

BRIEF REPORT

DTC genetic test for customized cosmetics in COVID-19 pandemic: Focused on women in their 40s and 60s in Seoul, Republic of Korea

Jinkyung Lee BA^{1,2} | Ki Han Kwon PhD¹

¹Division of Beauty Arts Care,
Department of Practical Arts, Graduate
School of Culture and Arts, Dongguk
University, Seoul, South Korea

²Daily Beauty Unit, Amorepacific Co,
Seoul, South Korea

Correspondence

Ki Han Kwon, Division of Beauty Arts
Care, Department of Practical Arts,
Graduate School of Culture and Arts,
Dongguk University, Seoul 04620, South
Korea.

Email: kihan.kwon@dongguk.edu

Abstract

Background: Severe acute respiratory syndrome coronavirus disease 19 (COVID-19) is attracting worldwide attention and has been declared an infectious disease by the World Health Organization (WHO), and accordingly, interest and meaning in health and well-being are expanding in recent years.

Aims: This paper attempted to investigate the recognition and development potential of customized cosmetics focusing on inner beauty products through DTC (Direct to Customer) genetic testing in the era of COVID-19 pandemic.

Patients/Methods: The number of women included in the survey of consumers living in Seoul metropolitan city ranged from 40 to 60, and 380 women in Republic of Korea. Statistical processing of the data collected by the data analysis method is analyzed using the Statistical Package for Social Science (SPSS) WIN25.0 statistical package program through the process of data coding and data cleansing.

Results: In this study, the DTC genetic test, single, and/or combination treatment for customized inner beauty products and customized cosmetics were compared and analyzed, respectively. Accordingly, in keeping with the rapidly changing market conditions, we sought to study customized inner beauty and customized cosmetics recognition and purchasing behavior through DTC genetic testing in the unexplored era after COVID-19 pandemic. As a result, it was significantly more effective to use customized inner beauty and customized cosmetics after DTC genetic test ($p < 0.001$).

Conclusion: This study emphasizes that after the global COVID-19 pandemic worldwide that occurred after January 2020, the definition of health persistence, wellness, and well-dying associated with beauty and cosmetology is also evolving from the DTC genetic test. In our results, it was found for the first time that the intake of customized inner beauty preparations and the use of customized cosmetics would be more effective. In the above significant research results, it is believed that research on the combinational effect of customized inner beauty products and customized cosmetics is required in the global DTC genetic testing market.

KEYWORDS

COVID-19, customized cosmetic, customized inner beauty products, DTC genetic test, purchase behavior

1 | INTRODUCTION

Coronavirus disease 19 (COVID-19) started in December 2019 and quickly swept around the world in just 1 month, leading to a global public health emergency. COVID-19 in 2019 caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) has become a pandemic. Accordingly, the World Health Organization (WHO) declared a pandemic. As the sudden appearance and rapid spread of SARS-CoV-2 around the world greatly threaten global health and economy, it is urgent to develop a multi-faceted strategy to curb the spread of the virus. In accordance with these times, various studies are underway to apply the natural potential of the immune system to treat COVID-19 patients. It is under diagnostic and therapeutic studies for antiviral antibodies that are compatible with the immune system and its natural potential. In our human body, severe viruses can cause COVID-19, a disease characterized by shortness of breath, fever, and pneumonia. This can be fatal for individuals with weakened immunity. In the past, human SARS-CoV-2 has many features similar to those of coronavirus. It is reported to have a genome similar to SARS-CoV-2, a virus that causes SARS disease. Like the coronavirus, SARS-CoV-2 is transmitted through droplet inhalation and interaction with contaminated surfaces, which are fatal to humans. In accordance with these times, interests and meanings for health and wellness are expanding. Aristotle saw humanity's efforts as directed toward health, the physical, mental, and spiritual state in which life flourishes. The modern definition of health recognizes that diseases and disabilities can and often coexist with well-being. In this new concept, health is transformed from disease-free to a state centered on the fullness of life.¹⁻⁴

The Ministry of Health and Welfare of the Republic of Korea directly asks regulated sandbox consumers Direct to Customer (DTC) to conduct a consumer participation study of a special case of genetic testing on December 30, 2019. It was revealed that it started with approval. We are now in an era where gene mutations can be easily confirmed by undergoing genetic testing. Analysis of DNA reveals that the entire gene can have millions of sequences with other people elsewhere. The genetic test analyzes the results of the genetic mutation on a computer and notifies the results such as "1.5 times more dangerous than the average value of the same age-group" or "same as the average value of people of the same genotype." On April 29, 2019, Terragen Etex Co., Ltd. was granted a special regulation sandbox demonstration for "DTC genetic test-based obesity (6 items) and nutrition (18 items) management service." Initially, 26 gene items (obesity 6, nutrition 20) were applied for, but a total of 24 items were excluded, excluding items of personal characteristics (choline) and depression (tryptophan) that could deceive the demonstrators. To start the demonstration exception in earnest, in order to verify the ethics and scientific validity of the demonstration exception research plan, the "Public IRB" under the Ministry of Health and Welfare was deliberated. The research plan for six obesity-related items (for a total of 880 people) has been approved by the public IRB. It is possible to carry out immediately after receiving the project implementation procedure such as taking out liability insurance. 18 nutrition-related items will be participated in 2020 in consideration

of statistical significance, etc.; the research plan will be revised so that joint research institutes will be secured and will be started through a research plan change application to the public IRB.^{5,6}

Additionally, from March 2020, the Ministry of Food and Drug Safety Custom Cosmetics System was implemented, and the qualification of a customized cosmetics preparator was newly established, opening the era of customized cosmetics in the Republic of Korea. The Ministry of Food and Drug Safety expects the domestic cosmetics industry to innovate and grow, such as creating new jobs for the introduction of customized cosmetics, and consumers can rest assured that it will strengthen cosmetics safety management for infants and children. It was revealed that it would contribute to creating an environment where cosmetics can be used. Many cosmetic companies in Korea are providing a new trend to customers called "Customized Services," a new business area adopted by the Korean government. This trend of customized services will gradually spread in Korea. Amorepacific Co., South Korea's leading cosmetics manufacturer, has challenged the customized cosmetics business and launched a new customized lipstick service in Myeong-dong, Seoul metropolitan city.^{7,8}

In addition, in August 2020, "your own health food recommendation and sales service" will pass through the Korean Chamber of Commerce and the government's sandbox and enter the market according to the individual's health condition and lifestyle. Companies that recommend custom health foods and have received sandbox approval for sales services are Green Cross Health, Luxury telecom, Polygraph H Enbi, BioEleven, Onnuri H&C, Unibio, Two Beacon, Korea Yakult, and Nine Cold Wind Nature Palms. It was applied a 2-year demonstration exception.⁹ The usage and utilization of drugs and cosmetics derived from plant cell and tissue culture have a long history. New trends in the production of cosmetics and foods have brought a new wave of advances in plant cell culture and new technologies over the past decade in a natural and sustainable way. Already more than 50 products have entered the cosmetic industry based on extracts extracted from plant cell culture. Most of these food extract-based products are produced in plant cell suspension culture. Nutritional ingredients are products and ingredients that act as dietary supplements to manage the natural beauty of the skin, nails, and hair, whereas among such products promotes beauty. Nutricosmetics is the latest trend in the beauty industry. This trend has garnered a large fan base to adapt to modern culture faster after COVID-19 pandemic. In addition, consumers in modern times are very cautious about the food and/or food ingredients; they introduce that there is a growing demand for natural products that can improve health and beauty without side effects.^{10,11}

In accordance with crisis situation of the unprecedented disease of the era of COVID-19 pandemic around all over the world, interest and meaning in health persistence, wellness, and well-dying have been greatly expanded in recent years. In the future, the right to know individual genetic information, DTC genetic testing, and rapid alterations in the beauty and cosmetology market, which are still inadequate in the future, are helpful for reference materials to prepare a plan to activate customized inner beauty products and customized cosmetics that reflect customer needs. Therefore, the present study has compared and

analyzed the effects and perceptions on the skin caused by the single and combinational treatment of customized inner beauty products and customized cosmetics using DTC genetic test, targeting middle-aged women in their 40s and 60s in Republic of Korea.¹²

2 | MATERIALS AND METHODS

This study was conducted online for 2 weeks from November 2 to 15, 2020, targeting women in their 40s and 60s residing in Seoul, Republic of Korea. A total of 400 people were surveyed, and the final analysis was conducted with 380 people excluding 20 respondents who were unfaithful. Data collected by the data analysis method were analyzed using the Statistical Package for Social Science (SPSS) WIN 25.0 statistical package program through data coding and data cleansing.¹²

First of all, factor analysis was performed to examine the necessity of the DTC genetic test, the validity and reliability of recognition and development direction, and Cronbach's alpha value was calculated through the reliability analysis. Principal component analysis was originally used to extract several factors that account for as much as possible of the variance of the variable. Secondly, through independent sample *t* test and one-way ANOVA, the degree of inflow, usage environment, purchase satisfaction, recognition of the need for DTC genetic testing, and significant differences in development direction according to the characteristics of subjects were investigated.¹²

3 | RESULTS

3.1 | Recognition of DTC genetic testing, customized inner beauty, and the needs for customized cosmetics

The items with commonality and factor loading values that do not meet the standard or that are tied to other factors have been deleted, and items that appear below the Cronbach's alpha value of

0.6 have also been deleted, and the validity of the DTC genetic test recognition, customized inner beauty products, and the need for customized cosmetic. The results of verifying the reliability and reliability are as follows. Table 1 is the exploratory factor analysis (EFA) results. Kaiser-Meyer-Olkin (KMO) has been validated as 0.787 to validate the population's normality measure. According to Bartlett's squirming test, the approximate chi-square value is 760.796 ($p < 0.001$). Principal component analysis (PCA) was used for the factor extraction model, and the factor rotation method was used for the Berrymax method. The total explanatory value explained in a total of five questions was about 60.61%. The intrinsic value of DTC genetic test recognition, customized inner beauty, and customized cosmetics demand was 3.030, accounting for about 60.61% of the description. This research tool turned out to be a valid sub-element. The Cronbach alpha value calculated for reliability verification was 0.834, which is the necessity of DTC genetic testing, customized inner beauty products, and customized cosmetics, and the internal consistency between each item was very high.¹²

3.2 | Differences in recognition and purchasing behavior of DTC genetic test according to the characteristics of the subjects subject to investigation

The results of independent sample *t* test and ANOVA were as follows Table 2 to examine the recognition of DTC gene test, the difference of customized inner beauty, and customized cosmetics purchasing behavior according to the characteristics of the subjects. The average of mobile cosmetics purchases over 200 000 won was the highest at 4.02 (SD = 0.54), and the lowest at 3.30 (SD = 0.79) for less than 50 000 won ($F = 6.930, p < 0.001$), and the highest at 3.62 (SD = 0.72) for the average monthly income of more than 5 million won, and 3.16 (SD = 0.72) for less than 1 million won 0.92. The lowest score was shown, showing a significant difference ($F = 2.650, p < 0.05$). The average of office/management job was 3.57 (SD = 0.73), and the housewife was the lowest with

TABLE 1 Validity and reliability of the DTC Genetic Test Necessity Scale

Diagnosis	Need for skin diagnosis	Cronbach's α
I want to purchase customized cosmetics after DTC genetic test.	0.823	0.834
The effect will be greater when taking inner beauty products and using customized cosmetics after DTC genetic test.	0.816	
I'd like to get an accurate current skin examination.	0.774	
I'd like to have an accurate DTC gene test.	0.739	
I think there is a connection between inner beauty products (eating cosmetics) and skin improvement.	0.736	
Eigenvalues	3.030	
% of variance	60.606	
Cumulative %	60.606	

Note: Kaiser-Meyer-Olkin measure of sampling adequacy: 0.787.

Bartlett's test of sphericity test [Approx. chi-square: 760.796, *df*: 10, $p < 0.001$].

TABLE 2 Differences in DTC genetic test recognition and purchase behavior according to survey subject characteristics

Diagnosis	N	M	SD	t/F	p	Scheffé
Monthly purchase number of mobile cosmetics						
Less than 50 000 won(a)	151	3.30	0.79	6.930 ^{***}	0.000 ^{***}	a<b,c,d<e
More than 50 000 won and less than 100 000 won(b)	135	3.43	0.77			
More than 100 000 won and less than 150 000 won(c)	61	3.80	0.71			
More than 150 000 won and less than 200 000 won(d)	22	3.74	0.73			
Over 200 000 won(e)	11	4.02	0.54			
Average monthly income						
Less than 1 million won(a)	44	3.16	0.92	2.650 [*]	0.033 [*]	a<b,c,d<e
More than 1 million won - less than 2 million won(b)	51	3.41	0.84			
More than 2 million won and less than 3.5 million won(c)	120	3.52	0.74			
More than 3.5 million won less than 5 million won(d)	83	3.47	0.75			
Over 5 million won(e)	82	3.62	0.72			
Occupation						
Professional/technical jobs	41	3.51	0.60	0.999	0.468	-
Office/management positions	139	3.57	0.73			
Self-ownership	25	3.44	1.01			
Sales/service jobs	40	3.40	0.88			
The housewife	135	3.39	0.80			
Academic background						
High school graduation	100	3.39	0.90	1.267	0.285	-
A junior college degree	73	3.50	0.79			
A 4-year college graduate	175	3.54	0.70			
Master's degree or higher	32	3.32	0.76			
Age						
Under the age of 40-43	118	3.44	0.77	1.139	0.338	-
44-47 years old	82	3.61	0.70			
48-50 years old	70	3.51	0.82			
51-55 years old	66	3.38	0.86			
56-60 years old	44	3.38	0.78			
Marital status						
Single	81	3.55	0.84	0.999	0.318	-
Married	299	3.45	0.77			

* $p < 0.05$.; *** $p < 0.001$.

3.39 (SD = 0.80), but it was not significant difference. The education level was the highest with 3.54 (SD = 0.70) when graduating from a 4-year university, and the lowest with 3.32 (SD = 0.76) but not the significant difference. The average score of 44-47 years old was the highest at 3.61 (SD = 0.70), the lowest at 51-55 and 56-60 years old at 3.38 (SD = 0.86) and 3.38 (SD = 0.78), respectively; however, it was not a significant difference. The score of marriage was 3.55 (SD = 0.84) and 3.45 (SD = 0.77) when married or not was unmarried. It was higher than that, but it was not significant. Therefore, the higher the monthly purchase amount and the average monthly income of cosmetics, the more DTC genetic testing and customized inner beauty and customized cosmetics use are interpreted as having positive perceptions on skin.¹²

4 | DISCUSSIONS

Declared as an infectious disease by the WHO on March 11, 2020. SARS-CoV-2 disease COVID-19 is gaining worldwide attention. In the past, after the pandemic of SARS, understanding of the epidemiology and causes of Middle East respiratory syndrome MERS, SARS-CoV-2 in 2012 and the development of viral infection treatments have accelerated since 2002-2003. Treatments and vaccines have been developed that can be used to control these diseases, but the disease is uncontrolled, and the COVID-19 pandemic is a major threat to public health worldwide. Several recent studies have shown that responsible testing is very common in patients with COVID-19 who have recovered from SARS-CoV-2 by reverse

transcriptase-polymerase chain reaction (RT-PCR). The clinical and epidemiologic characteristics of these patients and their potential explanation for relapse are summarized. However, we are discussing the re-detectable SARS-CoV-2 virus after discharge and the contagiousness of COVID-19 patients. The rate of positivity for COVID-19 patients discharged from hospital varied from 2.4 to 69.2% and was reported to last from 1 to 38 days after discharge, depending on population size, patient age, and sample type. Discharged COVID-19 patients test positive again for SARS-CoV-2 RNA and say reviews are underway to provide timely information to public health policy planners and clinicians. This is a published study showing discharged patients again tested positive for SARS-CoV-2 RNA. A review of this report reveals that there are asymptomatic but benign discharge patients. However, since RT-PCR test does not necessarily indicate the presence of a replicating and infectious virus, it is unclear whether it is contagious.¹³⁻¹⁵ And after a long asymptomatic period, SARS-CoV-2 by RNA PCR analysis after several intervals of SARS-CoV-2 RNA testing. Presenting potential examples of SARS-CoV-2 reinfection, leading discussions on differentiating persistent infections with intermittent viral excretion and reinfection, and diversifying knowledge and approaches to clinical management, follow-up molecular testing and treatment. However, the problem of reinfection of COVID-19 has not yet been resolved, and COVID-19 will last for a long time.¹⁶

Innate immunity is an important concept in epidemic theory of the population-level effect of individual immunity to prevent the transmission of pathogens. Innate immunity exists when a population or a sufficient number of animals in the population have immunity to a drug, which reduces the likelihood of effective contact between the affected and the vulnerable. To understand herd immunity, it is necessary to consider the dynamics of the infection, the manner that it is transmitted, and the acquisition of immunity in an individual population. Loss of innate immunity may also explain the age-related epidemic of diseases associated with the loss of passively acquired maternal immunity.¹⁷ The irreversible aging of the world's population, the increasing prevalence of infectious diseases, and the fear of the spread of the pandemic influenza have recently led Europe. EUGMS (Union Geriatrics Association) and IAGG (International European Association of Geriatric Geriatrics) establish vaccine recommendations for individuals aged 60 and older and promote lifetime vaccine programs. This approach has been motivated primarily by herd immunity-related effects on the epidemiology of infectious diseases observed in adult and elderly populations.¹⁸ Cancer and carcinogenesis have always been a problem as one of the most important healthcare issues in the world. The causes of cancer can be effective in producing things like the environment, food, genetics, hormones, viral factors, sunlight, smoking, weight changes, and a variety of physical activities. It has been applied to nutritional behaviors that are important for cancer prevention.¹⁹ Microarray data selected for bioinformatics analysis are gene expression data stored as GSE35570 code in the National Center for Biotechnology Information Gene Expression Omnibus database. Research has shown that applying variance filtering comparing thyroid cancer to a

healthy control group yields a list of genes with different expression levels between control groups. A total of 1209 genes were differentially expressed between these two groups. As a result, SFTPB, HMGA2, ARHGAP36, SYTL5, LRRK2, PRR15, DPP4, TENM1, and SCEL genes were upregulated in the thyroid papillary cancer group. It was confirmed that CCL21, COL9A3, FBLN1, LRP1B, PROM1, NEB, CDH16, and TFCP2L1 genes were downregulated. It has been reported that these identified genes can be used as candidate biomarker gene for the papillary thyroid cancer.^{12,20} Modern health measures should be linked to what we know as the determinants of health. Humanity strives for health in the first breath of an infant and the first connection with other humans. The modern definition of health recognizes that diseases and disorders can and often coexist with health. In this new concept, health shifts from disease-free to a state centered on the fullness of life. Health includes the unity of body and mind, and recognizes the impact of sociological, environmental, and behavioral factors. Appropriate measurement tools are required to understand and apply definitions among key stakeholder groups.⁴ DTC genetic testing has been discussed and criticized from perspectives including biomedical, commercial, ethical, legal, regulatory, and participating locations. Genetic testing as part of an expanding self-tracking marketplace that shapes communication, social modern life, and identity. By showing how "Gene Talk" supports and accelerates the speed of circulation of research results based on personal information, we have strengthened our readiness to establish itself as an information subject by illuminating how personal information gains value in people's lives. The user is presented with a data-enhanced being, "Lifeworld Inc.," where a new kind of ontological horizon is promoted by the development of technologies to generate numerical and computational coordinates for the narrative regime.²¹ Genetic testing products sold directly to consumers are provided to users, as a new way to understand ancestral identities, build communities around shared outcomes, and conceptualize the role of genetic determinism in life. These engagement tools allow users to newly explore their personal information. Genealogy knowledge, historical expertise, communication skills, access to genealogy services, cooperation, trust building, and this knowledge can be verified. Therefore, family origin narratives, genetic ancestral estimates, and this communication allow users to interpret genetic consequences. It aims to investigate the sharing of consumer contact information on how to form.²² In addition to the changing regulatory environment, there are other important changes in the situation. The hype in consumer diagnostics has shifted from genomics to mobile digital health (mHealth) technology. It remains unclear whether the regulatory paradigm for medical devices can be applied to a new generation of technology that crosses the space between the consumer market for wellness lifestyle products and the clinical market for medical devices. Although expected to be included in this new technology paradigm, at least 23 and is currently focusing most of its mobile health applications on other types of biomarkers, but there is growing awareness that its usefulness could improve in the future.²³

In recent years, the global consumption of inner beauty has been accelerating. Looking at the case of inner beauty around the world,

consumption in Japan and China is prominent in East Asia, and in the United States since the 1980s, including the health drink market that helps skin beauty with beverages and foods, Nestlé is a venture partner Innéov founded with L'Oréal. Is launching a wide range of products in France, and French food companies are striving to enter the anti-aging market with great potential.²⁴ Inner beauty foods are foods that can cultivate health and beauty through food consumption rather than temporary and artificial methods. In the past, inner beauty products were recognized as one of the health functional foods, but as various foods emphasizing the beauty effects of natural ingredients are released, the inner beauty food group is gradually expanding. In South Korea, products such as healthy juice containing native plants and medicinal plants, detox drinks, and juice are gaining popularity through marketing such as anti-oxidative and skin health. Inner beauty products are auxiliary ingredients that reduce hair loss and skin aging, improve skin quality, and strengthen the body's immune defense system. However, there are studies showing that among the inner beauty products on the market, whole plants using plant cell culture can reduce the energy efficiency of products for the cosmetics and food industry.^{10,25} Nevertheless, the market for "eating cosmetics" is outstanding worldwide. Inner beauty has established itself as a trend these days, leading the health functional foods market. Aside from the beauty from the inside, another trend that stands out is the increasing number of products that use "vegetable" natural vegetable ingredients. Based on this trend, recent research was conducted on the development of a plant extract called Agatti[®] for skin health using *Agastache rugosa*. Agatti[®] is an individual certified functional ingredient for skin health from the Korea Food and Drug Administration in 2020. Ingestion of Agatti[®] is expected to increase skin elasticity by suppressing the formation of wrinkles and reducing collagen content caused by UV rays. At the same time, it has been reported that it can prevent skin aging by improving skin hydration and epidermal moisture loss (TEWL), and studies show that hyaluronic acid and collagen production significantly increased, and matrix metalloproteinase production decreased.²⁶ Such the categories of inner beauty foods are diversifying around the world, and research on them is being conducted in various ways. Therefore, as target consumers are increasing, it is necessary to expand the market by establishing appropriate product and marketing strategies. Through these materials, research directions, and market trends of inner beauty products, there will be a need for gradual development into a customized industry.²⁵ The Japanese Pharmacist Act distinguishes between cosmetics and quasi-drugs, has a weak effect on the human body, and stipulates that it is safe for long-term use. Therefore, it is necessary to thoroughly evaluate and confirm the safety of cosmetics in consideration of the types of cosmetics, usage methods, and conditions of use. Post-marketing surveys of customer complaints and reporting of side effects are important to monitoring and confirming the safety of products, and cosmetics manufacturing and marketing are becoming more and more global, but regulations related to cosmetic safety still vary from country to country. Compliance with different regulations in different markets is an important issue for

producers.²⁷ Although the use of cosmetics is increasing like this, it is questionable whether consumers are aware of the safety of the product. After the COVID-19 epidemic in Malaysia, a study of adults' perceptions and attitudes toward cosmetics has focused on aesthetics rather than health safety. Demonstrated careless perception and attitude of Malaysian adults. Therefore, we concluded that it was to attenuate the spread of COVID-19.²⁸ It is good to raise awareness of the composition and effectiveness of cosmetics, increase hygiene practices, and persuade the sharing of cosmetics,²⁸ and raw material, quality control, and stability. However, consumer demand is expected to increase gradually as consumer-oriented customized cosmetics are mixed and subdivided according to individual needs. In addition, when considering the implementation plan of the customized cosmetic system reflecting the constitution, it was necessary to reflect the constitution in the customized cosmetic system considering that the constitution is the result of a combination of genetic predisposition and environmental factors. As a specific implementation plan of the customized cosmetic system to be built in the future, the constitution analysis system is reflected in the development of big data-based beauty devices combined with IT technology, and conventional skin care education for general cosmetics other than specific constitutional medical cosmetics by utilizing common factors for each constitutional medicine. It has been proposed to develop an app and introduce the concept of constitution to the existing skin care education to deepen the method of analyzing the skin condition.²⁹

Therefore, in the present study, we compared and analyzed the perception of DTC gene test, single, and combination treatment for customized inner beauty and customized cosmetics. Accordingly, in keeping with the rapidly changing market conditions, we wanted to study customized inner beauty and customized cosmetics recognition and purchasing behavior through DTC genetic testing in the unexplored era after COVID-19. As a result, it was much significantly more effective to use customized inner beauty and customized cosmetics after DTC genetic testing Table 1. In the validity and reliability test of the DTC genetic test necessity scale, "I want to purchase customized cosmetics after the DTC genetic test. The effect will be even greater if you use custom cosmetics." The result came out. This is a novel liquid skin cleanser, even in a comparative study of topical and oral supplements for the delivery of vitamin E to the skin, topical supplements also represent an attractive approach to alleviating environmentally induced skin vitamin E deficiency. The study reported the effect of natural light on stratum corneum (SC) vitamin E and also compared the effects of dietary supplements with topical application as a method of increasing vitamin E in the superficial layer of SC. As measured in the case, vitamin E in the SC surface layer was measured by HPLC after ethanol extraction. As a result, vitamin E in superficial SC decreased by 50–65% in a dose-dependent manner. One group used a commercial body wash containing 0.15% vitamin E and 0.10% vitamin E acetate for 1 min a day, while the second group used a body wash dieted with 400 IU alpha-tocopherol without vitamin E. As a result of supplementation, only dietary supplements increased serum vitamin E by about 2 times. Moreover, studies have

shown that only topical delivery increases SC vitamin E acetate.³⁰ In addition, in the study of skin symptoms of disorders of vitamin and mineral metabolism in the Swiss population, vitamin or mineral salt deficiency may still occur in certain situations or populations, but various vitamins or mineral salts of deficient skin, mucous membranes, hair, or nails list vitamins. More general than that it seems more useful to show various changes, and skin signs such as seborrheic dermatitis or serositis, perleche, psoriasis, hyperpigmentation, or less frequent skin changes have been mentioned. It is said that the production of medicines, cosmetics, and foods derived from plant cells and tissue culture has a long tradition.³¹⁻³³ In addition, in a study evaluating phase angle measurements and nutrient consumption in women aged 20–65 years old, it was suggested that by the bioelectrical impedance method a standard model BIA device requires adequate measurements by appropriately equipped staff. It was good to evaluate the prognosis and nutritional status of a population using specific criteria and a variety of analytical criteria. In a study examining the prevalence of malnutrition and obesity in elderly patients, two out of three elderly patients were at risk of malnutrition, malnutrition, or obesity. To prevent malnutrition and obesity in old age, it is necessary to comprehensively evaluate various fields such as medical, nutrition, and social status of elderly patients, promote physical activity, and come up with a new strategy to inform society about nutritional awareness. Meanwhile, in a study of the impact of multifunctional food supplements on work-related stress, mood, and eating disorders during the menopausal transition, a combination of diet programs, behavioral advice, and nutraceuticals, compared to a single diet, relieved emotions, and eating, problems with menopause. It is said that it can increase awareness of satisfactory work.^{34,35} However, in a study investigating the impact of dehydroepiandrosterone (DHEA) supplementation on cognitive function and quality of life in healthy older adults, DHEA supplementation does not benefit cognitive abilities. In healthy elderly and general population, there are reports that it should not be recommended for that purpose, so be careful.³⁶ As such, the desire to live healthy is becoming more common around the world, and interest in healthy life among middle-aged people is increasing to prepare for an ultra-aging society with beautiful skin along with disease liberation. It is said that the retirement age is not simply an extension of life, but the qualitative aspect of how to live happily or beautifully. Therefore, in this study, it was found that the recognition of customized inner beauty and customized cosmetics through DTC test was high, and the effect of taking customized inner beauty after DTC gene test and using customized cosmetics was more effective was found. However, the limitation of this study is that the questions are too few and insufficient to support them. In addition, as the scope of use expands, expertise is required to accurately analyze and respond to consumer needs. Therefore, it is determined that continuous research is necessary. Therefore, as a follow-up study, we plan to conduct research on the recognition of DTC genetic tests according to family history and the possibility of customized internal development.¹²

5 | CONCLUSIONS

This study emphasizes that after the global COVID-19 pandemic that occurred after January 2020, the definition of health persistence, wellness, and well-dying associated with beauty is also evolving after the DTC genetic test. It was found for the first time that the intake of customized inner beauty preparations and the use of customized cosmetics would be more effective. In the above significant research results, it is believed that research on the combinational effect of customized inner beauty products and customized cosmetics is required in the global DTC genetic testing market.

CONFLICT OF INTEREST

The authors of this manuscript do not have any conflicts of interest to disclose.

REFERENCES

- Ye Z, Zhang Y, Wang Y, Huang Z, Song B. Chest CT manifestations of new coronavirus disease 2019 (COVID-19): a pictorial review. *Eur Radiol.* 2020;30(8):4381-4389.PMCID: PMC7088323. <https://doi.org/10.1007/s00330-020-06801-0>
- Liu X, Liu C, Liu G, Luo W, Xia N. COVID-19: Progress in diagnostics, therapy and vaccination. *Theranostics.* 2020;10(17):7821-7835. PMCID: PMC7359073. <https://doi.org/10.7150/thno.47987>
- Assadi S, Fatahi Y, Zavvar M, Nicknam MH. COVID-19: significance of antibodies. *Hum Antibodies.* 2020;28(4):287-297. PMID: 32986664. <https://doi.org/10.3233/HAB-200429>
- Bradley KL USA (Ret), Goetz T, Viswanathan S. Toward a contemporary definition of health. *Mil Med.* 2018;183:204-207. PMID: 30462340. <https://doi.org/10.1093/milmed/usy213>
- Notice> View Press Release Contents "Regulation Sandbox DTC Genetic Test Demonstration Special Case Consumer Participation Research Begin" | A lifelong friend of strength, Ministry of Health and Welfare (mohw.go.kr). [dataset] Bioethics Policy Division; 2019. Regulation Sandbox DTC Genetic Test Demonstration Special Case Consumer Participation Research Begin. http://www.mohw.go.kr/react/al/sal0301vw.jsp?PAR_MENU_ID=04&MENU_ID=0403&CONT_SEQ=352118. Accessed 2020/January/06.
- Information%3e Laws%3e Ordinances/Ordinances/Notices/Guidelines View "DTC Genetic Testing Guidelines (for general consumers)" | A lifelong friend of strength, Ministry of Health and Welfare (mohw.go.kr); 2020. DTC Genetic Testing Guidelines (for general consumers). http://www.mohw.go.kr/react/jb/sjb0406vw.jsp?PAR_MENU_ID=03&MENU_ID=030406&CONT_SEQ=353448. Accessed 2020/March/24.
- Leap to the world power of K-beauty through the introduction of customized cosmetics View Details|Press Release | Ministry of Food and Drug Safety (mfds.go.kr); 2019; Leap to the world power of K-beauty through the introduction of customized cosmetics View Details|Press Release | Ministry of Food and Drug Safety (mfds.go.kr). mfds.go.kr/brd/m_99/view.do?seq=43644. Accessed 2019/August/19.
- KAREN LYDELLE LINAJA; New Trend: Korean Customized Cosmetics Gains Popularity; New Trend: Korean Customized Cosmetics Gains Popularity: K-WAVE: koreaportal. <http://en.koreaportal.com/articles/22227/20160907/new-trend-korean-customized-cosmetics-gains-popularity.htm>. Accessed 2016/September/07.
- [dataset] Maeil Business News Korea; You can buy'my own health food', and there is also a shared beauty salon. <https://www.mk.co>

- kr/news/economy/view/2020/08/884174/. Accessed 2020/August/27.
10. Eibl R, Meier P, Stutz I, Schildberger D, Hühn T, Eibl D. Plant cell culture technology in the cosmetics and food industries: current state and future trends. *Appl Microbiol Biotechnol*. 2018;102(20):8661-8675. PMID : 30099571 PMCID: PMC6153648. <https://doi.org/10.1007/s00253-018-9279-8>
 11. Dini I, Laneri S. Nutricosmetics: a brief overview. *Phytother Res*. 2019;33:3054-3063. PMID: 31478301. <https://doi.org/10.1002/ptr.6494>
 12. Lee J, Kwon KH. Recognition and the Development Potential of Mobile Shopping of Customized Cosmetic on Untact COVID19 Period: Focused on 40's to 60's Women in Seoul, Republic of Korea. *J Cosmet Dermatol*. 2021;20:1975-1991. Epub ahead of print. PMID: 33834593. <https://doi.org/10.1111/jocd.14150>
 13. Jin Y, Yang H, Ji W, et al. Virology, epidemiology, pathogenesis, and control of COVID-19. *Viruses*. 2020;12:372. PMID: 32230900 PMCID: PMC7232198. <https://doi.org/10.3390/v12040372>
 14. Dao TL, Hoang VT, Gautret P. Recurrence of SARS-CoV-2 viral RNA in recovered COVID-19 patients: a narrative review. *Eur J Clin Microbiol Infect Dis*. 2021;40(1):13-25. PMID: 33113040 PMCID: PMC7592450. <https://doi.org/10.1007/s10096-020-04088-z>
 15. Han Z, Battaglia F, Terlecky SR. Discharged COVID-19 patients testing positive again for SARS-CoV-2 RNA: a minireview of published studies from China. *J Med Virol*. 2021;93(1):262-274. PMID: 32609390 PMCID: PMC7361580. <https://doi.org/10.1002/jmv.26250>
 16. Tuan J, Spichler-Moffarah A, Ogbuagu O. A new positive SARS-CoV-2 test months after severe COVID-19 illness: reinfection or intermittent viral shedding? *BMJ Case Rep*. 2021;14(2):e240531. <https://doi.org/10.1136/bcr-2020-240531>. PMID: 33542020.
 17. Smith DR. Herd Immunity. *Vet Clin North Am Food Anim Pract*. 2019;35(3):593-604. <https://doi.org/10.1016/j.cvfa.2019.07.001>. PMID: 31590904.
 18. Lang PO. Les effets indésirables de l'immunité de « groupe » ou quand la vaccination infantile devient délétère pour l'épidémiologie infectieuse de l'adulte [Adverse effects of the herd immunity or when childhood vaccination becomes deleterious for the epidemiology of infectious diseases in adults]. *Geriatr Psychol Neuropsychiatr Vieil*. 2011;9(1):11-19. <https://doi.org/10.1684/pnv.2011.0260>. PMID: 21586372.
 19. Baghianimoghadam MH, Sharifpour Z, Lotfizadeh M, Nadjarzadeh A, Hashemi A-S, Baghianimoghadam B. The role of protection motivation theory in predicted of nutritional behavior in prevention cancers in mothers in Yazd city, Iran. *Progr Nutr [Internet]*. 2014;16:197-203. <https://mattioli1885journals.com/index.php/progressinnutrition/article/view/3477>
 20. Kadioglu Dalkilic L, Dalkilic S. Identification of key genes involved in papillary thyroid cancer by bioinformatics tools. *Progr Nutr [Internet]*. 2020;22:e2020014. <https://doi.org/10.23751/pn.v22i2-S.10193>
 21. Ruckenstein M. Keeping data alive: talking DTC genetic testing. *Inf Commun Soc*. 2017;20(7):1024-1039. <https://doi.org/10.1080/1369118X.2016.1203975>
 22. Gregory K. Contestable kinship: user experience and engagement on DTC genetic testing sites. *New Genet Soc*. 2019;38(4):387-409. <https://doi.org/10.1080/14636778.2019.1677148>.
 23. Hogarth S, Saukko P. A market in the making: the past, present and future of direct-to-consumer genomics. *New Genet Society*. 2017;36(3):197-208. <https://doi.org/10.1080/14636778.2017.1354692>
 24. Cho Y-K, Jung J-Y. Inner beauty status and preference survey in the domestic beauty market. *Korean Soc Design Trends*. 2012;36:65-378. <https://www.dbpia.co.kr/Journal/articleDetail?nodel=NODE08800239>
 25. Shim B-S, Lee B-J. Market Trends for Nutricosmetics, Industrial Chemistry Outlook. 2019:23-37. http://kiss.kstudy.com/search/detail_page.asp?key=3662743
 26. Woo KS. Korean native wild herbal-based functional ingredient for skin health: Agatri® (Agastache rugosa extract). *Korean Soc Food Sci Technol*. 2020;12;382-389. <https://www.koreascience.or.kr/article/JAKO202005351430033.page>
 27. Inomata S. Safety assurance of cosmetics in Japan: current situation and future prospects. *J Oleo Sci*. 2014;63:1-6. PMID: 24389794. <https://doi.org/10.5650/jos.ess13501>
 28. Mohammed AH, Blebil A, Dujaili J, Hassan BAR. Perception and attitude of adults toward cosmetic products amid COVID-19 pandemic in Malaysia. *J Cosmet Dermatol*. 2021;20(7):1992-2000. <https://doi.org/10.1111/jocd.14147>
 29. Kim E-H, Youn C-S. A study on the implementation plan of the customized cosmetics system reflecting the constitution. *Beauty Industry Res*. 2019;13:59-78. <http://www.riss.kr/link?id=A106575826>
 30. Tavakkol A, Nabi Z, Soliman N, Polefka TG. Delivery of vitamin E to the skin by a novel liquid skin cleanser: comparison of topical versus oral supplementation. *J Cosmet Sci*. 2004;55:177-187. PMID: 15131729.
 31. Koseoglu SZA, Dogrusoy M. Evaluation of phase angle measurements and nutrient consumption by bioelectrical impedance method of 20-65 years old women: Evaluation of Phase Angle Measurements and Nutrient Consumption by Bioelectrical Impedance Method. *Progr Nutr [Internet]*. 2020;22:e2020012. <https://doi.org/10.23751/pn.v22i3.8523>
 32. Turkbeyler İbrahim H, Ozturk ZA, Gol M, Abiyev A, Efendioglu EM, Yildiz H. Malnutrition and obesity prevalences in geriatric patients: malnutrition and obesity prevalences. *Progr Nutr [Internet]*. 2020;22:e2020017. <https://doi.org/10.23751/pn.v22i3.7954>
 33. Panizzon R. Hautsymptome bei Störungen des Vitamin- und Mineralhaushalts [Skin symptoms in disorders of vitamin and mineral metabolism]. *Ther Umsch*. 1995;52:257-263. PMID: 7754469.
 34. Conti DM, Agnelli GM, Chiroque Cruz KJ, et al. The impact of combined nutraceutical supplementation on Work-related stress, mood and eating disorders during the menopausal transition: a pilot study.: Work-related stress, mood and eating disorders during the menopausal transition. *Progr Nutr [Internet]*. 2020;22:e2020030. <https://doi.org/10.23751/pn.v22i3.9838>
 35. Conti DM, Agnelli GM, Chiroque Cruz KJ, et al. The impact of combined nutraceutical supplementation on Work-related stress, mood and eating disorders during the menopausal transition: a pilot study.: Work-related stress, mood and eating disorders during the menopausal transition. *Progr Nutr [Internet]*. 2020;22:e2020030. <https://doi.org/10.23751/pn.v22i3.9838>
 36. Kritz-Silverstein D, Von Mühlen D, Laughlin Gail A, Bettencourt R. Effects of dehydroepiandrosterone supplementation on cognitive function and quality of life: the DHEA and Well-Ness (DAWN) trial. *J Am Geriatr Soc*. 2008;56(7):1292-1298. <https://doi.org/10.1111/j.1532-5415.2008.01768.x>

How to cite this article: Lee J, Kwon KH. DTC genetic test for customized cosmetics in COVID-19 pandemic: Focused on women in their 40s and 60s in Seoul, Republic of Korea. *J Cosmet Dermatol*. 2021;20:3085-3092. <https://doi.org/10.1111/jocd.14377>