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Cosmetic Production Technology and Quality Control

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Abstract: With the rapid development of the national economy and the continuous improvement of residents' consumption levels, cosmetics have increasingly become an indispensable consumer product in people's daily lives. In recent years, cosmetic safety issues have become a social hotspot, making more consumers pay attention to cosmetic production technology, raw materials, and quality, and putting forward higher requirements for the production technology and quality control of cosmetic manufacturing enterprises. This paper conducts an in-depth study on the production technologies of different types of cosmetics, and elaborates on four aspects: improving quality control measures such as raw material management, establishing and implementing traceability management systems, conducting self-inspections of quality management systems, and optimizing sample retention and monitoring systems. The aim is to improve the quality of cosmetic production and promote the healthy development of the cosmetics industry.

Keywords: Cosmetics; Production technology; Quality control; Product quality

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1. Introduction

To standardize cosmetic production licensing and supervision and inspection work, and implement the "Cosmetic Production Quality Management Specifications", the National Medical Products Administration has organized the formulation of the "Inspection Points and Judgment Principles for Cosmetic Production Quality Management Specifications". It clarifies the production quality standards for different types of cosmetics, such as general liquid, cream and emulsion, powder units, aerosols, and organic solvent units, urging cosmetic manufacturing enterprises to standardize production and provide regular and safe cosmetics for consumers. This paper analyzes the characteristics and processes of production technologies for different types of cosmetics, clarifies quality standards for each link, and puts forward corresponding suggestions for cosmetic production and quality control. Cosmetic manufacturing enterprises must strictly control raw materials, establish a traceability management mechanism, retain samples of products in a timely manner, ensure that the number of microorganisms and bacterial colonies in products is within standard limits, strictly control the use of additives, and improve the quality of cosmetic production.

2. Analysis of Cosmetic Production Technologies

2.1. Production Technology of General Liquid Units

Liquid cosmetics are the most common and widely used type of cosmetics, and also one of the most concerned by consumers. Taking toner production as an example, cosmetic manufacturing enterprises must strictly control raw materials, disinfect all raw materials used, and only raw materials that pass inspection can enter the clean workshop for accurate weighing to control the dosage of raw materials. In this production link, enterprises also need to conduct high-temperature sterilization and ultrasonic cleaning of toner packaging materials, and send the sterilized packaging materials to the clean workshop. Technicians should pre-mix raw materials according to the cosmetic formula, put raw materials into the mixing tank in accordance with the formula ratio and feeding sequence, heat and stir the mixture, and then let the liquid cool naturally to the corresponding temperature to complete the preparation [1]. After the toner preparation is completed, enterprises need to take samples for physical and chemical tests and microbial tests, such as determining the pH value, viscosity, density, heat resistance, and cold resistance of the samples; testing microbial indicators such as the total number of bacterial colonies, mold, and yeast in the samples. Only after confirming that the samples pass the inspection can the semi-finished products be transferred to the filling workshop for final filling and packaging. Qualified products after quality inspection can be directly put into storage.

2.2. Production Technology of Cream and Emulsion Units

The production technology of creams and emulsions is relatively complex, with high requirements for production temperature, proportioning, and processing sequence. Taking oil-in-water skin care lotion as an example, cosmetic enterprises must do a good job in semi-finished product preparation and emulsification technology to ensure that the lotion has a soft texture and a comfortable skin feel. First, technicians should disinfect raw materials according to the formula, weigh them accurately, and prepare sterilized oil tanks and water tanks. Put the weighed raw material A into the oil tank for preparation, and raw material B into the water tank for preparation. Then put the prepared raw materials A and B into the emulsification tank for emulsification treatment. Second, technicians should process the emulsified semi-finished products, remove air bubbles using a vacuum pump, add raw material C and continue stirring. After mixing evenly, transfer the mixture to a storage tank for standing. During this process, technicians should inspect the standing semi-finished products, such as the color, texture, and microbial indicators of the skin care lotion semi-finished products, to ensure they meet quality standards. Filling can only start after the semi-finished products pass the inspection and the standing process is completed [2].

2.3. Production Technology of Powder Units

The production technology of powder cosmetics is relatively simple, and different types of powder products have different quality standards. The weighing, crushing, mixing, and filling of raw materials for powder cosmetics must be completed in a negative-pressure clean area to ensure that raw materials are not contaminated by the environment. To ensure the fineness and skin feel of powder products, cosmetic enterprises should be equipped with raw material crushers to crush rod-shaped, flake-shaped, and block-shaped raw materials, ensuring that the ground powder meets the required fineness standards. At the same time, powder production is inseparable from mixers, such as double conical drum mixers and vertical kneading mixers, which replace manual mixing to make powder semi-finished products more uniform [3]. After the powder mixing is completed, technicians should inspect the semi-finished products, focusing on physical and chemical tests and microbial tests, and conduct different

quality inspections according to product characteristics. For makeup powder products such as setting powder and loose powder, technicians should also test the smearing function, oil control, and hydrophobicity of the products to improve consumers' skin experience and product setting effect.

2.4. Production Technology of Aerosol and Organic Solvent Units

The raw materials of aerosol and organic solvent cosmetics are relatively special. Many cosmetics use flammable and explosive dangerous goods such as ethanol and essential oils, which are prone to explosions during stirring, mixing, and filling, threatening the personal safety of employees. Therefore, cosmetic enterprises must produce aerosols and organic solvent cosmetics in explosion-proof workshops and ensure that the workshops are in low-temperature conditions to minimize safety accidents during production. Taking perfume production as an example, enterprise technicians should weigh raw materials according to the formula, put the weighed raw materials into explosion-proof mechanical equipment for stirring, and operate in a low-temperature environment to avoid the volatilization of essential oils and maximize the retention of fragrance. Let the stirred mixture stand for a few days, then perform alcoholization treatment to filter out solid particles and impurities, age the filtrate, and finally conduct quality inspection [4]. In addition, technicians must strictly control the perfume filling process, use high-speed limited liquid level vacuum filling machines for filling to ensure the stability of the perfume liquid level; conduct pressure testing on the tank body, and finally inspect the nozzle to ensure that the sprayed mist is fine and uniform.

3. Quality Control Measures for Cosmetic Production

3.1. Improve Raw Material Quality Control Measures and Enhance Raw Material Safety

Cosmetic enterprises must strictly control the quality of raw materials, select product raw materials in accordance with the "Cosmetic Product Safety Assessment Report", clarify the standards for intermediate products and semi-finished raw materials required in cosmetic production, sample and conduct laboratory tests on raw materials, and only qualified products can be used as product raw materials. First, enterprises should select raw materials according to cosmetic functions and formulas, conduct physical and chemical tests and microbial tests on all raw materials and semi-finished materials, and ensure that raw material quality indicators meet the technical requirements of cosmetic registration or filing data. Enterprise inspectors should test heavy metal content, pathogenic bacteria, etc., in cosmetic raw materials, select raw materials that meet national standards, and ensure the safety of cosmetic production from the source [5]. At the same time, enterprises should test microorganisms, humidity, temperature, etc., in raw material storage warehouses to avoid deterioration of raw materials during storage. For example, in lipstick production, it is necessary to test raw materials such as fragrances, pigments, and glycerin, and try to use natural fragrances and pigments to ensure the safety of lipstick. Second, enterprises should inspect cosmetic inner packaging and outer packaging materials, clarify quality standards for paper packaging boxes and plastic packaging, avoid the use of contaminated materials, and try to use degradable environmentally friendly packaging materials to reduce environmental damage. In this link, enterprises should conduct sampling inspections on finished products of different batches of cosmetics, clarify sample sampling requirements, inspection operation procedures, and qualified standards, and only qualified products can leave the factory for sale to establish a good corporate reputation [6].

3.2. Establish and Implement Traceability Management Systems and Clarify Management Responsibilities

The "Cosmetic Production Quality Management Specifications" put forward new requirements for cosmetic quality management, requiring enterprises to control and trace the entire process of cosmetic raw materials, production processes, and quality inspections, and establish a cosmetic traceability management system. Against this background, cosmetic enterprises should establish the development concept of "quality first", abide by laws and regulations such as the "Cosmetic Production Quality Management Specifications", establish a sound traceability management system, clarify the responsible person and quality inspection standards for each link, timely identify problems in the cosmetic production process, and promptly destroy unqualified products to prevent them from flowing into the market. For example, enterprises can implement batch number management, clarify the naming standards for batch numbers of cosmetics produced in different batches, conduct random inspections of cosmetics of different batches through batch numbers, accurately locate unreasonable product batches, and improve the quality of cosmetic production quality management. A "batch" refers to products produced in the same production cycle and with the same production process, generally composed of any combination of numbers or numbers plus letters. It is the only identifier for cosmetics, which can help enterprises accurately trace and review the production history, production technology, and quality standards of cosmetics of different batches, and improve the efficiency and quality of cosmetic production quality supervision [7]. In addition, cosmetic enterprises can implement batch number management for raw materials, inner packaging materials, semi-finished products, and finished products, link all records related to the production of each batch of cosmetics, facilitating quality supervision of different production links. Once abnormal quality test data is found, the batches of problematic raw materials, packaging materials, and semi-finished products can be confirmed in the first place, realizing full traceability of all activities such as material procurement, product production, quality control, sales, and recall of each batch of products.

3.3. Conduct Self-Inspections of Quality Management Systems and Improve Cosmetic Production Quality

To standardize the production of cosmetic enterprises and promote the healthy development of the cosmetics industry, the National Medical Products Administration has not only clarified cosmetic production quality standards but also issued relevant penalty clauses, cracking down on illegal enterprises with unqualified random inspections and delayed rectification to create a good market environment. First, cosmetic enterprises should actively carry out self-inspections, conduct self-inspections on different types of cosmetics produced by the factory and products of the same type in different batches, formulate self-inspection standards for product production technology and quality testing with reference to national relevant regulations, and clarify details such as self-inspection time, procedures, departmental responsibilities, and result evaluation to ensure the smooth progress of internal self-inspection work. For example, enterprises can randomly select employees from different workshops, quality inspectors, and management personnel to form a self-inspection team to conduct random inspections on various cosmetics produced recently, covering raw materials, semi-finished products, finished products, and packaging materials of different batches, conduct inspections in internal laboratories, timely identify problems in the production process of cosmetics of different batches, and urge relevant departments to rectify to improve the quality of cosmetic production [8]. Second, enterprises should urge relevant departments to complete self-inspection reports, urge them to conduct self-inspections on raw materials, production technology, semi-finished products,

and packaging materials of their own departments, and require them to truthfully fill in relevant data in the self-inspection reports, such as raw material heavy metal residues and microbial test data. Urge all departments to conduct self-inspections on the cosmetic production process, timely identify problems in the production process, and improve the efficiency and quality of cosmetic production. In addition, cosmetic enterprises should standardize the disposal process of unqualified raw materials, semi-finished products, and finished products, promptly destroy unqualified products harmful to the human body, and conduct harmless treatment of non-reusable raw materials to reduce pollutant emissions and achieve the goal of green development.

3.4. Optimize Sample Retention and Monitoring Systems and Improve Quality Management Efficiency

Under the new "Specifications", cosmetic enterprises should establish a sound sample retention and monitoring system, retain samples of each batch of products to facilitate internal self-inspection and inspections by departments such as the Medical Products Administration, thereby improving the efficiency of cosmetic production quality management work. For example, enterprise quality inspectors should retain samples of raw materials and semi-finished products entering the workshop on the same day, as well as samples of finished products produced on the same day, and store the samples in the laboratory, controlling the humidity and temperature of the sample storage environment to avoid deterioration of samples during storage [9]. For factory-finished cosmetic products, enterprises should take samples of the original sales packaging. If it is a set containing multiple cosmetics, only the smallest sales unit can be retained, but the set packaging should be preserved to facilitate traceability management. For factory semi-finished products, enterprises should preserve sample packaging and labels, clarifying information such as the production batch, storage conditions, and service life of the semi-finished products. In addition, cosmetic enterprises should set up a dedicated sample retention room or area, store samples classified according to sample standards, and establish a sample warehousing database, entering information such as sample collection time, storage conditions, and production batches, clarifying the responsible person for sample collection and information entry. The sample retention period shall not be less than 6 months after the expiration of the product's service life. Quality inspectors should regularly inspect the retained samples, checking whether the sample form has changed, whether there is mold growth, whether there is a pungent odor, etc. Once samples are found to be deteriorated within the service life, the cause should be analyzed in a timely manner, and products of the same batch should be recalled to avoid harming the legitimate rights and interests of consumers, establish a good brand reputation, thereby improving the brand influence of cosmetic enterprises and attracting more loyal customers [10].

4. Conclusion

In summary, cosmetic production is a complex production chain with high requirements for raw materials and production technology. Therefore, cosmetic enterprises should select high-quality raw materials that meet safety standards, regularly clean and maintain processing equipment, conduct physical and chemical and microbial tests on semi-finished products and finished products, and eliminate unqualified products; establish a sound cosmetic quality traceability management mechanism, supervise each production process, and provide high-quality cosmetics for consumers. In the future, cosmetic enterprises should integrate artificial intelligence technology into production to achieve intelligent production, improve the precision and quality of cosmetic production, and

actively develop traditional Chinese medicine (TCM) cosmetics, integrating TCM into cosmetics to develop products more suitable for Chinese people's skin, allowing Chinese cosmetic brands to go global.

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