



**Prize Winner**

**Science Writing**

**Year 7-8**

**Sophie Lim**

**Concordia College**



# First Nation Science: The contrasts and correlations between bush medicine and modern medicine

WORD COUNT (exc. Referencing and Captions): 1594

## Introduction

“In traditional Aboriginal culture, the concept of healing an individual through the natural environment – using bush medicine – was ultimately entwined with the spiritual world and not just the physical” (Australian Geographic, 2012.)

Traditional medicine practice embodies the use of bush medicine and spiritual belief to heal through a complex system involving interconnectedness with the land (Oliver, 2013). Bush medicine, an integral part of First Nation’s culture for generations, emphasises the deep spiritual connection as it incorporates the use of native botanicals in physical and spiritual healing - First Nation’s communities use bush medicine to heal and connect with others and the environment. With the rise of modern medicine around Western healthcare systems, many First Nation’s people have ‘abandoned’ their traditional practices in favour of Western medicine. This has led to a gradual erosion of First Nation’s knowledge and practices, which is a loss not only for First Nation’s communities but for society as a whole as preservation of traditional knowledge maintains diversity within communities. So, how do the holistic practices and views of bush medicine compare to modern medicine and the extraction of active compounds?

## What are traditional practices of bush medicine?

Traditional First Nations bush medicine is used in a sense of physical and spiritual healing. Through creating a deeper connection to the environment, traditional bush medicine incorporates the use of different parts of plants such as the leaves and seeds into the natural remedies for immunity and healing (Critchley, 2018). Traditional practices of bush medicine focus on a whole spiritual and physical wellbeing and the mind and body are inseparable and to prevent illness, a range of healing techniques are used. These practices use certain components of native Australian plants such as the roots, leaves, and oil. Becoming an efficient way of treatment due to the easy accessibility to the environment nearby. For example, the materials available for use were the botanicals that were in season (University of Melbourne, 2020). Traditional bush medicine integrates plant components to create natural remedies for holistic healing, emphasising the connection of mind, body, and environment, guided by healers across generations. Treatments tend to vary based on the opinion and interpretations of the healer. Traditional healers, known as Ngangkari, possess extensive generational knowledge and expertise in interpreting symptoms and administering traditional healing treatments such as bush rubs and medicines, reflecting the holistic approach of First Nation’s culture towards healing (Mckendrick et al., 2013). Traditionally viewing and utilising bush medicine through a holistic approach to healing and wellness (Bush Medijina, 2021). In contrast to more Western or modern medical systems where treatment is concentrated on the individual and focused on the illness itself rather than other aspects of life such as spiritual or cultural wellbeing that may affect the situation.

## **A bridge between traditional and modern medicine**

The integration of First Nation's bush medicine into Western medicine, driven by European settlers' adaptation to the new environment and their observation of First Nation's practices, led to the development of synthetic drugs but also highlights the ongoing significance of natural compounds in current modern drug discovery and development. Resulting in a drastic change in lifestyle during colonisation, European settlers adapted to the environment by relying on natural resources from the bush for basic medicine. They learned from First Nation's interaction with the environment to create a deeper connection through usage of leaves and seeds for healing and incorporated similar techniques into their own practices (Clarke, 2008). The use of bush medicine by First Nations people in Australia was adopted by European settlers during colonisation, leading to the development of synthetic methods for producing drugs, lessening the reliance on natural products. However, active compounds for many modern drugs are still extracted from natural products. Subsequently, the extracted compounds from the natural product may or may not follow the traditional way of intended use (Yuan et al., 2016). The implementation of traditional medicine in drug discovery and development efforts has exhibited a decline in interest in traditional medicine (Dias, Urban and Roessner, 2012). Despite this decline in interest, potential has been seen for traditional medicine to be used in drug discovery and development as the development of new drugs relying purely on modern technology appears to be reaching something of a limit (Yuan et al., 2016).

Modern medicine can utilise the years of knowledge accumulated by First Nation's communities by integrating traditional methodologies into modern technologies to develop culturally meaningful outcomes throughout communities. Many First Nation Australians are interested in incorporating traditional medical knowledge into modern medical scenarios; however, ethical concerns around the intellectual property and benefit sharing often halt this process (Packer et al., 2019). The Nagoya Protocol enforced by the Australian Government on access benefit sharing (Fig. 1) allows for scientists and First Nation peoples to benefit from the outcomes. Facilitating the integration of traditional medicine into modern healthcare while ensuring recognition and fair benefit sharing between scientists and First Nation communities (Australian Government, 2022). Whilst addressing the ethical concerns around intellectual property and benefit sharing ensure fair recognition and compensation for First Nation peoples' contributions to the modern medical system.

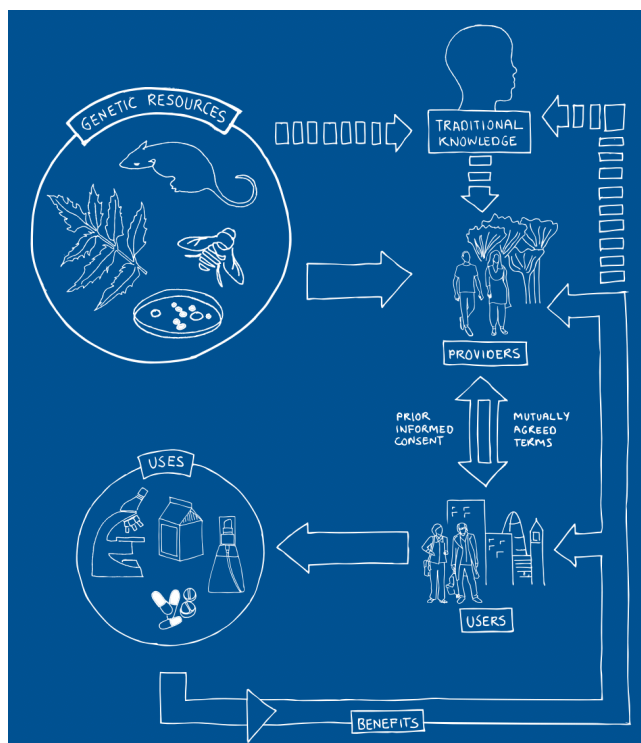


Figure 1: Visual representation of the Nagoya Protocol on Access and Benefit-sharing. Showing the transparency given for both providers and users of genetic resources has been legally enforced where First Nation peoples are given recognition in the form of money or other benefits for their contribution of traditional knowledge on bush medicine under mutually agreed terms with prior informed consent. (Convention on Biological Diversity, 2011)

The use of traditional medicine has already been incorporated into drugs with other native plants from around the world. Evident with the early development of Dimethyl fumarate (Fig. 2), which was traced back to being used in traditional medicine of the plant common fumitory (Fig. 3). This current use of Dimethyl fumarate, developed from common fumitory is an example of how natural products in traditional medicine have advanced modern medicine in the pharmaceutical industry.

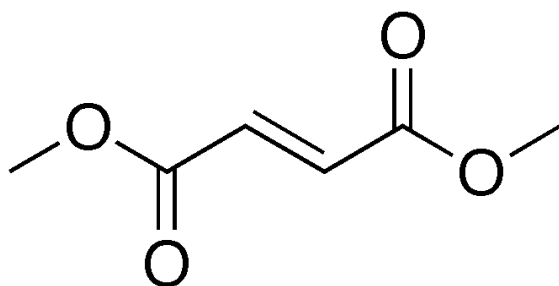


Figure 2: The chemical structure of Dimethyl fumarate, the methyl ester of the NP fumarate which was once used treatment for psoriasis. The fumaric acid derivatives were initially used for treatment of psoriasis as it was believed to be caused by a metabolic deficiency that believed to be compensated for gratification of fumarate. (Atanasov et al., 2021; Wikipedia, 2023)



Figure 3: A picture of the plant common fumitory (*Fumaria officinalis*), a plant used in traditional medicine and native to Europe and Asia. (Wikipedia, 2023.)

Tigilanol tigate (Fig. 4), an isolated natural product from the Australian blushwood tree (Fig. 5) has been approved and marketed as treatment for canine cell tumours in many nations such as Australia and the United States of America. Currently being developed further as a human and veterinary medicine, the use of Tigilanol tigate in cancerous treatment holds possibilities for expanding treatment options and potentially improving outcomes for patients and animals affected by cancer (QBiotech, 2020).



Figure 4: Tigilanol tigate, an isolated product from the kernels of the Australian blushwood tree (see right) has commonly been used for pharmaceutical treatment of non-metastatic and non-resectable mast cell tumours on dogs. (Vet Practice Magazine, 2022; PubChem, 2023)



Figure 5: A picture of the Australian blushwood tree (*Fontainea picrosperma*), a plant in which its kernels are sourced for the veterinary anticancer drug, tigilanol tigate. (QIMR Berghofer Medical Research Institute, 2020; Chianese et al., 2022)

The extraction of active compounds from plants traditionally used in bush medicine is a key process in the development and creation of new drugs. The preparation of medicinal plants for usage tends to include an extraction process to collect a certain compound found in the natural plant; occasionally due to inability for whole plant usage for the certain cause as it may not be suitable to incorporate into the treatment in that form. Due to the chemical and structural diversity of plants, they are the most dominant natural source for pharmaceutical use (Mathur and Hoskins, 2017). By extracting and purifying specific active compounds from natural products, many modern drugs can be produced. Subsequently, it may be used on its own or in combination with other composites.

Tea tree oil was traditionally used as an antiseptic and can now be found incorporated with many treatments for various conditions such as acne, lice, cuts, and insect bites. The extraction of the active ingredient known as Terpinen-4-ol found in tea tree leaves and oil (Fig. 6) additionally driven by the growing interest in natural alternatives to synthetic treatments, making tea tree oil a coveted ingredient in various industries such as the pharmaceutical industry.

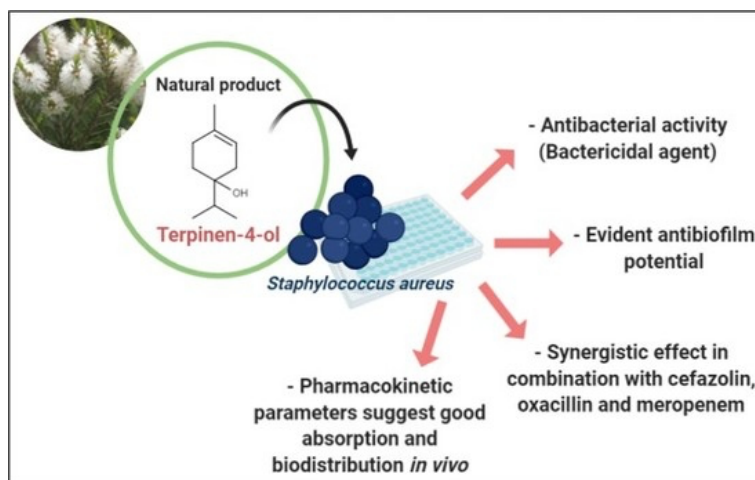


Figure 6: Terpinen-4-ol, an extract found in the natural of product tea tree oil, extracted from tea trees (*Melaleuca alternifolia*). Known for its antiseptic and antifungal properties possessed with a synergistic effect in combination with cefazolin, oxacillin and meropenem (all types of antibiotics). (Cordeiro et al., 2020)

Research has shown that eucalyptus oil, derived from the leaves of the eucalyptus tree, possesses a variety of health benefits, including antibacterial and anti-inflammatory properties, making it a valuable alternative to traditional and synthetic extraction methods (Mieres-Castro et al., 2021). First Nation peoples traditionally used eucalyptus to treat colds and coughs by building steam pits that were heated through fires which were lined with Eucalyptus leaves, they were able to vaporise and extract the oil to be inhaled as a decongestant treatment (Australian Curriculum, 2017). It has been incorporated into modern medical supplements to act as a decongestant through rubs and vapor baths, and example of this is with Vicks VapoRub (DailyMed, 2023).

The traditional method of extracting eucalyptus oil by using steam pits resonates with the modern steam distillation process (Fig. 7). This differs in contrast to modern techniques of the steam distillation process of Eucalyptus oil which involve distilling water with the plant material to then extract the oil in a vaporised form with steam. Subsequently, condensed with the steam to turn into water and essential oil, separated due to differences in density. The key difference is that the traditional method uses a pit heated by fire, whilst the modern method uses the apparatus of steam distillation which is commonly used in industrial settings; both methods utilise steam to vaporise the oil from the plant material. Eucalyptus oil, a versatile natural product with a range of possible health benefits which are still being explored, used for centuries by First Nation's people, its incorporation into modern medical systems is developing.

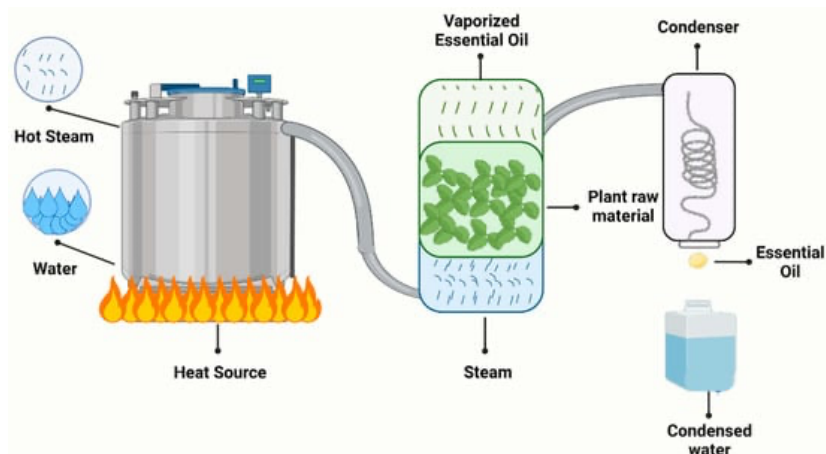


Figure 7: Visual overview of the steps involved in the steam distillation process. Commonly used in industrial settings to extract essential oils from the raw plant material, for example eucalyptus (*Eucalyptus globulus*). This figure is an adapted version from Tonguanchan and Benjakul. (Machado et al., 2022)

## Conclusion

Traditional medicine practice has been used for centuries by First Nation Australians to treat a variety of ailments, incorporating the use of bush medicine and spiritual belief to heal through a holistic approach (Oliver, 2013). The incorporation of native botanicals into modern medicine through physical and spiritual healing allows for deeper connection with communities and the environment. However, the increasing influence of Western medicine has resulted in the gradual abandonment of traditional practices, resulting in loss of traditional knowledge. This loss depletes the cultural diversity of society as a whole, not just for First Nation’s communities. Understanding different approaches to healing through exploring the incorporation of different compounds like eucalyptus oil may contribute to a more inclusive healthcare system and society. By acknowledging the value of traditional knowledge passed down from generation to generation, we can foster cultural preservation and appreciate the holistic approach taken by First Nation’s people with traditional bush medicine.

## Reference List

- Atanasov, A.G., Zotchev, S.B., Dirsch, V.M. and Supuran, C.T. (2021). Natural products in drug discovery: advances and opportunities. *Nature Reviews Drug Discovery*, [online] 20. doi:<https://doi.org/10.1038/s41573-020-00114-z>.
- Australian Curriculum (2017). *Teacher background information - Year 5 Science Content Detail*. [online] Australian Curriculum. Available at: <https://australiancurriculum.edu.au/TeacherBackgroundInfo?id=56652#:~:text=Prior%20to%20colonisation%2C%20the%20Wiradjuri,treatment%20for%20coughs%20and%20colds>. [Accessed 1 Jun. 2023].
- Australian Geographic (2012). *Bush medicine: Aboriginal remedies for common ills*. [online] Australian Geographic. Available at: <https://www.australiangeographic.com.au/topics/history-culture/2012/05/bush-medicine-aboriginal-remedies-for-common-ills/> [Accessed 21 May 2023].
- Australian Government (2022). *The Nagoya Protocol - Convention on Biological Diversity - DCCEEW*. [online] Department of Climate Change, Energy, the Environment and Water. Available at: <https://www.dcceew.gov.au/science-research/australias-biological-resources/nagoya-protocol-convention->

[biological#:~:text=The%20Nagoya%20Protocol%20on%20Access,on%20Biological%20Diversity%20\(CBD\). \[Accessed 25 Apr. 2023\].](#)

Bush Medijina (2021). *What is Bush Medicine?* | *Bush Medijina*. [online] Bush Medijina. Available at: <https://bushmedijina.com.au/pages/bush-medicine> [Accessed 2 May 2023].

Chianese, G., Amin, H.I.M., Maioli, C., Reddell, P., Parsons, P., Cullen, J., Johns, J., Handoko, H., Boyle, G., Appendino, G., Tagliatalata-Scafati, O. and Gaeta, S. (2022). Cryptic Epoxytiglanes from the Kernels of the Blushwood Tree (*Fontainea picrosperma*). *Journal of Natural Products*, [online] 85(8), pp.1959–1966. doi:<https://doi.org/10.1021/acs.jnatprod.2c00226>.

Clarke, P. (2008). Philip Clarke - Aboriginal healing practices and Australian bush medicine Aboriginal healing practices and Australian bush medicine. *Journal of the Anthropological Society of South Australia*, [online] 33. Available at: <http://www.friendsofglenthorne.org.au/wp-content/uploads/Clarke-Vol-33-2008.pdf> [Accessed 20 May 2023].

Convention on Biological Diversity (2010). *Introduction to access and benefit-sharing*. [online] Secretariat of the Convention on Biological Diversity, pp.1–5. Available at: <https://www.cbd.int/abs/infokit/brochure-en.pdf> [Accessed 25 Apr. 2023].

Convention on Biological Diversity (2011). *The Nagoya Protocol on Access and Benefit-sharing*. [online] Secretariat of the Convention on Biological Diversity, pp.1–3. Available at: <https://www.cbd.int/abs/infokit/revise/web/factsheet-nagoya-en.pdf> [Accessed 25 Apr. 2023].

Coppen, J.J.W. (2002). *Eucalyptus*. [online] CRC Press, pp.161, 162. Available at: [https://books.google.com.au/books?id=0dRIDMvLhQ0C&printsec=frontcover&source=gbs\\_ge\\_summary\\_r&cad=0#v=onepage&q&f=false](https://books.google.com.au/books?id=0dRIDMvLhQ0C&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false) [Accessed 7 Jun. 2023].

Cordeiro, L.V., Figueiredo, P., Souza, S., Pereira, A., Andrade-Júnior, F., Medeiros, D., Nóbrega, J., Nunes, D., Martins, E., Barbosa-Filho, J.M. and de, E. (2020). Terpinen-4-ol as an Antibacterial and Antibiofilm Agent against *Staphylococcus aureus*. *International Journal of Molecular Sciences*, [online] 21(12), pp.4531–4531. doi:<https://doi.org/10.3390/ijms21124531>.

Critchley, C. (2018). *The endurance of bush medicine*. [online] University of Melbourne. Available at: <https://pursuit.unimelb.edu.au/articles/the-endurance-of-bush-medicine> [Accessed 13 May 2023].

DailyMed (2023). *DailyMed - VICKS VAPORUB (camphor- synthetic, eucalyptus oil, and menthol ointment)*. [online] National Library of Medicine. Available at: <https://dailymed.nlm.nih.gov/dailymed/drugInfo.cfm?setid=e69a7c9b-fd04-4109-a7c8-6edfd83855fc> [Accessed 3 Jun. 2023].

Dias, D., Urban, S. and Roessner, U. (2012). A Historical Overview of Natural Products in Drug Discovery. *Metabolites*, [online] 2(2), pp.303–336. doi:<https://doi.org/10.3390/metabo2020303>.

Huynh, Q., Phan, T.D., Thieu, V.Q.Q., Tran, S.T. and Do, S.H. (2012). Extraction and refining of essential oil from Australian tea tree, *Melaleuca alterfornia*, and the antimicrobial activity in cosmetic products. *Journal of Physics: Conference Series*, [online] 352, p.012053. doi:<https://doi.org/10.1088/1742-6596/352/1/012053>.

IOP Conference Series: Earth and Environmental Science (2021). *Review: Eucalyptus globulus essential oil extraction method*. Available at: [7](https://iopscience.iop.org/article/10.1088/1755-1315/733/1/012103/pdf#:~:text=Thus%2C%20the%20appropriate%20extraction%20method,%2C%20and%20ultrasound%2D%20assisted%20extraction. [Accessed 8 Jun. 2023].</a></p></div><div data-bbox=)



- Jens (2021). *Traditional Aboriginal health care*. [online] Creative Spirits. Available at: <https://www.creativespirits.info/aboriginalculture/health/traditional-aboriginal-health-care#:~:text=Depending%20on%20a%20client's%20problems,remove%20pain%2C%20blockages%20or%20obstructions>. [Accessed 24 May 2023].
- Jones, G. (2014). *Indigenous medicine – a fusion of ritual and remedy*. [online] The Conversation. Available at: <https://theconversation.com/indigenous-medicine-a-fusion-of-ritual-and-remedy-33142> [Accessed 2 May 2023].
- Machado, C.A., Oliveira, F.O., de Andrade, M.A., Hodel, K.V.S., Lepikson, H., Machado, B.A.S. (2022). Steam Distillation for Essential Oil Extraction: An Evaluation of Technological Advances Based on an Analysis of Patent Documents. *Sustainability*, [online] 14(12), pp.7119–7119. doi:https://doi.org/10.3390/su14127119.
- Mathur, S. and Hoskins, C. (2017). Drug development: Lessons from nature. *National Library of Medicine*, [online] 6(6), pp.612–614. doi:https://doi.org/10.3892/br.2017.909. [Accessed 13 May 2023].
- Mckendrick, J., Brooks, R., Hudson, J., Thorpe, M. and Bennett, P. (2013). *Aboriginal and Torres Strait Islander Healing Programs A Literature Review*. [online] Available at: <https://healingfoundation.org.au/app/uploads/2017/02/Aboriginal-and-Torres-Strait-Islander-Healing-Programs-A-Literature-Review.pdf> [Accessed 13 May 2023].
- MedlinePlus (2021). *Eucalyptus*. [online] MedlinePlus. Available at: <https://medlineplus.gov/druginfo/natural/700.html> [Accessed 6 Jun. 2023].
- MedlinePlus (2022). *Dimethyl Fumarate: MedlinePlus Drug Information*. [online] MedlinePlus. Available at: [https://medlineplus.gov/druginfo/meds/a613028.html#:~:text=Dimethyl%20fumarate%20is%20used%20to,incl uding%20clinically%20isolated%20syndrome%20\(CIS%3B](https://medlineplus.gov/druginfo/meds/a613028.html#:~:text=Dimethyl%20fumarate%20is%20used%20to,incl uding%20clinically%20isolated%20syndrome%20(CIS%3B) [Accessed 12 Jun. 2023].
- Mieres-Castro, D., Ahmar, S., Shabbir, R. and Mora, F. (2021). Antiviral Activities of Eucalyptus Essential Oils: Their Effectiveness as Therapeutic Targets against Human Viruses. *Pharmaceuticals*, [online] 14(12), pp.1210–1210. doi:https://doi.org/10.3390/ph14121210.
- Nordqvist, J. (2018). *The health benefits of eucalyptus*. [online] Medicalnewstoday.com. Available at: <https://www.medicalnewstoday.com/articles/266580> [Accessed 8 Jun. 2023].
- Norris, R. (2014). *Aboriginal people – how to misunderstand their science*. [online] The Conversation. Available at: <https://theconversation.com/aboriginal-people-how-to-misunderstand-their-science-23835> [Accessed 1 May 2023].
- Oliver, S.J. (2013). The role of traditional medicine practice in primary health care within Aboriginal Australia: a review of the literature. *Journal of Ethnobiology and Ethnomedicine*, [online] 9(1). doi:https://doi.org/10.1186/1746-4269-9-46.
- PubChem (2023). *Tigilanol tiglate*. [online] PubChem. Available at: <https://pubchem.ncbi.nlm.nih.gov/compound/Tigilanol-tiglate> [Accessed 25 Jun. 2023].
- QBiotics (2020). *STELFONTA® - QBiotics*. [online] QBiotics. Available at: <https://qbiotics.com/product-pipeline/stelfonta> [Accessed 25 Jun. 2023].
- QBiotics (2023). *QBiotics - Harnessing the power of nature to improve lives*. [online] QBiotics. Available at: <https://qbiotics.com/36-news/human-oncology/367-first-patient-treated-in-qbiotics-phase-ii-clinical-trial-in-patients-with-soft-tissue-sarcoma> [Accessed 11 Jun. 2023].

QIMR Berghofer Medical Research Institute (2020). *Cancer drug destroys tumours in pre-clinical trials*. [online] QIMR Berghofer. Available at: <https://www.qimrberghofer.edu.au/media-releases/cancer-drug-destroys-tumours-in-pre-clinical-trials/> [Accessed 25 Jun. 2023].

Ralph-Flint, J. (2017). *Cultural borrowing and sharing: Aboriginal bush medicine in practice*. [online] Informit. Available at: <https://search.informit.org/doi/10.3316/informit.493463645635065> [Accessed 2 May 2023].

Salehi, B., Sharifi-Rad, J., Quispe, C., Llaique, H., Villalobos, M.J., Smeriglio, A., Trombetta, D., Ezzat, S.M., Salem, M.L., Zayed, A.I., Marina, C., Yazdi, S.E., Sen, S., Acharya, K., Sharopov, F. and Martins, N. (2019). Insights into Eucalyptus genus chemical constituents, biological activities and health-promoting effects. *ScienceDirect*, [online] 91, pp.609–624. doi:<https://doi.org/10.1016/j.tifs.2019.08.003>.

Tressider, V. (2019). *Bush remedies leading to advances in modern medicine*. [online] The Lighthouse. Available at: <https://lighthouse.mq.edu.au/article/july-2019/bush-medicine> [Accessed 29 Apr. 2023].

University of Melbourne (2020). *Seasonal foods and Aboriginal astronomy*. [online] University of Melbourne - Indigenous Knowledge Institute. Available at: <https://indigenousknowledge.unimelb.edu.au/curriculum/resources/seasonal-foods-and-aboriginal-astronomy> [Accessed 17 May 2023].

Vet Practice Magazine (2022). *STELFONTA®*, *The New Treatment for Canine Mast Cell Tumours*. [online] Vet Practice Magazine. Available at: <https://www.vetpracticemag.com.au/stelfonta-the-new-treatment-for-canine-mast-cell-tumours/> [Accessed 25 Jun. 2023].

Wang, S. (2022). *The Ultimate Guide to Essential Oil Extraction Methods: Steam Distillation, Expression, and Solvent Extraction*. [online] Lavender Backyard Garden®. Available at: <https://www.lavenderbackyard.co.nz/blogs/news/what-are-essential-oils> [Accessed 8 Jun. 2023].

World Health Organization (2019). *Traditional, Complementary and Integrative Medicine*. [online] Who.int. Available at: [https://www.who.int/health-topics/traditional-complementary-and-integrative-medicine#tab=tab\\_1](https://www.who.int/health-topics/traditional-complementary-and-integrative-medicine#tab=tab_1) [Accessed 17 May 2023].

Yuan, H.-D., Ma, Q., Ye, L. and Piao, G. (2016). The Traditional Medicine and Modern Medicine from Natural Products. *Molecules*, [online] 21(5), pp.559–559. doi:<https://doi.org/10.3390/molecules21050559>.