CHAPTER IV
DISCUSSION

This research uses soaking and spraying techniques with green tea leaf extract (*Camellia sinensis*) concentrate 50% as a disinfectant on alginate impression materials. Both techniques aim to prevent cross-contamination of the impression material, but in their application, there are potential problems regarding the dimensional stability of the impression after disinfection. Alginate molds are known to have syneresis and imbibition properties because this material is in gel form. This means that the mold is susceptible to changes in size due to water absorption or evaporation, which can cause the mold to expand or shrink, thereby reducing the accuracy of the printed results. [19,20,21]

In Tables 1 and 2 in this study, the average results of dimensional measurements from various samples show differences between treatment without treatment, with the soaking technique, and with the spraying technique. These dimensional differences can be influenced by several technical factors, including the method of mixing the alginate material, printing time, and the type of alginate used. The type and quality of alginate affects the dimensional stability of the mold, as this material tends to lose stability over time due to syneresis and imbibition processes. The imbibition property allows the mold to absorb moisture from the environment, while syneresis is the process of releasing water bound in the alginate gel, both of which affect the stability of the shape and size of the mold. Therefore, to maintain dimensional accuracy, alginate molds should ideally be cast immediately after collection to reduce the impact of size changes that can occur during storage. [19,20,21]

In the treatment group using the immersion technique, the duration of immersion played a very important role in influencing the dimensional stability of the alginate mold. Soaking for 5 minutes resulted in minimal dimensional changes in both vertical and horizontal dimensions, with results still within acceptable clinical tolerance limits. However, as the soaking duration increased to 30 minutes, there was a more significant increase in changes in vertical dimensions, where the measurement results showed that the average vertical dimension increased to 37.65 mm, while the horizontal dimension increased to 55.10 mm. This suggests that although immersion provides deeper penetration of the disinfectant fluid, a longer duration can also exacerbate the imbibition effect, causing the mold to absorb more fluid resulting in greater dimensional distortion.[24]

The results of the One-way ANOVA test shown in table 3 support these findings with a significance value of 0.025, indicating there is a significant difference in changes in the dimensions of the alginate mold based on the duration of soaking. Further tests using Duncan's test in table 5 show that the 30 minute immersion group had significant changes in dimensions compared to the group without treatment and the groups with 5 and 15 minute immersion duration. This indicates that longer soaking durations can cause greater dimensional changes and need to be strictly controlled to maintain mold quality. Thus, although soaking in 50% green tea leaf extract provides effective results in

terms of disinfection, excessively long soaking durations should be avoided to avoid significant dimensional distortion.[25]

On the other hand, the spraying technique also provides significant results on the dimensional stability of the alginate mold, although the dimensional changes that occur are more moderate compared to the immersion technique. The results of the One-way ANOVA test shown in Table 4 show that there is a significant difference in changes in the dimensions of the alginate mold based on spraying duration, with a significance value of 0.049. This indicates that the spraying duration has a significant effect on the dimensional stability of the mold. Further tests using Duncan's test in Table 6 show that the 15 minute spraying group had significant changes in dimensions compared to the no treatment group and the 5 and 10 minute spraying groups.

From the two disinfection techniques used, there are significant dimensional differences in the alginate mold. This shows that the technique applied has an impact on the final print result. The dimensional stability of alginate tends to decrease with the length of storage time, so to achieve the best results, alginate molds should be cast as quickly as possible after collection. Impression materials such as alginate must be able to reproduce measured values accurately and remain dimensionally stable over time, so that the impression results meet the required standards. However, the accuracy of this print is highly dependent on several factors, including water evaporation and syneresis, which is the process of releasing water bound in the gel. In alginate gel, water can exist in two forms: free or bound. Free water evaporation or imbibition can make the mold susceptible to volume changes, which ultimately affects the dimensional accuracy of the mold. Storage conditions also play an important role in maintaining this stability, because the syneresis process is influenced by the composition of the alginate used. Therefore, special attention needs to be paid to storage and handling techniques to ensure that the alginate mold remains in optimal condition and meets the desired accuracy criteria.[25, 26]

Even though there are significant differences between the two techniques, based on the results of the One Way ANOVA test, the dimensional differences produced by the immersion and spray techniques remain within acceptable tolerance limits, namely below 0.5%. This confirms that despite the effect of disinfection on mold dimensions, the change still complies with tolerable standards according to ADA specification No. 19. [27]

Based on the results of the study, it was found that in the use of two disinfection techniques using 50% tea duan extract, there were significant dimensional differences in the alginate moulds although the dimensional changes that occurred in the spraying technique were more minimal compared to the soaking technique. The results of this study are in line with Fadriyanti et al. who used 1% sungkai (Peronema canescens) leaf extract as a natural disinfectant. The study showed that spraying and soaking techniques for 10 minutes had a significant effect on the dimensions of alginate moulds.[28] Similar results were also found in Trivedi et al.'s study using Aloe vera extract, where soaking caused significant dimensional changes in the moulds, while the spray method had

minimal impact. However, both methods remained equivalent in disinfection effectiveness.[12]

The use of green tea leaf extract with a concentration of 50% showed a high average zone of inhibition compared to lower concentrations. This was shown in a study that indicated that increasing concentration can increase antibacterial effectiveness that is able to fully inhibit bacterial growth.[31] In general, green tea leaves contain phenol and non-phenol substances. Phenol substances are composed of catechins/tannins and flavanols, while non-phenol substances are composed of alkaloids. These phenols themselves are responsible for antioxidant activities. Not only that, this phenol substance functions as an antimicrobial that can inhibit and kill bacteria along with non-phenol substances. The rich content in green tea (Camellia sinensis) can be an alternative to chemical disinfectants for printing materials because it is easy to find and with a concentration of 50% can inhibit the growth of microorganisms. The timing and technique of application largely determine its effectiveness as well as its impact on the dimensional stability of alginate moulds.[30] However, a study revealed that despite proper timing and application technique, the use of alcohol as a disinfectant can still damage the dimensional stability of alginate moulds. This suggests that while internal factors such as application time and technique are important, external factors such as the type of disinfectant used can have a conflicting negative impact. [32]

BAB V
CONCLUSION

This study shows that the use of 50% green tea (Camellia sinensis) leaf extract as a disinfectant affects the dimensional stability of alginate moulds. The spraying technique resulted in smaller dimensional changes compared to immersion, although both remained within clinical tolerance limits.

Longer duration of soaking increased dimensional distortion due to imbibition, while spraying had a more controllable impact. A 50% concentration of green tea leaf extract can be used as a natural disinfectant due to its phenol content, but the duration and application technique should be regulated appropriately to maintain mould accuracy.

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ATTACHMENT

Appendix 1. Letter of Assignment Thesis Advisor

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,
RISET, DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN
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SURAT TUGAS
Nomor: 03495/UN4.13/PK.03.08/2023

Dalam rangka kelancaran penyusunan Tugas Akhir (Skripsi) Mahasiswa Angkatan 2021 Program Studi Sarjana (S1) Kedokteran Gigi Fakultas Kedokteran Gigi Universitas Hasanuddin, maka dengan ini menugaskan Dosen pada Departemen Ilmu Bahan dan Teknologi Kedokteran Gigi (IBTKG) FKG Unhas sebagai pembimbing skripsi mahasiswa yang tersebut namanya di bawah ini:

NO.	NIM	NAMA	DOSEN PEMBIMBING
1.	J011211106	M. Zulkarnain	Dr. Lenni Indriani, drg., M.Kes.
2.	J011211156	Nanda Mulia Nurhimsa	
3.	J011211001	Fadhilah Ramadhana Efendi	

Surat tugas ini dibuat untuk dilaksanakan dengan penuh tanggung jawab.

Makassar, 4 September 2023

Dekan,

Irfan Sugianto, drg., M.Med.Ed., Ph.D.
NIP 198102152008011009

Tembusan:
1. Wakil Dekan Bidang Akademik dan Kemahasiswaan FKG Unhas;
2. Ketua dan Sekretaris Departemen IBTKG FKG Unhas;
3. Yang bersangkutan.

Balai Sertifikasi Elektronik

Catatan :
1. UU ITE No. 11 Tahun 2008 Pasal 5 Ayat 1 "Informasi Elektronik dan/atau Dokumen Elektronik dan/atau hasil cetakannya merupakan alat bukti yang sah."
2. Dokumen ini telah ditandatangani secara elektronik menggunakan sertifikat elektronik yang diterbitkan oleh BSrE.

IAS-ANZ
KAN

Appendix 2. Research License

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,
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Nomor : 1337/UN4.13/PT.01.04/2024 18 Februari 2024
Hal : **Izin Penelitian**

Yth.
1. Dekan Fakultas Kedokteran Gigi Universitas Hasanuddin
2. Dekan Fakultas Farmasi Universitas Muslim Indonesia
Makassar

Dengan hormat kami sampaikan bahwa sehubungan dengan kewajiban penyelesaian tugas akhir (Skripsi) mahasiswa **Program Studi Pendidikan Dokter Gigi (S1)** Fakultas Kedokteran Gigi Universitas Hasanuddin, maka mahasiswa kami bermaksud akan melakukan penelitian.

Sehubungan dengan hal tersebut, mohon kiranya dapat diberikan **izin penelitian** kepada mahasiswa di bawah ini:

Nama / NIM	: **Nanda Mulia Nurhimsa / J011211156**
Waktu Penelitian	: Maret 2024 s.d. Selesai
Tempat Penelitian	: Laboratorium Kimia Fakultas Farmasi Universitas Muslim Indonesia dan Laboratorium Dental Material FKG Unhas
Pembimbing	: Dr. Lenni Indriani, drg., M.Kes.
Judul Penelitian	: Pengaruh Teknik Desinfeksi secara Penyemprotan dan Perendaman Menggunakan Ekstrak Daun Teh Hijau (*Camellia Sinensis*) 50% terhadap Stabilitas Dimensi Bahan Cetak Alginat

Demikian permohonan kami, atas perhatian dan kerjasama yang baik diucapkan terima kasih.

a.n. Dekan,
Wakil Dekan Bidang Akademik dan Kemahasiswaan

Acing Habibie Mude, drg., Ph.D., Sp.Pros., Subsp.OGST(K).
NIP 198102072008121002

Tembusan:
1. Dekan FKG Unhas;
2. Kepala Bagian Tata Usaha FKG Unhas;
3. Penanggung Jawab Laboratorium Dental Material FKG Unhas;
4. Kepala Laboratorium Kimia Fakultas Farmasi UMI.

Appendix 3. Research Ethics

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET, DAN TEKNOLOGI
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RUMAH SAKIT GIGI DAN MULUT PENDIDIKAN
KOMITE ETIK PENELITIAN KESEHATAN
Sekretariat : Jl.Kandea No. 5 Makassar Lantai 2, Gedung Lama RSGM Unhas
Contact Person: drg. Muhammad Ikbal, Sp.Pros/Nur Asiah AR TELP. [illegible]

RSGMP

REKOMENDASI PERSETUJUAN ETIK
Nomor: 0078/PL.09/KEPK FKG-RSGM UNHAS/2024

Tanggal: 29 April 2024

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

No. Protokol	UH 17121092	No Protokol Sponsor	
Peneliti Utama	Nanda Mulia Nurhimsa	Sponsor	Pribadi
Judul Peneliti	Pengaruh Teknik Desinfeksi Secara Penyemprotan dan Perendaman Menggunakan Ekstrak Daun Teh Hijau (Camellia Sinensis) 50% Terhadap Stabilitas Dimensi Bahan Cetak Alginat		
No. Versi Protokol	1	Tanggal Versi	20 Maret 2024
No. Versi Protokol		Tanggal Versi	
Tempat Penelitian	Universitas Hasanuddin		
Dokumen Lain			
Jenis Review	[x] Exempted [ ] Expedited [ ] Fullboard	Masa Berlaku 29 April 2024 - 29 April 2025	Frekuensi Review Lanjutan
Ketua Komisi Etik Penelitian	Nama: Dr. drg. Marhamah, M.Kes	Tanda Tangan	Tanggal 29 April 2024
Sekretaris Komisi Etik Penelitian	Nama: drg. Muhammad Ikbal, Sp.Pros	Tanda Tangan	Tanggal 29 April 2024

Kewajiban peneliti utama:

- Menyerahkan Amandemen Protokol untuk persetujuan sebelum diimplementasikan
- Menyerahkan laporan SAE 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.

Appendix 4. Seminar Results Invitation

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,
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Laman www.unhas.ac.id Email fdhu@unhas.ac.id

Nomor : 06835/UN4.13.7/KM.00.03/2024 25 November 2024
Hal : Undangan Seminar Hasil Skripsi

Yth.
1. Dr. Lenni Indriani Hatta, drg., M. Kes (Pembimbing)
2. Dr. Ike Damayanti Habar, drg., Sp.Pros., Subsp., PKIKG (K) (Penguji 1)
3. Muhammad Ikbal, drg., Ph.D., Sp.Pros., Subsp., PKIKG (K) (Penguji 2)
Fakultas Kedokteran Gigi Universitas Hasanuddin
Makassar

Dengan hormat, bersama ini kami mengundang Bapak/Ibu untuk menghadiri Seminar Hasil Skripsi mahasiswa atas nama:

NO.	NIM	NAMA	JUDUL
1.	J011211156	Nanda Mulia Nurhimsa	Pengaruh teknik desinfeksi penyemprotan dan perendaman menggunakan ekstrak daun teh hijau (Camellia sinensis) 50% terhadap stabilitas dimensi bahan cetak alginat

Yang akan dilaksanakan pada:

Hari/Tanggal : Kamis, 28 November 2024
Pukul : 14.00 Wita
Tempat : Kelas Internasional A FKG Unhas

Demikian undangan kami, atas perhatian dan kehadirannya disampaikan terima kasih.

Ketua Departemen,

Dr. drg., Lenni Indriyani Hatta, M.Kes.
NIP 197605132005012002

Appendix 5. Minutes of the Seminar Results

KEMENTERIAN PENDIDIKAN, KEBUDAYAAN,
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UNIVERSITAS HASANUDDIN
FAKULTAS KEDOKTERAN GIGI
DEPARTEMEN ILMU BAHAN DAN TEKNOLOGI KEDOKTERAN GIGI
Jl. Perintis Kemerdekaan Km. 10, Makassar 90245
Telepon (0411) 586012, 584641 Faximile. (0411) 584641
Laman: dent.unhas.ac.id

BERITA ACARA SEMINAR HASIL SKRIPSI
DEPARTEMEN ILMU BAHAN DAN TEKNOLOGI KEDOKTERAN GIGI

Pada hari ini **Kamis**, tanggal **28 Bulan November Tahun 2024**, pukul **14.00 WITA** bertempat di Ruang Seminar Dental Center FKG Unhas, telah dilaksanakan evaluasi seminar hasil skripsi bagi saudara:

N a m a : Nanda Mulia Nurhimsa
NIM : J011211156
Program Studi : Sarjana Kedokteran Gigi
Judul : Pengaruh teknik desinfeksi penyemprotan dan perendaman menggunakan ekstrak daun teh hijau (Camellia sinensis) 50% terhadap stabilitas dimensi bahan cetak alginat

No.	Dosen Penguji	Jabatan	Tanda Tangan
1.	Dr. Lenni Indriani Hatta, drg., M.Kes.	Pembimbing	
2.	Dr. Ike Damayanti Habar, drg., Sp.Pros., Subsp., PKIKG (K).	Penguji I	
3.	Muhammad Ikbal, drg., Ph.D., Sp.Pros., Subsp., PKIKG (K).	Penguji II	

Hasil keputusan tim penguji seminar hasil skripsi:
Lulus / ~~**Tidak Lulus**~~ dengan nilai angka ..88.... dan huruf A

Makassar, 28 November 2024
Ketua Departemen,

Dr. Lenni Indriani Hatta, drg., M.Kes.
NIP 197605132005012002