semua aturan yang berlaku.

## B. Pemeriksaan kadar albumin



LABORATORIUM KIMIA MAKANAN TERNAK  
JURUSAN NUTRISI DAN MAKANAN TERNAK  
FAKULTAS PETERNAKAN  
UNIVERSITAS HASANUDDIN

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**HASIL ANALISIS BAHAN**

No	Kode Sampel	Albumin (%)
1	Ekstrak Ikan Gabus	96,09

Makassar, 3 Januari 2023  
Analis  
  
Muhaimid Syarif  
Np. 19790003 2001 12 1 001

## C. Hasil analisis uji statistik menggunakan SPSS 25,0 for windows 10

Dependent Variable	Hari	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
Interleukin	ke-1	7.000	.344	6.300	7.700
	ke-3	7.083	.344	6.383	7.783
	ke-5	4.833	.344	4.133	5.533
	ke-7	3.833	.344	3.133	4.533
Limfosit	ke-1	6.250	.339	5.560	6.940
	ke-3	6.167	.339	5.477	6.856
	ke-5	4.583	.339	3.894	5.273
	ke-7	3.750	.339	3.060	4.440



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**Pairwise Comparisons**

Dependent Variable	(I)	(J)	Mean Difference (I-J)	Std. Error	Sig. <sup>b</sup>	95% Confidence Interval for Difference <sup>b</sup>	
						Lower Bound	Upper Bound
						Ekstrak	Ekstrak
Interleukin	D	C	-.417	.486	.398	-1.406	.573
		B	-2.500*	.486	.000	-3.490	-1.510
		A	-5.500*	.486	.000	-6.490	-4.510
	C	D	.417	.486	.398	-.573	1.406
		B	-2.083*	.486	.000	-3.073	-1.094
		A	-5.083*	.486	.000	-6.073	-4.094
	B	D	2.500*	.486	.000	1.510	3.490
		C	2.083*	.486	.000	1.094	3.073
		A	-3.000*	.486	.000	-3.990	-2.010
	A	D	5.500*	.486	.000	4.510	6.490
		C	5.083*	.486	.000	4.094	6.073
		B	3.000*	.486	.000	2.010	3.990
Limfosit	D	C	-.583	.479	.232	-1.558	.392
		B	-3.333*	.479	.000	-4.308	-2.358
		A	-5.500*	.479	.000	-6.475	-4.525
	C	D	.583	.479	.232	-.392	1.558
		B	-2.750*	.479	.000	-3.725	-1.775
		A	-4.917*	.479	.000	-5.892	-3.942
	B	D	3.333*	.479	.000	2.358	4.308
		C	2.750*	.479	.000	1.775	3.725
		A	-2.167*	.479	.000	-3.142	-1.192
	A	D	5.500*	.479	.000	4.525	6.475
		C	4.917*	.479	.000	3.942	5.892
		B	2.167*	.479	.000	1.192	3.142

Based on estimated marginal means

\*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

#### D. Dokumentasi Penelitian

1. Proses pembuatan ekstrak ikan haruan (*Channa striata*) menggunakan freeze dryer



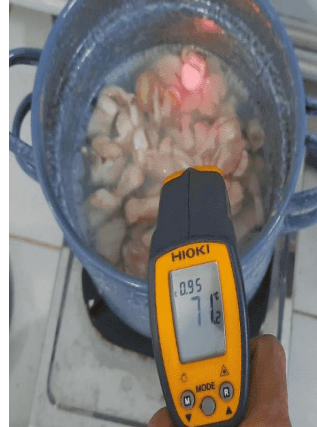
(A)



(B)



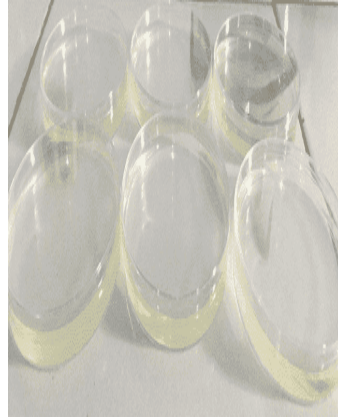
(C)



(D)



(E)



(F)



(G)



(H)

Gambar A. Ikan haruan (*Channa striata*), B. Hasil ekstraksi daging ikan haruan (*Channa striata*), C. Larutan aquadest, D. Proses pengukusan, E,F Ekstrak ikan haruan (*Channa striata*) berupa cairan yang berwarna kuning muda, G.Ekstrak ikan haruan (*Channa striata*) yang telah dibekukan, H. Alat *freeze drying*.

## 2. Ekstrak ikan haruan (*Channa striata*) ukuran nano partikel



Gambar A. Alat ukuran mikropartikel, B. Ekstrak ikan haruan ukuran nano partikel

### 3. Proses preparasi dan aplikasi bahan uji kombinasi ekstrak ikan haruan dan kalsium hidroksida



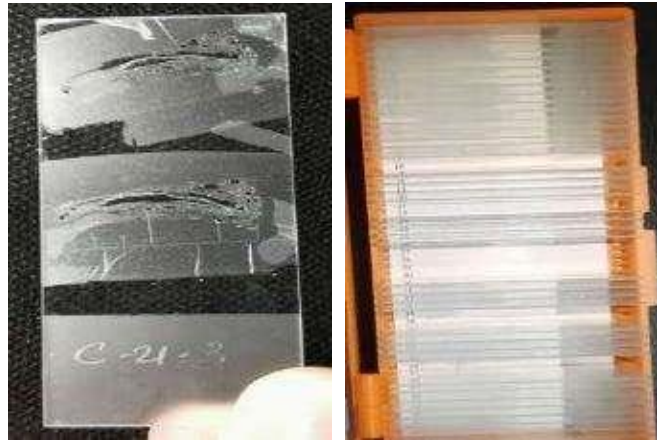
(A)

(B)

(C)

Gambar A. Preparasi gigi tikus galur wistar (*Rattus norvegicus*) menggunakan handpiece dengan round diamond bur ukuran  $\frac{1}{4}$  (Mani Inc., Japan) dengan kedalaman 0,5 mm, B. Aplikasi bahan uji, C. Kavitas ditutup dengan menggunakan RMGIC dan di *light curing* selama 40 detik.

### 4. Pembuatan slide preparat



Gambar. Slide preparat