



# Uses of Lanolin

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## Executive Summary

Derived from wool-bearing animals, lanolin has a wide variety of applications resulting its expansion within the global market. In the many forms lanolin can be extracted into, including wax, oil and alcohol, the waxy, emollient and hydrophobic properties enable lanolin to be used in a variety of applications from cosmetics to medical equipment and from paints to softening textiles.

This report, commissioned by Menter Mon, examines the role of lanolin in the Welsh wool sector. In particular, the project undertakes two objectives, namely:

1. To identify the potential for lanolin as a substitute for other oils and lubricants; and
2. To understand the market for lanolin.

The first stage of the project involved a three pronged desk based review focussing on (i) existing uses and applications for lanolin; (ii) a bibliographic review to understand the scope and concentration of discourse related to lanolin in literature including academic, professional and official governmental publications; and (iii) an evaluation of the domestic and global market for lanolin charting increase in demand and price over the past decade.

An empirical study was undertaken in Stage Two in order to gain insight into the challenges faced by and opportunities arising for those operating within the lanolin supply chain. The methodological approach adopted comprised of an online survey distributed to selected key stakeholders within the wool sector and lanolin market.

The project found that whilst the global market for lanolin is growing and new emergent markets are being identified as applications for lanolin increase, there is concurrently a discourse opposing lanolin on the grounds that (i) lanolin is an animal derived product and therefore is incompatible with vegan lifestyles; (ii) the processes used to extract lanolin from wool is environmentally damaging, using significant quantities of water and chemicals and (iii) alternatives to lanolin exist which offer greater efficiency. This, coupled with the lack of recognition stakeholders in Wales have for the opportunities lanolin presents in a wide variety of applications, is limiting the potential lanolin market in Wales.

## Section 1: Introduction

This report, commissioned by Gwnaed a Gwlan examines the existing and potential market for lanolin in Wales. In order to achieve this, the work explores the process of harnessing lanolin from wool, the forms lanolin takes and the types of applications lanolin is used in. The study considers the aspects of lanolin that form the main discourse and analysis of lanolin academically and professionally through a bibliometric analysis before analysing primary data captured from an online survey and interviews with producers, suppliers and manufacturers of wool and lanolin in Wales.

### Description

Lanolin, referred to sometimes as “wool wax” or “wool grease” is a yellow waxy substance secreted by the sebaceous glands of wool-bearing animals (Sengupta, A & Behera, J). Its purpose is to condition and protect the wool. Due to its conditioning and protective properties the substance had a wide variety of applications in human cosmetics, medical skincare treatments and industrial uses. Most lanolin used by humans comes from domestic sheep breeds that are raised specifically for their wool. Crude lanolin constitutes about 5-25% of the weight of freshly shorn wool (Sengupta, A & Behera, J, 2014).

### Benefits to Lanolin

The properties in lanolin make it a wide ranging and useful substance for cosmetics, medicine and industrial purposes. Both lanolin and lanolin derived products serve use to consumers in both cooler and warmer climates, consequently the global market for lanolin is considerable and is shown to be increasing markedly. This market is considered to be expanding for a number of reasons, namely (i) the rise in organic consciousness of consumers and behavioural and choice changes in personal care products; (ii) rapid expansion of distribution channels by certain major companies which has resulted in alterations to market dynamics (GrandView Research, 2022) and (iii) the sustainability properties of lanolin as it is biodegradable, non-toxic and ecologically friendly.

Lanolin has a vast array of uses and potential future uses, particularly those associated with hygienic and hypoallergenic applications in medical textiles and industrial applications. Indeed, the need to protect both hospital staff and their patients from bacteria; viruses and body fluid invasions is paramount, particularly given the rise in blood borne diseases, such as hepatitis C and HIV. As Desai (2007) observes, the major requirements for barrier fabrics are that they resist the penetration of liquids, particularly blood and at the same time be sterile, breathable, flexible and inexpensive. Indeed, the properties of lanolin address a number of the requirements in the characteristics of healthcare textiles and is a highly lucrative market. By 2005, hygiene and medical textiles valued at US\$4.1 billion are predicted to account for 1.65 Mt (almost 12%) of the global technical textiles market.

### Process for capturing lanolin from wool

Lanolin is extracted by scouring the wool in hot water with a detergent to remove dirt, wool grease (crude lanolin), suint (sweat salts), and anything else stuck to the wool. The wool grease is removed during the washing process through a centrifuge. This concentrates the lanolin into a wax-like substance, melting at approximately 38°C<sup>1</sup>. Wang et al (2022) examined watersaving processes for the extraction of lanolin from sheep wool. A hot alcoholic solution (85% Ethanol and 15% methanol) at 60 degrees Celsius obtained significant lanolin crude product. It appears there is

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<sup>1</sup> The process is undertaken after the sheep are sheared and thus the sheep are not harmed.

still some way to go with technology which can enable the harnessing of lanolin without the need for high volumes of water, chemicals and/or heating.

## Forms of Lanolin

Although chemically classified as a wax, lanolin has all the physical properties of a grease. Lanolin is also compatible with numerous additives that modify the consistency and characteristics of the resulting protective films (e.g. hard, soft, water soluble or insoluble). Lanolin can be extracted into a number of different forms typically referred to as either hydrous or anhydrous. These two classifications of lanolin can be further broken down into forms including lanolin wax, lanolin alcohol, ethoxylated lanolin and lanolin oil (liquid lanolin).

Table 1, Forms of Lanolin

Lanolin Form	Description
Wax	High melting point. Used in hair creams, lipsticks, ointments & coatings
Alcohol	Has excellent emulsifying properties and increases the water absorption capability of hydrocarbon mixtures. Hard, waxy solid material used in creams and lotions as an emulsion stabiliser.
Ethoxylated	Water soluble lanolin used in water based applications such as shampoos and hand wash.
Oil	Liquid fraction on lanolin captured through fractional crystallisation at very low temperatures.

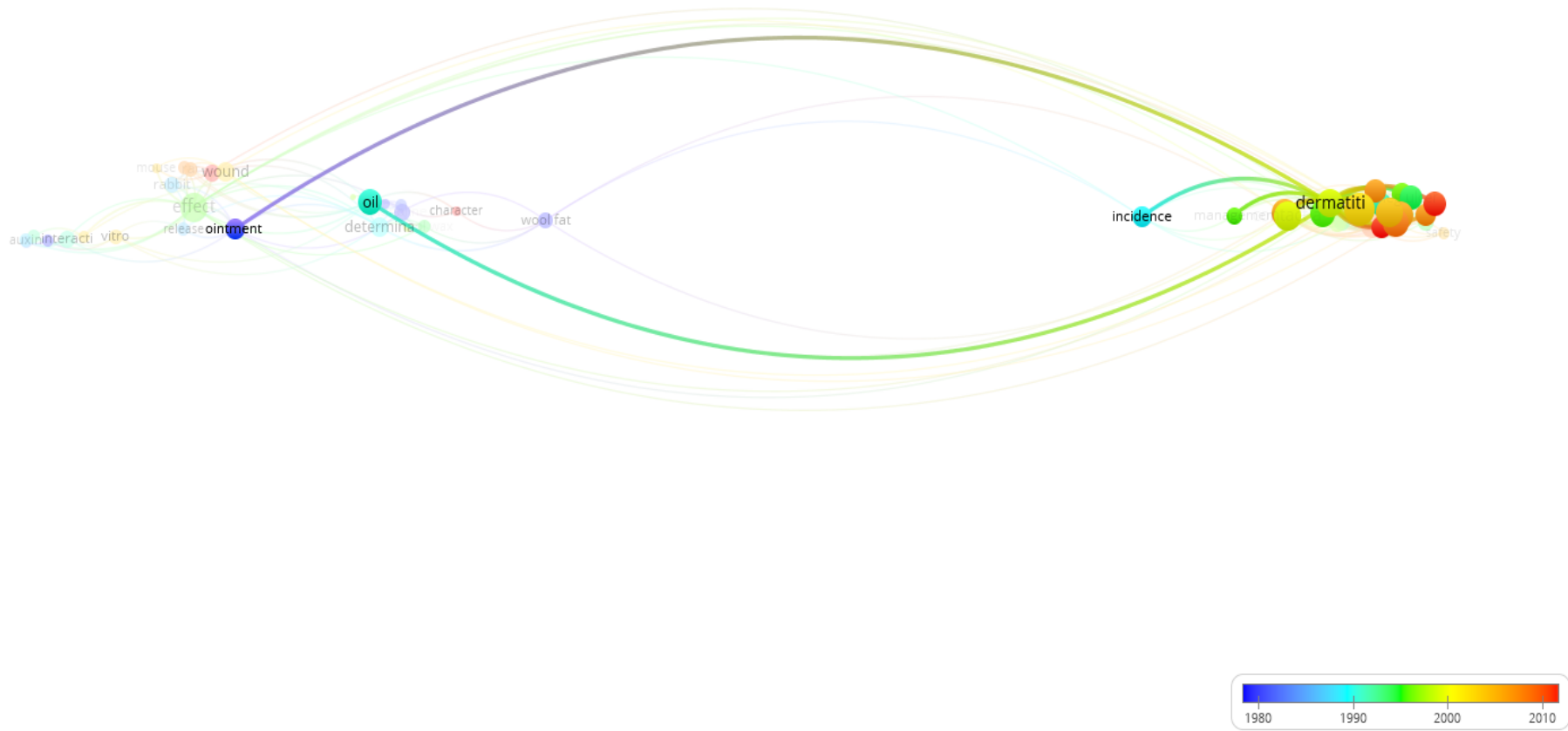
## Section 2: Uses for Lanolin

Lanolin has a wide scope of applications across a number of specific sectors, especially cosmetic, medical and industrial. These will each be considered separately below

### Cosmetic

Lanolin acts as an occlusive moisturizer, emollient and soothing agent on the skin, slowing water loss and avoiding dehydration, dryness and peeling. According to a study, lanolin can reduce water loss through the skin by 20 to 30 percent which gives the appearance of plump smoother skin. This in turn has a beneficial effect on self esteem and, as Purnamawati et al (2017) observe improve a patient's social life, psychological satisfaction and quality of life. Lanolin also contains vitamin D which has many benefits such as boosting the skin's immune system and helping reduce scarring. Moisturisers not only have a smoothing and moistening effect but have greater health and medical benefits as (i) anti inflammatories; (ii) antipuritic; (iii) antimitotic and would healing. These properties associated with lanolin are reflected in the proportion of publications which focus on medical treatments using lanolin for the treatment of wounds, ulcers, and dermatological ailments being of particular concentration in the VOS literature mapping, see Figure 1 below.

Figure 1, VOS visualisation depicting relationships in literature between lanolin, oil and medical applications.





Lanolin is, for example viewed as being a supportive therapy in response to the aesthetic and functional side effects of chemotherapy on lips. Indeed, Santos et al (2013) found that HPA® Lanolin has anti-inflammatory, antimicrobial and moisturising properties. Their research indicated that patients using this product experienced improvement in lip dryness and reduction in discomfort and pain.

Whilst lanolin has been recognised as an allergen by dermatologists for decades (Lee and Warshaw, 2008) discourse suggesting risks of allergies posed by the use of lanolin and its derivatives for cosmetic purpose medical studies have not demonstrated this. In a review of 24,449 patients between 1982-1996 who were tested with a series containing 30% wool alcohols Wakelin et al found the mean sensitivity to the allergen was 1.7%. Consequently, the study found that “lanolin sensitisation remains at a relatively low and constant rate even in a high-risk population (i.e. patients with recent or active eczema)”. This has been supported by research undertaken by Kligman (2007) who observed that “no one has succeeded in sensitizing animals or humans to lanolin or wool wax alcohols”. Wolf (1996) discusses what he refers to as “lanolin paradoxes” in dermatological applications whereby lanolin is used a topical therapeutic agent sensitizing patients but is, simultaneously adopted widely in cosmetics<sup>1</sup>.

Research published in January 2023 examining patients in the United States (US) has found that lanolin is a weak sensitizer. Jenkins and Belsito (2023) refer to the frequency of contact allergy to lanolin in the European population to be 0.4%, although notes that the risk is higher with concomitant conditions such as stasis dermatitis, leg ulcers, perianal/genital dermatitis and atopic dermatitis. Interestingly, the work suggests that non-Hispanic patients of colour are less likely to be lanolin allergic.

Reactions can be prevented by checking the ingredients of products containing lanolin oil and avoiding using too much on areas at risk of swallowing, such as lips (through the use of lip balms). Where lanolin is misused, for example through being ingested then where there is a large amount or build up of this substance in the human body this can result in poisoning and damage to the intestines (Gallagher, G, 2019).

Table 2, Cosmetic Uses of Lanolin

Cosmetic Use	Description
Anti-aging cosmetics	Lanolin can hold twice its weight in water. This gives the appearance of plump, tighter skin which reduces wrinkles.
Hair oil	Reduces dryness and split ends
Lip balms	Reduces dry and chapped lips.
Nipple cream	Protects the skin for breastfeeding and used to protect against chaffing in sports. Vintec International Hospital advises that those actively breastfeeding should use 100% pure and refined lanolin.

## Industrial

Lanolin is an important component of a broad range of industrial applications such as lubricants and protective preparations for ferrous metals, preventing rusting. Lanolin has a tenacious adhesive tendency to metal surfaces, which is much higher than for hydrocarbons. Lanolin also has high penetration potential, particularly as a low viscous formulation. This enables the substance to work its way into cervices, cavities and micro fissures in a structure or mechanical part, for example and attach to the metallic surface providing an anti-corrosive layer.

Table 3, Industrial Uses of Lanolin

Industrial Use	Description
Rust prevention of nautical vessels and tanks	Salt water resistance and anti-corrosive
Conserving ferrous metals such as pipelines, hardware, machinery, roofing tiles, plates, steel wire, wood surfaces automobile parts	Lubricating & anti-corrosive properties
Metal cutting	Anti-frictional properties
Metal processing e.g rolling, grinding, pressing	Lubricating
Restoration of leather	Emollient and nourishing oil
Shoe polish	Emulsifier and gloss enhancer
Textiles	Softener
Paints & varnishes	Dispersing agent for homogenous covering; decrease drying time; provide fluidity; prevents aggregation of pigments in paints
Polishing wax and abrasive	Emulsifier and gloss enhancer
Paper conditioner	Softener, steam resistance for wrapping of surgical instruments (retain sterilisation properties)
Industrial hand cleaners and creams	Reduces dehydrating effects of detergents
Concrete waterproofing products	Water resistance
Oil binding agents	Emulsifier

## Medical Uses

Lanolin is used for the treatment of skin dryness, irritation and soreness. For example it can be used to prevent or protect skin from nappy rash, haemorrhoid cream and burns cream as well as skin wipes, sun screen and eczema, as well as being used as the lubricant in products.

Table 4, Medical Uses for Lanolin

Medical Use	Description
Ointment bases, burns dressings and wound sprays	Emollient to support wound healing
Pigmented medications	Dispersing agent
Cutaneous infections & deodorising toiletries	Anti-microbial & disinfectant
Suppositories substantial base	Carrier for active ingredients
Surgical adhesive tapes	Impregnating agent, plasticiser and kin-suited tack enhancer
Chewing gum bases	Food additive (physiologically compatible emollient)

## Alternatives to Lanolin

The challenge with using lanolin is that the “Lanolin refining process can be complicated and difficult leading to increased costs” (Anon., 2016). However, a major issue surrounding industry is the toxic makeup of the substance, which has led to end-users opting for other alternatives. Lactic acid is among the finest bio-based substitutes available along with coconut oil. It is widely



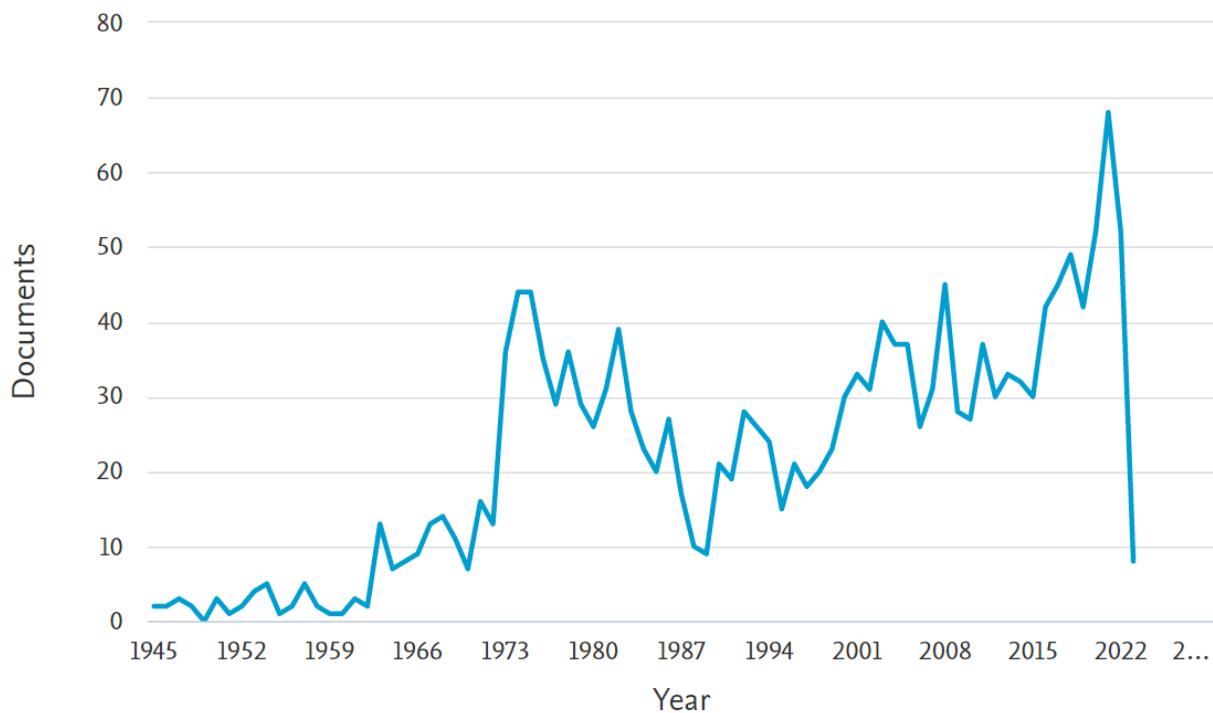
used in skin care creams and lotions to make the skin firmer and thicker. Coconut oil is gradually gaining importance as a potential alternative due to its antioxidant properties.

In addition, Clark et al (2006) observe the “growing reluctance to use animal derived products (extending to lanolin from sheep’s wool)”. It is not only the vegan market who are embracing alternatives to lanolin (such as rice bran oil, orange wax, breast milk and cupuacu butter), but those who believe that farming of sheep is environmentally unsustainable due to greenhouse gas emission associated with the practice, as well as those processes in extracting lanolin from the fleece, which involve significant amounts of water at a high temperature (see above). This is leading industries to examine methods for environmentally low impact extraction as well as vegetable alternatives to lanolin in their processes and products.

### Section 3: Existing Research and Discussion on Lanolin

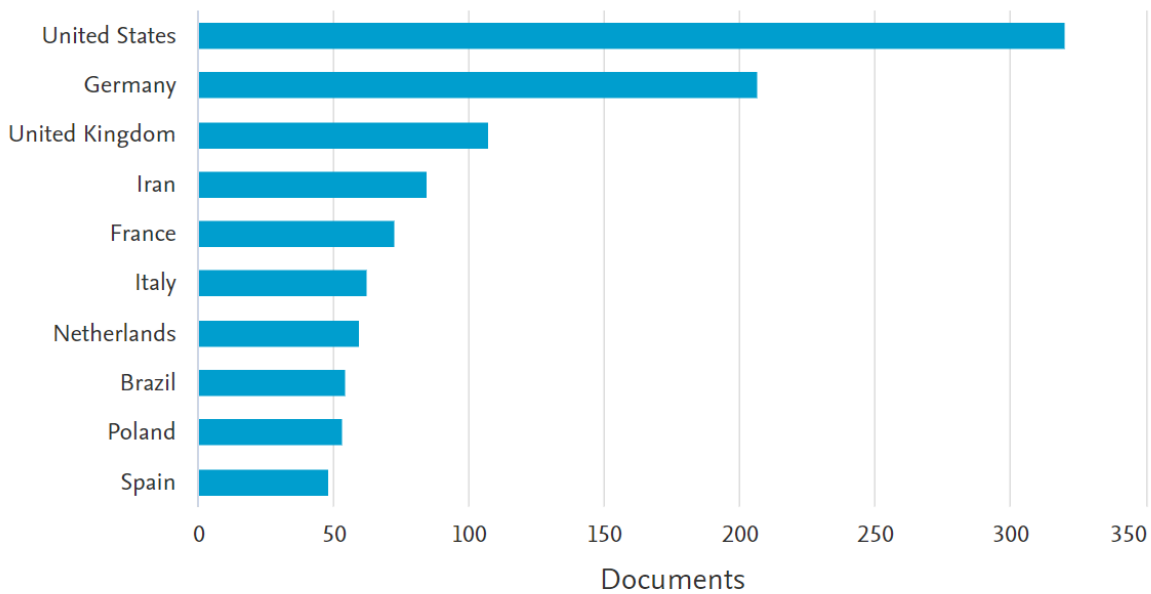
Using Scopus the number of academic articles with the keyword “lanolin” was investigated. In total 1735 articles between 1945 and 2022 have been published. As can be seen below, lanolin as a research topic has fluctuated in interest, however indications suggest that this area of research is on the rise, with a peak, to date, in 2021-2022.

Figure 2, Documents published each year on lanolin (1945-2022)



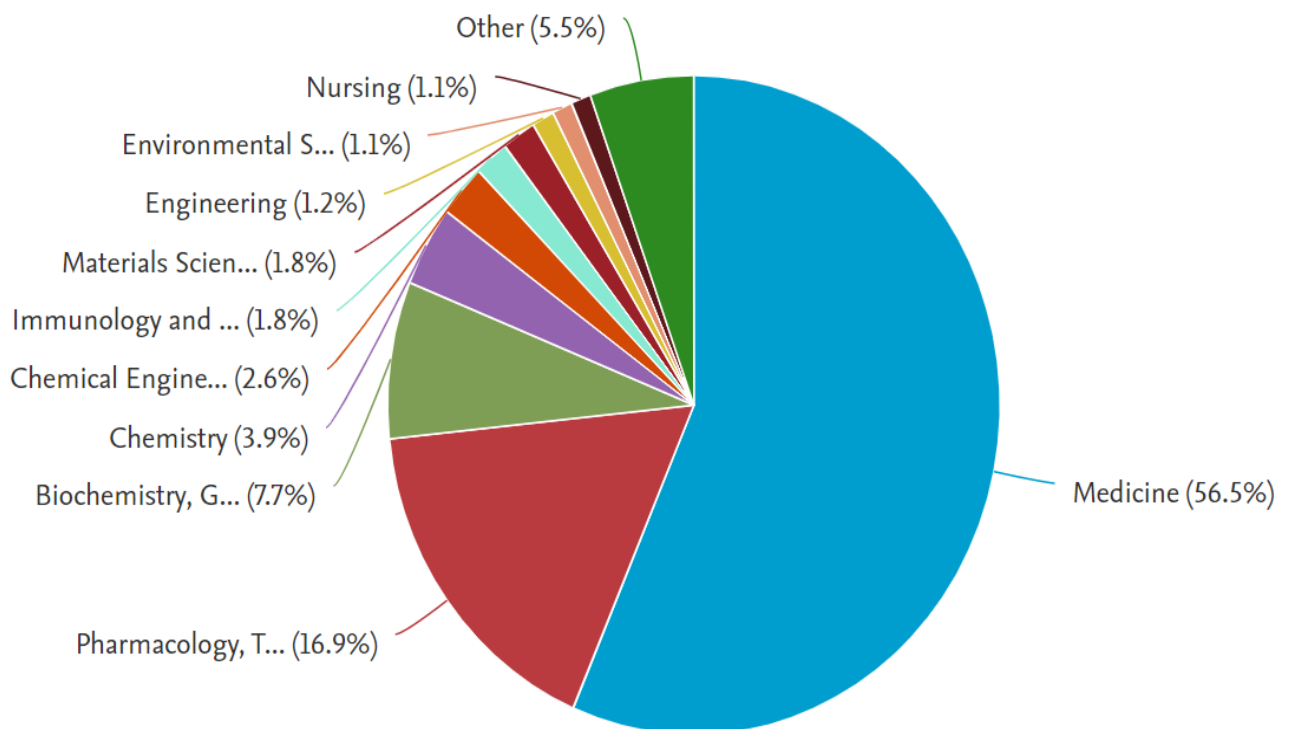
Examining the literature by geographic origin, the United States are responsible for the vast majority of the discourse followed by Germany and the UK. This is unsurprising when considering that the US has the greatest share of the global lanolin market. Conversely, it is interesting to note the UK is undertaking significant research, although its share of the market is limited. When looking at the subject area covered over 56% of the literature has its basis in medicine.

Figure 3, Publications on Lanolin by Country



Where all sources of publication are analysed as part of a bibliometric exercise, the data changes little. There is little policy in relation to lanolin aside from that supporting the import and export of wool grease or fatty substances (including lanolin and lanolin alcohol)<sup>2</sup>. What is interesting is the subject area of the publications, which is predominantly dermatological, as can be seen in Figure 4 below.

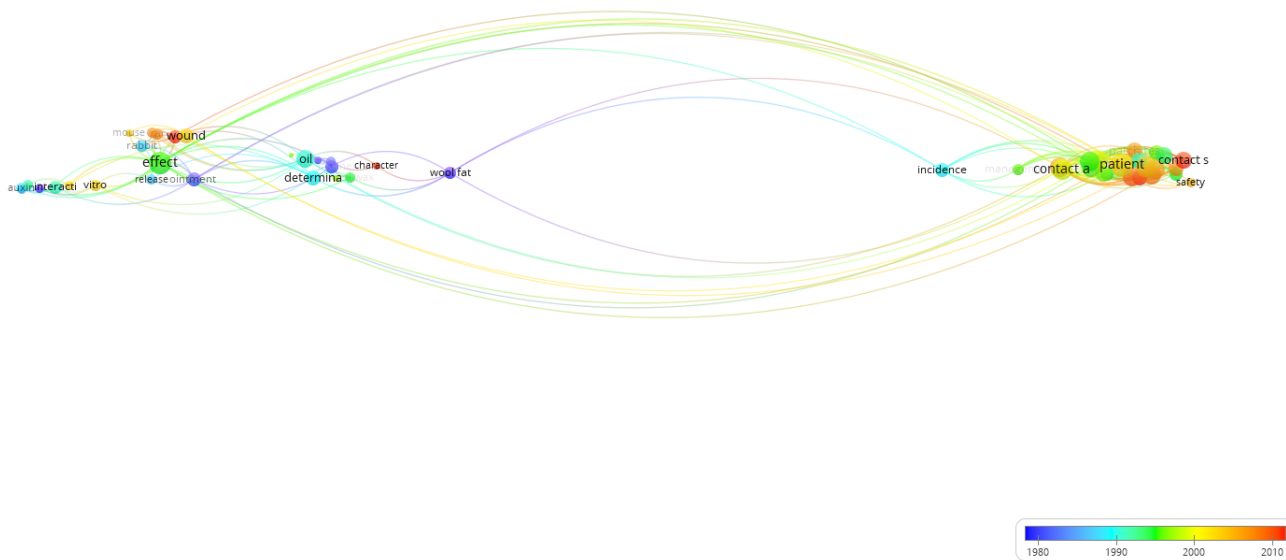
Figure 4, Subject area of Lanolin Research



VOS Viewer Data on research literature provides an overlay visualisation depicting relationships of research by topic involving lanolin and date of publication. It is clear from the visualisation that

the majority of the literature explores lanolin from a medical perspective, particularly in the treatment of skin conditions. There is also a related body of work exploring the risks associated with using lanolin for medical treatments and cosmetic applications. However, it is worth noting that research has not found a clear link between allergy and lanolin in the population, see above.

Figure 5, Visualisation of Publication on lanolin by subject area



## Section 4: Markets

### Changing demand for Lanolin since 2000

At the turn of the century trade reports for lanolin were positive. This was due to the decline in the wool markets due to the global move in textiles towards synthetic fabrics. This transition was largely viewed as a permanent decline (Papanikolaw, 2000). As wool is the origin of wool grease, and therefore lanolin, wool is necessary to maintain supply. Britanica (2023) explains that “[L]anolin is a purified form of wool grease is obtained from wool, and due to its ability to absorb into the skin so easily, it is widely used for medicinal ointments. (Britanica, 2023) The result was that the demand for wool to satisfy lanolin markets and production of products containing lanolin was greater than supply. This led to the value of lanolin in the US reaching an all time high (Papanikolaw, 2000) The global lanolin market is expected to reach USD 227.7 million by 2024 (Anon., 2016).

Consequently, the demand for lanolin decreased as the high prices meant companies working on industrial applications searched for lower priced alternatives. This rising price of lanolin due to scarcity was coupled with a rising demand for lanolin as its use in personal care and pharmaceutical products grew. In 2002 large company Croda (who started in Australia on the strength of high quality wool grease availability) has now grown. It is positive sign for the UK as they have invested in a facility in East Yorkshire based on the demand for lanolin for the high grade pharmaceuticals market (Guzman, 2002).

### Challenges with Supply

The long term challenge to the lanolin market stems from the supply of wool. Where wool grease continues to be in short supply there is a risk that this will have a lasting impact on the trade as

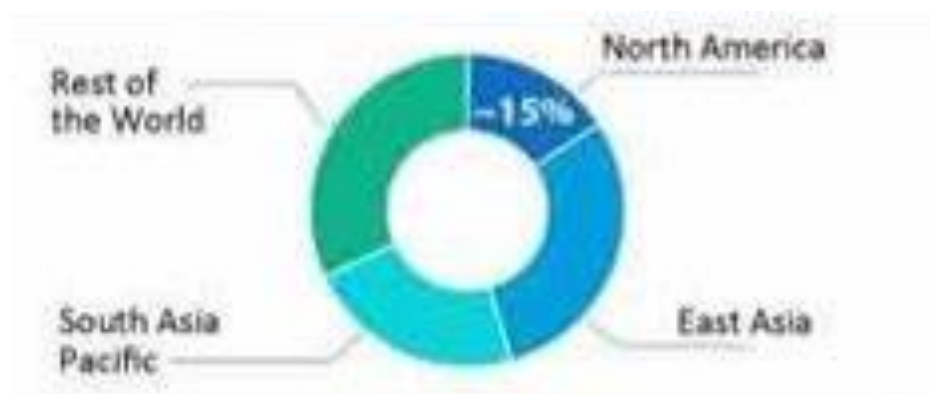
companies using lanolin may look to source cheaper and more readily available alternatives. Papanikolaw (2000) cautions that “[a]lthough pharmaceutical and personal care uses for lanolin continue to increase, high prices have encouraged industrial users to adopt cheaper, petroleum-based alternatives”. However, the practicality of suitable substitutes for lanolin is likely to be a deterrent for manufacturers as for many applications the uniqueness of the chemical structure of lanolin makes it difficult to replace effectively. Furthermore, Papanikolaw (2000) argues that “it can’t be synthesized from a cost efficiency standpoint, so the only choice left is to completely reformulate.

The lanolin market has not yet fully recovered from the historically high prices seen in 2000, and producers are again bracing for possible price hikes in the near- to medium-term (Guzman, 2002). Lanolin supply is tightening as wool grease stocks, lanolin’s precursor, are contracting because of the slowdown in global wool processing. Wool processors, led by China, are faced with higher wool prices, especially in Australia. Strengthening Australian currency and reduced wool stockpiles are some of the major factors in wool’s current pricing.

### International Markets for Lanolin

Consequently, the global market for lanolin is growing. Anon (2016) points out that the global lanolin market demand was 53.4 kilo tons in 2015 and is expected to exceed 80.0 kilo tons by 2024, growing at a compound annual growth rate (CAGR) of 5.0% from 2016 to 2024. Global lanolin trade is mainly confined with in USA and Asia. The rest of the World accounts for a low percentage of the overall market, and this is predicted to continue. Due to the COVID-19 pandemic and Russia-Ukraine War Influence, the global market for Lanolin Oil estimated at USUSD million in the year 2022, is projected to reach a revised size of USUSD million by 2028, growing at a CAGR during the forecast period 2022-2028. The USA market for Lanolin Oil is estimated to increase from USD million in 2022 to reach USD million by 2028, at a CAGR during the forecast period of 2023 through 2028. The Europe market for Lanolin Oil is estimated to increase from USD million in 2022 to reach USD million by 2028, at a CAGR during the forecast period of 2023 through 2028.

Figure 6, Global market share of lanolin by region ([www.persistencemarketresearch.com](http://www.persistencemarketresearch.com), 2018)

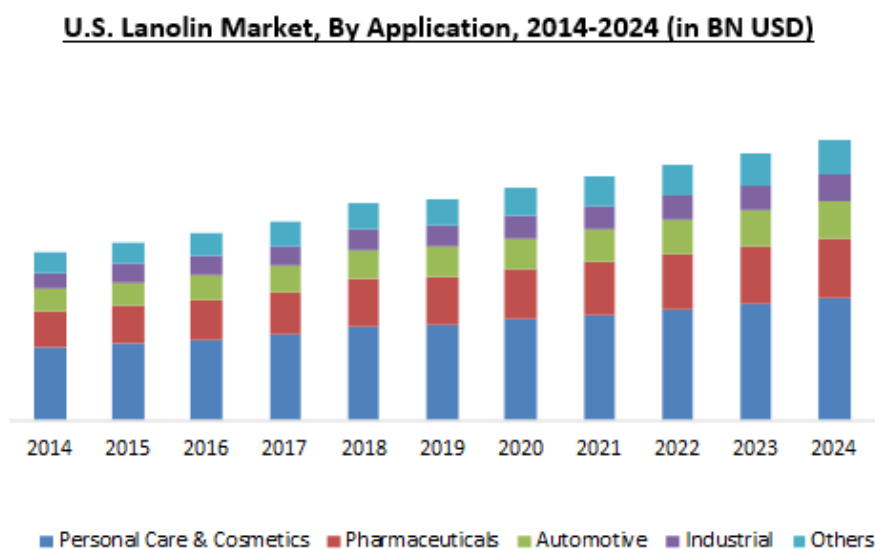


Asia Pacific was the dominant region with a volumetric share of over 35% in 2015. Improving economic conditions coupled with a versatile pharmaceutical manufacturing landscape in China, India, and the Philippines are touted to drive growth. China and India collectively accounted for over 60% of the consumption in Asia Pacific and projected to be high-growth markets over the forecast period. In the US personal care and cosmetics, along with pharmaceuticals, accounted

for nearly 70% of the market value in 2015 (Anon., 2016). One example of an emerging market for lanolin is for beard care. With beards becoming more popular the need for suitable care has also increased. Due to a trade deal with Walmart, the value of these products under one brand alone “is expected to reach \$3.37 billion by 2020, according to a January forecast by Euromonitor” (Walsh, 2018)

The global key manufacturers of Lanolin Oil include Lubrizol, Weleda, Zhejiang Garden Biochemical, Deutsche Lanolin Gesellschaft, Nippon Fine Chemical, Liwei Biological and Dishman. Ameriresearch.com (2023) examined the lanolin market in the US by application. Not only does the graph indicate the increase in usage overall of lanolin and therefore a growing market, but clearly shows a rise of use across the various applications of personal care and cosmetics; pharmaceuticals, automotive, industrial and other sectors.

Figure 7, US Lanolin market by application ([www.ameriresearch.com](http://www.ameriresearch.com))



## The Future

The Data Bridge Market Research Market Analysis Study undertaken in 2020 forecasts that the global lanolin market is expected to grow by 4.3% in the Asia-Pacific Region between 2020 and 2027. This is seen as being driven by increasing usage of lanolin in personal care and cosmetics industry, new product development and opportunities for the market. Furthermore, the study shows that anhydrous lanolin is in greater demand and is set to experience the largest increase in demand across China, Germany and the US.

An online survey was conducted as part of this research which sought views and insights from a variety of stakeholders within the lanolin market in Wales. Results demonstrate that those involved in the production of lamb and wool are unlikely to understand the lanolin market, or indeed, the product itself. Some responses from individuals highlighted the values of lanolin and stated that as consumers they purchase particular products due to their lanolin content.

## Section 5: Recommendations

The study found that whilst lanolin had a broad and diverse number of applications across a variety of sectors and in its different forms, it is plagued by challenges including the reduction in the supply of wool, the cost of extracting the wool grease from the wool, its reputation, albeit unsubstantiated, as an allergen, as well as emerging criticisms regarding its sustainability properties and the cheaper, non animal originating substitute products, such as coconut oil.

Research on the potential market for lanolin in Wales is extremely limited and with access to detailed, up-to-date studies on the market unavailable without being purchased, gaining an accurate understanding of the lanolin market is difficult. It is therefore reflective of the ongoing discourse in lanolin that domestic wool producers, suppliers and indeed manufacturers of lanolin do not understand the market or potentials for this versatile and unique substance which, as yet, is almost impossible to replicate effectively with alternative materials. Consequently, recommendations to improve the trajectory of lanolin in Wales are set out below:

- Promote lanolin and its uses through effective information sharing on the end uses of lanolin to raise awareness of lanolin as an important and valuable product for the Welsh, as well as global economy;
- Invest in reports containing detailed and up-to-date trade data on the global lanolin market to capture an accurate picture of supply, manufacture, distribution and demand;
- Ensure Wales is benefitting from lanolin products, investigate producing Welsh lanolin products and market accordingly;
- Undertake detailed empirical research with a cross section of stakeholders involve din the lanolin market in Wales to understand the practical opportunities and challenges in growing the lanolin market in Wales.

## Section 6: References

[www.ameriresearch.com](http://www.ameriresearch.com) [accessed 03/05/23].

Anon (2016) “Global \$227 Million Lanolin Market Personal Care and Cosmetics, Baby Care Products, Pharmaceuticals, Industrial Analysis 2016-2024 - Research Markets”. *Pharma Business Week*.

Anon (2019) *The Derm Review*. Available online at: <http://thederreview.com/lanolin-cream/> [accessed 17/04/2023].

Britannica, E.o.E (2023) [www.britannica.com/science/lanolin](http://www.britannica.com/science/lanolin). [Available online at: <https://www.britannica.com/science/lanolin> [accessed 17/04/2023].

Desai, A. (March 2007) “Medical Textiles: Healthcare and Hygiene Products”. *Fibre2Fashion*. Available online at: <https://www.fibre2fashion.com/industry-article/1704/medical-textiles-healthcare-and-hygiene> [correct 07/03/2023].

Gallagher, G. “What you need to know about Lanolin Oil”. (2019) *Healthline.com*. Available online at: <https://www.healthline.com/health/lanolin-oils> [correct 08/03/2023].

Grand View Research (2022) *Lanolin Market Size, Share & Trends Analysis Report By Application (Personal Care & Cosmetics, Pharmaceuticals), By Derivative (Lanolin Alcohol, Cholestrin, Lanosterol), By Region, And Segment Forecasts, 2019 - 2025*. Available online at: <https://www.grandviewresearch.com/industry-analysis/lanolin-market> [correct 07/03/2023].



- Guardian, F. (2004) *European Research Grant could benefit “dozens of farms”*. UBM Information Ltd.
- Guzman, D. D. (2002) “Lanolin faces price pressure on tightening supply”. *Chemical Market Reporter*, Vol. 261, Issue 24.
- Jenkins, B. A and Belsito, D. V. (2023) “Lanolin”. *Dermatitis*. Vol.34(1).
- Kligman, A. M. (2007) “The Myth of Lanolin Allergy”. *Contact Dermatitis*, Vol.39(3), p.103-107.
- Papanikolaw, J. (2000) “Lanolin continues to face high prices and weak supplies”. *Chemical Market Reporter*, 10 January, 257(2).
- Purnamawati, S., Indrastuti, N., Danarti, R & Saefudin, T. (2017) The Role of Moisturizers in Addressing Various Kinds of Dermatitis: A Review. *Clin Med Res*. Dec; 15(3-4: 75-87)
- Sengupta, A & Behera, J. “Comprehensive view on chemistry, manufacturing & applications of lanolin extracted from wool pre treatment”. *American Journal of Engineering Research* Vol 03, Issue-07, pp-33-43.
- Santos, P., Tinoco-Araujo, J., de Souza, L., Ferreira, F., Ikoma, M., Razera, A & Santos, M. (2013) “Efficacy of HPA Lanolin in Treatment of lip alterations related to Chemotherapy”. *J APPL Oral Sci*. Mar-Apr; 21(2): 163-166.
- Sengupta, A & Behera, J. (2014) “Comprehensive view in chemistry, manufacturing and applications of lanolin extracted from wool pretreatment”. *American Journal of Engineering Research*, Vol.03, Issue 07. Available online at: [https://ajer.org/papers/v3\(7\)/F0373343.pdf](https://ajer.org/papers/v3(7)/F0373343.pdf) [correct 03/05/23].
- Stroud, E. G & Rhoades-Brown, J. E (1953) “Note on the Protection of Mild Steel by Films of Lanolin”. *Journal of Applied Chemistry*. June.
- Vinmec International Hospital (2019) *What you need to know about lanolin oil*. Available online at: <https://www.vinmec.com/en/news/health-news/beauty/what-you-need-to-know-about-lanolin-oil/> [Correct 07/03/2023].
- Wakelin, S. H., Smith, H., White, I R., Rycroft, R J & McFadden, J P. (2001) A Retrospective Analysis of Contact Allergy to Lanolin. *Br J Dermatol*, Jul; 145(1): 28-31.