

Study on the Influence and Optimization of Household Hydration Mesotherapy Technology on Skin Penetration

Lamp Liu^{1,a}, Vera Zhang^{2,b,*}

¹Company of Swiss GEMO, Lausanne, 1005, Switzerland

²Company of Swiss GEMO, Shanghai, 200009, China

^aLampliu@gemoglobal.com, ^bverazhang@gemoglobal.com

*Corresponding author

Abstract: As household hydration mesotherapy technology enters a new era, the beauty and skincare field faces a new stage of high-quality development. This paper mainly focuses on the deep coupling of household hydration mesotherapy technology and skin penetration theory. It discusses the interaction between household hydration mesotherapy equipment, penetration promotion methods, skin physiology, and the impact of market trends on the direction of technology research and development. The study points out that as users' demand for the convenience of hydration mesotherapy increases, hydration mesotherapy technology in household scenes is becoming a development trend. The article also compares the differences between household hydration mesotherapy and hospital hydration mesotherapy, including technology, equipment, formula, user requirements, and risks. It points out the advantages of household hydration mesotherapy in terms of convenience and cost-effectiveness. At the same time, this paper discusses the risk factors caused by technical limitations, such as equipment performance stability, operator skill proficiency, and product component adaptability. It proposes technical innovation and regulatory strategies for the beauty industry to meet these challenges. Finally, the article emphasizes the importance of returning to the essence of skin health and rationally guides the application of household hydration mesotherapy technology to achieve high-quality development and meet users' needs.

Keywords: Household hydration mesotherapy technology; Skin penetration; Beauty skincare; Technological innovation; Regulatory strategy

1. Introduction

The impact and optimization research of household hydration mesotherapy technology on skin penetration, based on deep coupling of skin penetration theory, is the leading research direction in beauty and skincare. It can be divided into basic household hydration mesotherapy technology and non-basic household hydration mesotherapy technology, respectively, which are composed of penetration-promoting methods and household hydration mesotherapy equipment. The household hydration mesotherapy technology has also commissioned a research and development team to optimize the technology and innovate the equipment to improve the skin penetration effect. In the new era, household hydration mesotherapy technology has become the key to beauty and skincare, and the skin penetration effect has become a criterion for evaluation. Compared to traditional beauty methods, household hydration mesotherapy technology emphasizes personalized skincare, technological innovation, and user experience.

Originating from the penetration theory centered on skin physiology, the household hydration mesotherapy technology embodies scientific principles and is also a tool for beauty and skincare. From the perspective of technical structure, the household hydration mesotherapy technology pursues efficient penetration and achieves modernization of skincare by combining penetration-promoting methods with skin physiology. However, this is only at the theoretical level. To this day, the household hydration mesotherapy technology has embarked on a unique development path. The comprehensive promotion of household hydration mesotherapy technology has redefined the beauty and skincare industry, reflecting users' needs. And it will reinvent market trends, and impact the direction of technological research and development. Therefore, when discussing household hydration mesotherapy technology, it is necessary to take a forward-looking and global perspective. The household hydration mesotherapy technology emerges in the beauty and skincare sector for this reason.

In short, the household hydration mesotherapy technology is a necessary condition and guarantee for achieving efficient skin penetration. From the perspective of market trends, the household hydration mesotherapy technology has gained progress, but still has shortcomings. The effective path for household hydration mesotherapy technology has not yet been fully identified, and efforts are still being made to move forward. Therefore, the household hydration mesotherapy technology still needs to be continuously optimized which meets market demand and is the development direction of the beauty and skincare industry.

2. The ‘Deep Coupling’ of Household Hydration Mesotherapy Technology and Skin Penetration Theory Facilitates Revolution in Beauty and Skincare

2.1. Scientific Interpretation of the Principle of Household Hydration Mesotherapy Technology

The core principle of household hydration mesotherapy technology is based on the theory of skin penetration, using the deep coupling of the penetration promotion method and household hydration mesotherapy equipment to achieve efficient skin penetration. This technology combines advanced technologies such as ultrasound, radio-frequency, and iontophoresis to increase skin permeability and promote the penetration and absorption of active ingredients. Representative household hydration mesotherapy devices and technologies on the market include Ultra-PER hydration mesotherapy transdermal hyperosmotic technology, microcrystalline injection technology, and ionization induction-extraction technology advocated by Rolf Zinkernagel, the father of Swiss cytology. According to Professor Rolf's research, maintaining long-term antibody memory is crucial for protective immune responses in the cellular system, and the cellular system more easily accepts mediators that mimic cellular memory. The development inspiration for GEMO's Ultra-PER hydration light transdermal technology is also based on the discovery of Nobel water channels. The "Aquaporin in the Human Body" - a Nobel Prize-winning topic, discovered a water channel protein (AQP) on the cell membrane that can selectively transport water molecules, and thus won the Nobel Prize in Chemistry in 2003[1][2][3].

Household hydration mesotherapy technology achieves efficient penetration based on the physiological characteristics of the skin by selecting appropriate methods to promote penetration, such as ultrasound induction, microneedle induction, ion induction, etc. This technology pursues efficient penetration and achieves modernization of skincare by deeply coupling penetration-promoting methods with skin physiology [4][5][6].

The scientific interpretation of household hydration mesotherapy technology requires an in-depth exploration of the intrinsic relationship between the mechanism of promoting penetration and skin physiology to achieve technological innovation [7][8].

2.2. Household Hydration Mesotherapy Equipment, Penetration Promotion Methods, and Skin Physiology

2.2.1. Analysis of Users' Skin Characteristics and Personalized Skin Care Needs

With users' increasing demand for Hydration Mesotherapy convenience, household hydration mesotherapy technology is becoming a development trend. This trend stems from users' constantly changing skin characteristics and personalized skincare needs. Household hydration mesotherapy technology achieves an efficient and personalized skincare experience by deeply understanding users' skin types and personalized skincare needs and using customized penetration-promoting methods and equipment.

The development trend of household hydration mesotherapy equipment is mainly reflected in the following aspects:

Customization: Household hydration mesotherapy equipment can provide customized penetration promotion solutions based on the skin characteristics of users, meeting the needs of different users.

Convenience: Household hydration mesotherapy devices emphasize operational convenience, allowing users to easily complete skincare at home.

Intelligence: With the development of technologies of artificial intelligence and the Internet of Things, household hydration mesotherapy devices have taken on intelligent characteristics that can automatically detect users' skin types and provide intelligent skincare advice.

Efficiency: Household hydration mesotherapy equipment pursues efficient skincare, adopting advanced penetration-promoting technology to achieve efficient penetration and absorption.

The booming development of household hydration mesotherapy technology has met users' needs for efficient and personalized skincare while promoting the development of the beauty industry. With the continuous progress of technology, household hydration mesotherapy devices will become more efficient, convenient, and intelligent, bringing users a better skincare experience.

2.2.2. The Influence of Market Trends on the Research and Development Direction of Household Hydration Mesotherapy Technology

The market trend significantly impacts the research and development direction of household hydration mesotherapy technology. With the increasing consumer demand for convenient and efficient household beauty devices, the technology of household beauty devices is constantly breaking through and innovating.

For example, the Ultra-PER Hydration Mesotherapy transdermal hyperosmotic technology adopts triple hyperosmotic technology: condensation, small molecule permeation, hyperosmotic electric pulse, and enveloping hyperosmotic technology. These innovative technologies can significantly enhance skin penetration, allowing active ingredients to penetrate deeper into the skin more effectively, achieving ideal skincare effects.

In addition, microcrystalline injection technology is one of the most anticipated technologies in the market. It injects tiny crystal particles into the skin, opening channels for active ingredients to penetrate more easily. This technology features minimal skin damage and fast recovery, gaining great popularity among consumers.

These technological breakthroughs fully reflect the driving role of market trends in the research and development direction of household hydration mesotherapy technology. Household beauty device brands strive to meet consumers' demand for efficient and safe devices through technological innovation to gain a larger market share.

2.3. Household Hydration Mesotherapy Research and Development Team Upgraded to Meet User Needs

With users' increasing demand for household beauty devices, major brands have strengthened their research and development teams to adapt to market changes. Some brands have successfully introduced world-class research teams, such as GEMO, which has become an industry leader by bringing in Nobel laureates, such as the Swiss father of cytology. These research teams have successfully developed multiple efficient and safe household beauty products based on their rich experience in penetration promotion technology, skin physiology, and other fields, meeting users' growing personalized skincare needs.

In addition, other well-known brands are actively investing in research and development, continuously optimizing product formulas and equipment design to enhance product efficacy. For example, some brands have launched household beauty devices based on technologies such as microneedles, ultrasound, and radio frequency, aiming to meet users' needs for efficient and convenient skincare. The R&D teams of these brands have successfully driven the development of household hydration mesotherapy technology through continuous innovation.

A strong R&D team has become the key to developing household hydration mesotherapy technology. With the intensification of market competition, major brands are enhancing their technological strength by increasing R&D investment, introducing top scientific research teams, and other means to stand out in the fierce market competition [9].

2.3.1. Household Hydration Mesotherapy Becoming a New Trend of the Beauty Economy

With the increasing emphasis of consumers on beauty and skin care, household hydration mesotherapy technology has become a new trend in the beauty economy. This trend is mainly reflected in the following aspects:

Firstly, the popularity of household beauty equipment is constantly growing, and more and more consumers are inclined to choose household beauty equipment for daily skincare. Household beauty devices are convenient to operate and use, allowing consumers to enjoy a professional skincare experience in the comfort of their homes.

Secondly, the development of household beauty equipment technology is constantly driving the growth of the beauty economy. Various innovative technologies, such as ultrasound induction, microneedle penetration promotion, radio frequency skin tightening, etc., have brought more efficient and safe skincare effects to household beauty devices, attracting more consumer attention and purchase.

In addition, the customized and intelligent features of household beauty devices could also meet the increasing demand for personalized skincare from consumers. Household beauty devices can provide customized skincare solutions based on the user's skin type and needs, allowing consumers to enjoy a more precise and efficient skincare experience.

In short, the development of household hydration mesotherapy technology has not only brought consumers more convenient and efficient skincare choices but also promoted the growth of the beauty economy. The continuous expansion of the household beauty device market drives the development of related industries and injects new vitality into the beauty economy [10].

3. Horizontal and Vertical Comparison of Household and Hospital Hydration Mesotherapy

3.1. Analysis of the Difference between Household Hydration Mesotherapy Technology and Hospital Hydration Mesotherapy Equipment

There are differences in the technical implementation and functional design between household hydration mesotherapy technology and hospital hydration mesotherapy equipment.

Household hydration mesotherapy technology focuses on convenience and ease of operation, while hospital hydration mesotherapy equipment emphasizes professionalism and comprehensive functionality more. Household hydration mesotherapy technology typically simplifies processes and operations to meet the needs of ordinary users. In contrast, hospital hydration mesotherapy equipment provides more advanced features and complex operating procedures to meet the needs of professionals.

Household hydration mesotherapy devices usually have relatively focused functions, while hospital hydration mesotherapy devices provide more functional options. The hospital's hydration mesotherapy equipment can provide various types of penetration promotion technologies, such as microneedle penetration promotion, ion introduction, etc., to cater to users and tackle various skin problems. In contrast, the functions of household hydration mesotherapy equipment are relatively concentrated, with a greater emphasis on core functions.

Hospital hydration mesotherapy equipment is usually superior to household hydration mesotherapy equipment in terms of performance parameters, such as output power, frequency, time control, etc. It can provide more accurate and efficient treatment effects. Household hydration mesotherapy equipment, on the other hand, places greater emphasis on ease of use and safety while minimizing operational procedures and lowering usage barriers. The analysis on the difference between the technology of household hydration mesotherapy and the hydration mesotherapy equipment in the hospital is shown in Figure 1:

GEMO II Children's Beauty Bullet	All components	Core components of compound water light in the hospital		
		REJURAN PDRN	REJURAN collagen	REJURAN black box
<p>Core functional ingredients: DNA sodium; Hyaluronic acid; Collagen; Tripeptides; Swiss Glacier Violin; Type III light streak collagen; XVII type contour collagen; HRP retinol; Bose factor; Type III collagen; Type XVII collagen; Type II collagen; Tripeptide-1; Neurotransmitter peptides;</p>	<p>Freeze dried ingredients: water, mannitol, sodium alginate, sodium DNA, hydroxypropyl tetrahydroxyurate, hydrolyzed collagen, sprouting short stem enzyme polysaccharide, 1,2-hexanediol myogepptide, collagen, hydrolyzed sodium hyaluronate, acetyl hexapeptide-8, tripeptide-1, acetyl octapeptide-3, pentapeptide-3, conus pestisidexozozyme solution: water, butanediol, hexanediol, glycerol, 1,2-hexanediol, isononyl nonyl acetate, p-hydroxyacetophenone, thermophilic bacteria fermentation products, sodium polyacryldimethyltaurine, glucose, fructose, phosphatidylcholine, maltodextrin, ethylhexyl glycerol, dipotassium dihydrogen phosphate, 1,5-propanediol, arginine, urea, betaine, disodium EDTA, acetylglutamine, hydroxypropanoate, retinoate, trehalose, sodium polyglutamate, xanthan gum, acacia SENEGAL gum, yeast extract. Citric acid, inositol, sodium citrate, soluble collagen, taurine, sucrose, dextrin, crocus sativus flower extract, PCA sodium, sodium benzoate, sodium lactate, phenoxyethanol, cellulose gum, pyrrolidone carboxylic acid, alanine, glutamic acid, octanol Potassium sorbate, aspartic acid, serine, glycine, lysine hydrochloride, threonine, hexyl nicotinate, ascorbic acid palmitic acid ester, tocopherol (vitamin E), sodium hyaluronate, CHONDRUSCRISPUS extract, proline, hydroxypropyl trimethylammonium gasification hyaluronate, succinic acid, hydrolyzed hyaluronic acid, acetylated sodium hyaluronate, hyaluronic acid; Acid, hydrolyzed sodium hyaluronate, sodium hyaluronate cross-linked polymer, potassium hyaluronate</p>	<p>DNA Sodium; Hyaluronic Acid; Collagen Tripeptide</p>	<p>DNA sodium; hyaluronic acid</p>	<p>DNA Sodium; Polynucleotide; Mannitol</p>
GEMOI type white porcelain bullet	All components	Core components of compound water light in the hospital		
<p>Core functional ingredients: VCIP; Hyaluronic acid; Peptides; 4MSK; five hundred and seventy-seven Swiss organic plant extracts Niacinamide, 9-peptide-1, clotting acid, yeast extract</p>	<p>Freeze dried ingredients: water, mannitol, seaweed, absicic acid, malt extract, sprouting short enzyme polysaccharide, 1,2-hexanediol, Jushou-1, Pinus STROBUS bark extract, hydrolyzed sodium hyaluronate, myogepptide solution: water, butanediol, niacinamide, glycerol, hexanediol, 1,2-hexanediol, ascorbic acid tetraisopropyl palmitate, filtered fermentation product of bifid yeast, p-hydroxyacetophenone, water, sodium polyacryldimethyltaurinate, phosphatidylcholine, grape, fructose, palm bark extract (PTEROCARPUSMARSUPIUM), ethylhexylglycerol, EDTA disodium, dihydrogen phosphate, urea, sugar beet break, ethylglutamine, sodium metabisulfite, seaweed, sodium polyglutamate, xanthamims, arabic gum (ACACIA SENEGAL) gum, yeast extract, inositol, hexyl decanoil, taurine, Scutellaria baicalensis flower/leaf/stem extract, Sucrose, dextrin, PCA, hydroxypropyl cyclodextrin, phenoxyethanol, hydrogenated lecithin, 4-butyl resorcinol, sodium lactate, cellulose gum, citric acid, pyrrolidone carboxylic acid, propionic acid, glutamic acid, octanol, potassium sorbate, aspartic acid, lecithin, serine, glycine, ascorbic acid palmitic acid, fertility (vitamin E), transaminic salt, threonine, hexyl nicotinate, arginine, EPIDIUM SATIVUM sprout extract, sodium hyaluronate, and glycyrrhizin. CHONDRUSCRISPUS extract, pulmonary ammonia, hydroxypropyl trimethylammonium oxide hyaluronic acid, hydrolyzed hyaluronic acid, sodium ethoxylated hyaluronic acid, hyaluronic acid, hydrolyzed hyaluronic acid, sodium hyaluronate cross-linked polymer, potassium hyaluronate</p>	<p>Hyaluronic acid; glutathione DNA sodium; Panthenol</p>	<p>Hyaluronic acid; amino acid; DNA sodium</p>	<p>Hyaluronic acid; amino acid; polypeptide</p>

Figure 1: Comparative analysis of components

Household hydration mesotherapy technology is more suitable for daily household use, while hospital hydration mesotherapy equipment is more suitable for professional beauty salons and other institutions. Household hydration mesotherapy equipment is easy to operate, convenient and fast, and suitable for ordinary users to use at home. The hospital hydration mesotherapy equipment has comprehensive functions and is more appropriate for professionals to use in professional venues.

However, in recent years, influenced by the trend of household beauty development, the household hydration mesotherapy industry has flourished, and the effect of household hydration mesotherapy has gradually aligned with the hospital effect. On the basis of ensuring the safety of household hydration mesotherapy, its technology, formula, and ingredients are infinitely close to the hospital level, allowing consumers to enjoy the hospital effect of hydration mesotherapy at home.

In summary, there are differences in the technical implementation, functional design, performance parameters, and application scope between household and hospital hydration mesotherapy technologies, each with its own characteristics. Users can make choices based on their own needs and conditions.

3.2. Analysis of Differences in the Formula of Household and Hospital Hydration Mesotherapy Technologies

There are significant differences in the formula between household and hospital hydration mesotherapy technologies. The formulas used in household hydration mesotherapy technology often focus more on gentleness and applicability, as they are mainly designed for ordinary users, thus placing more emphasis on the safety, tolerance, and convenience of the formulas. At the same time, the formulas of household hydration mesotherapy technology generally highlight certain functions to ensure that users can easily master the method. Because of the growing consumer demand for household beauty devices, the core formulas of household hydration mesotherapy brands have gradually been refined, becoming highly similar to the hospital formulas. For example, the core hydration mesotherapy components of the hospital line, such as DNA nano, hyaluronic acid, collagen, tripeptide, etc., can also be found in the composite formula of some high-level household hydration mesotherapy products. The household hydration mesotherapy technology begins to challenge the hospital line from the formula.

The formula used in the hospital's hydration mesotherapy equipment places more emphasis on comprehensiveness. The formula designed for professional beauticians offers stronger efficacy and specificity. At the same time, the formula used in the hospital's hydration mesotherapy equipment is also more complex, containing a variety of active ingredients and auxiliary ingredients to deliver more comprehensive and efficient skincare. In addition, the hospital's hydration mesotherapy formula is more targeted and can provide personalized formula choices for different skin types and problems.

In summary, there are differences in formulas between household and hospital hydration mesotherapy technologies in terms of their emphasis on mildness, applicability, professionalism, and comprehensiveness. However, household hydration mesotherapy is catching up with hospital hydration mesotherapy in terms of effect, formula, and experience, with the two scenarios targeting different user groups. Users can make choices based on their own needs and conditions.

3.3. Requirements and Risks for Users of Household and Hospital Hydration Mesotherapy

3.3.1. Misunderstandings in Technology-based Decision-making and Deviations from Standardized Operations

When using household and hospital hydration mesotherapy, users may face misunderstandings in technical decision-making and deviations in standardized operations. Due to differences in technology and equipment between household and hospital hydration mesotherapy, users may misunderstand when choosing and using them.

Hospital hydration mesotherapy equipment usually has stronger efficacy and more professional operating procedures, which can provide more accurate and efficient treatment effects at higher cost and requires professional operation. In contrast, the less specialized household hydration mesotherapy equipment is convenient to operate and use at lower costs, thus more suitable for household use.

Therefore, users should weigh their own needs and conditions when making choices. Users who pursue a professional skincare experience can choose hospital hydration mesotherapy; users who pursue convenience and cost-effectiveness can choose household hydration mesotherapy. Meanwhile, users should follow standardized procedures during the operation process to avoid risks caused by improper

operation.

3.3.2. Risk of Gap between User Psychological Expectations and Actual Effects

When using household and hospital hydration mesotherapy, users may face the risk of the gap between their psychological expectations and actual results. Due to excessive brand promotion and advertising on the market, users may have high expectations for the effectiveness of hydration mesotherapy technology. However, in actual use, the results may not live up to expectations.

Due to its professional technology and significant effectiveness, users may have higher expectations for the effectiveness of the hospital hydration mesotherapy equipment. However, in the actual operation, the therapeutic effect may be influenced by various factors, such as the operator's skills, equipment performance, user's skin type, etc. Therefore, there may be a gap between the actual effect and expectations.

Although household hydration mesotherapy equipment is easy to operate and use, its effectiveness is closely related to the operating techniques and duration of use. Users may also have high expectations for the effect during use, leading to disappointment when the effect does not meet expectations.

To reduce the risk of differences between psychological expectations and actual effects, users should approach promotion and advertising rationally when choosing hydration mesotherapy equipment, fully understand the functions and effects of the equipment. Meanwhile, standardized procedures should be strictly followed during the operation process to achieve the best results. In addition, users should also understand their own skin type and choose the suitable hydration mesotherapy equipment.

4. Technological Innovation and Regulatory Strategies in the Beauty Industry to Meet the Challenges of Hydration Mesotherapy Device Technology

4.1. Dual Upgrade of Technology and Service: Breaking through Application Bottlenecks

Compared with traditional beauty techniques, hydration mesotherapy device technology emphasizes deep coupling with skin physiology and has distinctive characteristics. However, it is still challenging to define hydration mesotherapy device technology and its essence using certain traditional standards. Hydration mesotherapy device technology is an essential standard of modern beauty technology and holds profound significance in the expression of beauty techniques.

The dual upgrade of hydration mesotherapy device technology and services is the key to addressing technological challenges. Hydration mesotherapy device technology plays an essential role in breaking through application bottlenecks. Through technological innovation and service upgrades, hydration mesotherapy device technology can better meet user needs and improve user satisfaction. At the same time, strengthening supervision to ensure the compliance and safety of hydration mesotherapy device technology is also an important task facing the beauty industry.

4.2. Multi-player Governance: Building a Regulatory Mechanism Adapting to Hydration Mesotherapy Device Technology

Compared with traditional regulatory models, the regulatory mechanism featuring multi-player governance places more emphasis on the relationships between various players and collaborative cooperation. Although some scholars question whether a direct relationship exists between multi-player governance and a single-player regulatory model, most scholars advocate that multi-player governance can provide a more comprehensive and rational evaluation for the regulation of hydration mesotherapy device technology.

In the regulatory framework of multi-player governance, all parties involved jointly assume responsibility and promote the development of hydration mesotherapy device technology through cooperation and coordination. This regulatory model includes multiple aspects such as government regulation, industry self-discipline, enterprise self-control, and consumer participation. Government regulatory agencies, industry associations, enterprises, and consumer organizations are all involved in the supervision of hydration mesotherapy device technology, forming an effective regulatory network.

This regulatory model emphasizes the responsibilities of all parties involved and requires them to jointly assume the safety and quality responsibilities of hydration mesotherapy device technology. Government regulatory agencies formulate relevant laws, regulations, and standards. Industry

associations are responsible for formulating industry self-discipline norms, enterprises are responsible for product quality control and safety management, and consumers participate in the supervision and provide feedback to jointly promote the healthy development of hydration device technology.

Although the diversified co-governance regulatory model may face some challenges in practice, in the long run, it can promote the healthy development of hydration device technology, protect consumer rights, and promote the overall progress of the beauty industry. Therefore, the regulatory mechanism of diversified governance has gradually become a consensus for the regulation of hydration mesotherapy technology and an important direction for promoting technological innovation and regulatory strategies in the beauty industry.

4.3. Returning to the Essence of Skin Health: Rationally Guiding the Application of Household Mesotherapy Device

Compared with traditional skincare concepts, the rational guidance for the application of household hydration mesotherapy devices emphasizes the relationship between skin health and skincare methods, demonstrating scientific orientation. Although some consumers question the direct impact of household hydration mesotherapy device technology on skin health, most scholars advocate that such technology can provide a rational evaluation of skin health.

In the framework of rational guidance for applying household hydration mesotherapy devices, skin health is regarded as the core value and highest criterion of skincare. This concept reflects the shift in skincare philosophy in recent years, from focusing on effects on the skin surface only to deep skin health and overall balance. As a new skincare method, the application of household hydration mesotherapy device technology should follow the principles of skin health and focus on long-term effects rather than short-term changes on the surface.

However, due to the diversity of household hydration mesotherapy device technologies in the market and differences of consumers, its applications show a trend of diversification. But the technology of household hydration mesotherapy devices is yet to be improved, and consumers lack scientific skincare mechanisms. This creates a "shortcoming" in the rational guidance for the application of household hydration mesotherapy devices, affecting skin health maintenance.

To solve this problem, consumers should receive scientific skincare education to understand the principles and application scope of household hydration mesotherapy device technology. At the same time, skincare product and service providers should also take responsibility and provide reasonable advice and products based on skin health concepts. Through these measures, household hydration mesotherapy device technology can better serve skin health and become an effective means of maintaining skin health.

5. Conclusion

The impact and optimization research of household hydration mesotherapy technology on skin penetration, based on deep coupling of skin penetration theory, is the main research direction in the field of beauty and skincare. This technology achieves efficient skin penetration through penetration-promoting methods and household hydration mesotherapy equipment, meeting users' needs for personalized skincare, technological innovation, and user experience. The development of household hydration mesotherapy technology has changed the beauty and skincare industry and influenced market trends, technology research, and development directions. However, risk factors arising from technological limitations, such as the performance stability of equipment, proficiency of operator, and adaptability of product ingredients, require technological innovation and regulatory strategies in the beauty industry to address. In addition, the rational guidance for the application of household hydration mesotherapy technology to achieve the essence of skin health is crucial for future development. In summary, the sustainable improvement and development of household hydration mesotherapy technology is significant for meeting user needs and promoting the high-quality development of the beauty and skincare industry.

References

[1] Zinkernagel R M, Callahan G N, Althage A, et al. On the thymus in the differentiation of "H-2 self-recognition" by T cells: evidence for dual recognition?[J]. *The Journal of experimental medicine*, 1978,

147(3): 882-896.

[2] Pircher H, Bürki K, Lang R, et al. Tolerance induction in double specific T-cell receptor transgenic mice varies with antigen[J]. *Nature*, 1989, 342(6249): 559-561.

[3] Dutzler R, Campbell E B, Cadene M, et al. X-ray structure of a ClC chloride channel at 3.0 Å reveals the molecular basis of anion selectivity[J]. *Nature*, 2002, 415(6869): 287-294.

[4] Doyle D A, Cabral J M, Pfuetzner R A, et al. The structure of the potassium channel: molecular basis of K⁺ conduction and selectivity[J]. *Science*, 1998, 280(5360): 69-77.

[5] Pinschewer D D, Ochsenbein A F, Odermatt B, et al. FTY720 immunosuppression impairs effector T cell peripheral homing without affecting induction, expansion, and memory[J]. *The Journal of Immunology*, 2000, 164(11): 5761-5770.

[6] Salminen A. Increased immunosuppression impairs tissue homeostasis with aging and age-related diseases[J]. *Journal of molecular medicine*, 2021, 99: 1-20.

[7] within Arenavirus C C C. Identification of an N-Terminal Trimeric[J]. *J. Virol*, 2006, 80(12): 5897.

[8] Ochsenbein A F, Pinschewer D D, Sierro S, et al. Protective long-term antibody memory by antigen-driven and T help-dependent differentiation of long-lived memory B cells to short-lived plasma cells independent of secondary lymphoid organs[J]. *Proceedings of the National Academy of Sciences*, 2000, 97(24): 13263-13268.

[9] Li Li. Expert Consensus on the Selection and Use of Home Beauty Devices for Anti Facial Skin Aging [J]. *Chinese Journal of Dermatology and Venereology*, 2023, 37(09): 977-982. DOI: 10.13735/j.cjdv.1001-7089.202303085.

[10] Zhao Zhenyu. Current Status and Progress of Household Beauty Devices [C]//Chinese Household Electrical Appliances Association. *Proceedings of the 2023 China Household Electrical Appliances Technology Conference [Publisher unknown]*, 2023:11. DOI: 10.26914/c.cnkihy.2023.075171.