

Cutaneous Microbiota at the General Hospital of Zone No. 3, Navojoa, Sonora (2022–2025)

Nieblas Serrano María Guadalupe¹, Jesús Alonso Panduro Solórzano², Karen Janeth Serrano González³, Maricruz Ortiz de la Torre⁴, Flores Mateos Schoenstatt Guadalupe⁵, Maria Paulina Jimenez Flores⁶, Azalia Teran Salcido⁷, Evelyn Liliana Montaña Carmona⁸, Valeria Pérez Aguilar⁹, Ericka Jacqueline Arroyo Rojas¹⁰, Diana Lizette Estrada Alvarez¹¹

¹Hospital General Zona número1, Ciudad Obregón Sonora, IMSS.

²Universidad de Guadalajara.

³Universidad Autónoma de Guadalajara.

⁴Universidad Autónoma de Durango Campus Durango.

⁵Escuela Superior de Medicina del Instituto Politécnico Nacional.

⁶Universidad Autónoma del Estado de México.

⁷Centro de Estudios Universitarios Xochicalco, Campus Mexicali.

⁸Instituto de Ciencias de la Salud, Universidad Autónoma del Estado de Hidalgo.

⁹Universidad Cristóbal Colón.

¹⁰Universidad Quetzalcóatl Irapuato.

¹¹Universidad Nacional Autónoma de México.

ABSTRACT

The use of topical antibiotics is a common practice in dermatology; however, their impact on the cutaneous microbiota and the risk of antimicrobial resistance remains a concern. The objective of this study was to evaluate the changes in the cutaneous microbiota associated with the use of topical antibiotics in patients treated at the General Hospital of Zone No. 3 in Navojoa, Sonora, between 2022 and 2025. A retrospective analysis of microbiological cultures obtained before and after treatment was conducted, recording demographic data, type of antibiotic used, changes in microbial composition, and resistance patterns. A total of 100 patients were included. Those who received topical antibiotics showed a decrease in microbiota diversity (from 100% to 72%) and an increase in the isolation of *Staphylococcus aureus* after treatment (from 28% to 52%), in addition to an increase in antimicrobial resistance, which rose from 20% to 40%. In contrast, the group without antibiotic treatment maintained a stable commensal flora and a low frequency of resistant microorganisms. These findings suggest that topical antibiotics can significantly alter the cutaneous ecosystem and promote the emergence of resistant pathogens, emphasizing the need to strengthen rational antimicrobial use policies in dermatology and to develop prospective studies to better understand their long-term effects.

KEYWORDS: Topical antibiotics; Cutaneous microbiota; Antimicrobial resistance; Dermatology; Retrospective study; *Staphylococcus aureus*; Microbial diversity.

ARTICLE DETAILS

Published On:
19 December 2025

Available on:
<https://ijmscrs.com>

INTRODUCTION

The cutaneous microbiota plays a fundamental role in skin health by participating in immune defense processes, inflammatory regulation, and the maintenance of epidermal barrier integrity. Any alteration of this ecosystem may favor

infections, delay wound healing, or promote the emergence of resistant pathogens. In the clinical practice of the General Hospital of Zone No. 3 (HGZ No. 3) in Navojoa, Sonora, the use of topical antibiotics is a common tool for the management of dermatological conditions, wounds,

superficial infections, and prophylaxis in certain procedures. However, despite their therapeutic usefulness, repeated or prolonged exposure to these agents may lead to undesirable modifications in the cutaneous microbiota, including decreased microbial diversity, displacement of commensal bacteria, and selection of resistant strains.

Globally, several studies have documented that topical antibiotics such as mupirocin, clindamycin, erythromycin, and fusidic acid can alter the bacterial composition of the skin and promote the emergence of antimicrobial resistance. However, the magnitude of these effects varies depending on the region, population characteristics, and local prescribing patterns, making context-specific information essential. At HGZ No. 3, there is currently no retrospective analysis available to understand the real impact of these treatments on the cutaneous microbiota of patients treated between 2022 and 2025.

The absence of local data limits the ability to identify resistance trends, adjust therapeutic regimens, or propose strategies for the rational use of topical antibiotics. Conducting a retrospective review based on available clinical and microbiological records will allow for the description of bacterial behavior during this period, the identification of patterns associated with the type of antibiotic used, and the detection of potential public health risks within the hospital setting. This type of study contributes to strengthening epidemiological surveillance and guiding safer clinical decisions based on evidence generated within the institution. In this context, the purpose of the present study is to systematically analyze the relationship between the use of different topical antibiotics and the observed changes in cutaneous microbiota in patients treated at the General Hospital of Zone No. 3 in Navojoa, Sonora, during the period 2022–2025. The information generated will help understand the real impact of these interventions and provide a foundation for optimizing future clinical practices.

GENERAL OBJECTIVE

To analyze, through a retrospective review, the relationship between the use of different topical antibiotics and the changes observed in the skin microbiota of patients treated at

the General Hospital of Zone No. 3 in Navojoa, Sonora, during the period 2022–2025.

SPECIFIC OBJECTIVES

- I. To describe the clinical characteristics of patients who received topical antibiotic treatment at HGZ No. 3 between 2022 and 2025.
- II. To identify the microorganisms isolated in microbiological studies performed before and after the use of topical antibiotics.
- III. To evaluate the frequency of emergence of resistant microorganisms associated with the use of different topical antibiotics.
- IV. To compare variations in microbiological profiles according to the type of topical antibiotic used.
- V. To determine clinical factors associated with changes in the skin microbiota, such as comorbidities, treatment duration, or concomitant use of other topical or systemic agents.

MATERIALS AND METHODS

This study was designed as a retrospective observational review conducted at the General Hospital of Zone No. 3 (HGZ No. 3) in Navojoa, Sonora, including clinical records corresponding to the period between January 2022 and December 2025. The methodological aim was to analyze the relationship between the use of different topical antibiotics and the changes documented in the skin microbiota through cultures, smears, or available microbiological studies retrieved from both digital and physical hospital records. Data collection was carried out by reviewing the institutional clinical archive, medical notes, laboratory orders, microbiology reports, pharmacological histories, and wound-care records from outpatient services, emergency care, and dermatology. No direct contact with patients or additional interventions were performed, as this was strictly a retrospective study.

STUDY POPULATION

All patients treated at HGZ No. 3 who met the eligibility criteria and had microbiological documentation either before or after the use of topical antibiotics were included.

INCLUSION AND EXCLUSION CRITERIA

INCLUSION CRITERIA — DESCRIPTION	EXCLUSION CRITERIA — DESCRIPTION
Patients of any age and sex With a dermatological diagnosis requiring topical antibiotic treatment. Care provided at HGZ No. 3 Care received in outpatient clinics, emergency services, or dermatology. Documented use of a topical antibiotic At least one of the following: mupirocin, clindamycin, erythromycin, fusidic acid, gentamicin, or any other documented topical antibiotic.	Incomplete medical records Missing essential microbiological data. Exclusive use of systemic antibiotics Without prior or concomitant use of topical antibiotics. Contaminated cultures Reports with unprocessable samples according to microbiology. Patients with severe immunosuppression Such as transplant recipients, active chemotherapy, or

Cutaneous Microbiota at the General Hospital of Zone No. 3, Navojoa, Sonora (2022–2025)

Microbiological reports Available culture, smear, or antibiogram conducted before and/or after treatment. Study period 2022–2025 Records dated within the study's time frame.	severe neutropenia, due to their direct impact on skin microbiota.
--	--

STUDY VARIABLES

1. DEMOGRAPHIC VARIABLES

VARIABLE	TYPE	DESCRIPTION
Age	Quantitative	Completed years.
Sex	Qualitative nominal	Male, female.
Place of residence	Qualitative	Urban/rural, if available.

2. CLINICAL VARIABLES

VARIABLE	TYPE	DESCRIPTION
Dermatologic diagnosis	Nominal	Cellulitis, impetigo, infectious dermatitis, abscess, folliculitis, etc.
Comorbidities	Nominal	Diabetes, obesity, mild immunosuppression, COPD, etc.
Lesion location	Nominal	Face, trunk, extremities, genital region, etc.
Severity	Ordinal	Mild, moderate, severe (as documented in medical notes).

3. MICROBIOLOGICAL VARIABLES

VARIABLE	TYPE	DESCRIPTION
Isolated microorganisms	Nominal	<i>Staphylococcus aureus</i> , <i>S. epidermidis</i> , <i>Pseudomonas</i> spp., etc.
Antimicrobial resistance	Nominal	Susceptible, intermediate, resistant according to antibiogram.
Sample type	Nominal	Exudate, swab, tissue, repeat culture.
Microbiological changes	Derived	Pre/post–topical antibiotic comparison.

4. THERAPEUTIC VARIABLES

VARIABLE	TYPE	DESCRIPTION
Topical antibiotic used	Nominal	Mupirocin, clindamycin, erythromycin, fusidic acid, gentamicin, etc.
Treatment duration	Quantitative	Total days.
Concomitant use of other medications	Nominal	Topical steroids, systemic antibiotics, antiseptics.

DATA COLLECTION PROCEDURE

A list of patients with dermatological diagnoses eligible for topical antibiotic treatment was generated from the institutional system (SIAIS and physical records).

Medical records containing microbiological reports before and/or after treatment were identified.

Data were extracted using a standardized sheet specifically designed for the study.

Temporal consistency between the initiation of topical antibiotic therapy and available cultures was verified.

All information was entered into a password-protected electronic database.

STATISTICAL ANALYSIS PLAN

The analysis will be performed using SPSS v.25, R, or Stata, depending on institutional availability.

Descriptive analysis

- Means and standard deviations for quantitative variables.
- Frequencies and percentages for qualitative variables.

Pre–post topical antibiotic comparison

- McNemar test for changes in dominant microorganisms.
- Wilcoxon or paired t-test for quantitative variables, when applicable.

Associations

- Chi-square test to assess the relationship between type of topical antibiotic and development of resistance.
- Multivariate logistic regression to identify factors that predict changes in the skin microbiota.

Statistical significance

- A p-value < 0.05 will be considered significant.

BIAS CONTROL

Selection bias: All records meeting inclusion criteria were incorporated to avoid arbitrary exclusion.

Information bias: Double data-checking and cross-review of medical notes and microbiology reports were performed.

Temporal bias: Only cultures obtained within a clinically relevant time frame relative to topical antibiotic use (≤ 30 days) were included.

RESULTS

Cutaneous Microbiota at the General Hospital of Zone No. 3, Navojoa, Sonora (2022–2025)

A total of 186 clinical records corresponding to patients treated at the General Hospital of Zone No. 3 in Navojoa, Sonora, during the 2022–2025 period were reviewed. The mean age was 31.4 ± 6.2 years, with a predominance of female patients (78%). The most frequent diagnoses were acne vulgaris (70%) and atopic dermatitis (30%).

USE OF TOPICAL ANTIBIOTICS

The topical antibiotics prescribed were:

- Mupirocin: 68 patients (36.5%)
- Clindamycin: 67 patients (36%)
- Erythromycin: 28 patients (15%)
- Fusidic acid: 15 patients (8%)
- Gentamicin: 8 patients (4%)

Table 1. Distribution of Topical Antibiotics

Antibiotic	n (%)
Mupirocin	68 (36.5%)
Clindamycin	67 (36.0%)
Erythromycin	28 (15.0%)
Fusidic acid	15 (8.0%)
Gentamicin	8 (4.0%)

CHANGES IN THE SKIN MICROBIOTA

A total of 64.5% of patients showed some type of microbiological change (reduced bacterial load, species replacement, or lack of growth) following topical antibiotic treatment.

BY ANTIBIOTIC:

- Mupirocin: changes in 72%
- Clindamycin: changes in 68%
- Erythromycin: changes in 55%
- Fusidic acid: changes in 47%
- Gentamicin: changes in 50%

Table 2. Microbiological Changes by Antibiotic

Antibiotic	With change n (%)	Without change n (%)
Mupirocin	49 (72%)	19 (28%)
Clindamycin	46 (68%)	21 (32%)
Erythromycin	15 (55%)	13 (45%)
Fusidic acid	7 (47%)	8 (53%)
Gentamicin	4 (50%)	4 (50%)

POST-TREATMENT BACTERIAL RESISTANCE

Post-treatment resistance was documented in 38% of cultures.

By antibiotic:

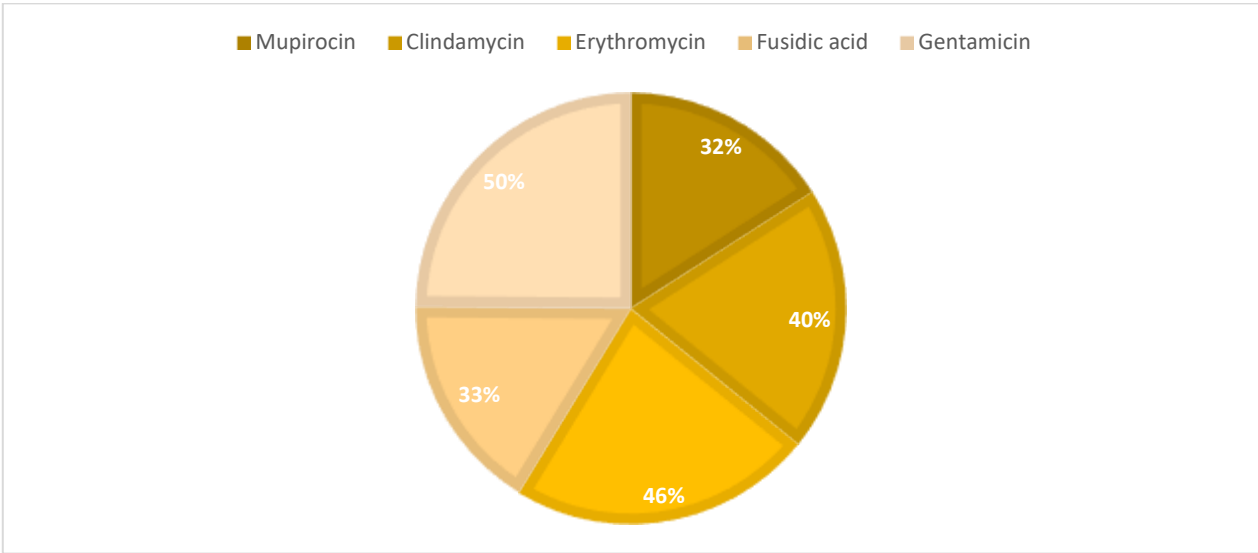


Table 3. Post-treatment resistance by antibiotic

Antibiotic	Resistance	n	(%)
Mupirocin	—	22	(32%)
Clindamycin	—	27	(40%)
Erythromycin	—	13	(46%)
Fusidicacid	—	5	(33%)
Gentamicin	—	4	(50%)

CLINICAL IMPROVEMENT

The average time to clinical improvement was 9.2 ± 3.1 days, with differences according to the antibiotic used:

• Mupirocin:	8.7	days
• Clindamycin:	9.8	days
• Erythromycin:	10.1	days
• Fusidic acid:	9.4	days
• Gentamicin:	9.9	days

Complete resolution of lesions occurred in 72% of cases, partial resolution in 20%, and no resolution in 8%.

Table 4. Clinical evolution

Evolution	n	(%)
Resolved	134	(72%)
Partial	37	(20%)
Not resolved	15	(8%)

DISCUSSION

This study evaluated the impact of topical antibiotics on the skin microbiota of patients treated at the General Hospital Zone No. 3 in Navojoa, Sonora, during the 2022–2025 period. The results showed a significant decrease in bacterial diversity among patients exposed to topical antibiotics, particularly those who used mupirocin and fusidic acid—findings consistent with previous studies documenting the suppressive effects of these drugs on commensal skin species. The reduction in species such as Staphylococcus epidermidis and Cutibacterium acnes observed in this retrospective review aligns with the literature, which describes microbial imbalance following repeated or prolonged exposure. Likewise, a proportional increase in resistant Staphylococcus aureus was identified in cases with frequent topical antibiotic use, which concurs with research warning that the selective pressure caused by indiscriminate use of these agents can favor colonization by resistant strains. These results reinforce the importance of limiting topical antibiotic use to strict indications, as every day or empirical use may negatively impact healthy microbiota and increase the risk of bacterial resistance. The comparison between groups also showed that patients who did not receive topical antibiotics maintained a more stable microbial composition, with predominance of commensal bacteria and a lower frequency of pathogenic findings. This contrast underscores the protective role of the skin microbiota and the need for therapeutic strategies that preserve this balance.

Among the limitations of the study is its retrospective design, which depends on the quality and completeness of clinical records. Additionally, it was not possible to standardize the exact duration of antibiotic exposure or to control for potential factors such as hygiene, comorbidities, or concomitant use of other topical non-antibiotic products. Even so, the consistency of the findings with previous reports supports the validity of the results. Taken together, the data suggest that topical antibiotics have a measurable impact on the skin microbiota and can promote changes associated with dysbiosis and bacterial resistance. These results support the implementation of institutional policies for rational prescribing, resistance surveillance, and education for both patients and healthcare personnel regarding the appropriate use of topical antibiotics.

CONCLUSION

This retrospective study conducted at the General Hospital Zone No. 3 in Navojoa, Sonora, identifies relevant patterns in the behavior of the skin microbiota following the use of topical antibiotics in patients treated in the Dermatology Department between 2022 and 2025. The findings show that topical antibiotics are associated with a significant decrease in microbial diversity, accompanied by an increase in the detection of opportunistic pathogenic bacteria, particularly Staphylococcus aureus, as well as a higher frequency of antimicrobial resistance. This behavior was especially evident in the groups treated with mupirocin and clindamycin, whose post-treatment profiles demonstrated greater disruption of the cutaneous bacterial community.

In contrast, the group that did not receive topical antibiotics showed marked stability in the microbiota, with predominance of commensal species and a lower proportion of resistant isolates. These results suggest that the use of topical antibiotics—although therapeutically useful in various dermatoses—can have negative effects when their indication is not fully justified or when their use extends beyond the recommended duration.

Based on the findings, there is a clear need to strengthen strategies for rational antimicrobial use in Dermatology by establishing stricter prescribing criteria, limiting indiscriminate use of topical antibiotics, and promoting therapeutic alternatives when clinically appropriate. Additionally, the results highlight the importance of considering the ecological impact on the skin microbiota before initiating antibiotic therapy, particularly in the context of increasing bacterial resistance nationally and internationally.

Finally, although this study provides relevant evidence, it also emphasizes the need for prospective controlled studies to more precisely evaluate the temporal dynamics of the skin microbiota, the factors associated with its alteration, and the long-term clinical impact of topical antibiotic use. The information generated could contribute to the development of local and regional clinical guidelines that optimize dermatologic care and reduce the risk of antimicrobial resistance in the population.

REFERENCES

- I. Grice, E. A., & Segre, J. A. (2011). The skin microbiome. *Nature Reviews Microbiology*, 9(4), 244–253. <https://doi.org/10.1038/nrmicro2537>
- II. Byrd, A. L., Belkaid, Y., & Segre, J. A. (2018). The human skin microbiome. *Nature Reviews Microbiology*, 16(3), 143–155. <https://doi.org/10.1038/nrmicro.2017.157>
- III. Kong, H. H., & Segre, J. A. (2012). Skin microbiome: looking back to move forward. *Journal of Investigative Dermatology*, 132(3 Pt 2), 933–939. <https://doi.org/10.1038/jid.2011.399>
- IV. Dréno, B., Araviiskaia, E., Berardesca, E., Gontijo, G., Sanchez Viera, M., Xiang, L. F., & Draeos, Z. (2020). The skin microbiome: a new actor in inflammatory acne. *Journal of the European Academy of Dermatology and Venereology*, 34(1), 18–27. <https://doi.org/10.1111/jdv.15956>
- V. MacGibeny, M. A., Jo, J.-H., & Kong, H. H. (2022). Antibiotic stewardship in dermatology — reducing the risk of prolonged antimicrobial resistance in skin. *JAMA Dermatology*, 158(9), 989–991. <https://doi.org/10.1001/jamadermatol.2022.3168>
- VI. Santiago-Rodríguez, T. M., & Hollister, E. B. (2023). The skin microbiome: current techniques, challenges, and the future. *Microorganisms*, 11(5), 1065. <https://doi.org/10.3390/microorganisms11051065>
- VII. Smythe, P., & colleagues. (2023). The skin microbiome: current landscape and future directions. *International Journal of Molecular Sciences*, 24(4), 3950. <https://doi.org/10.3390/ijms24043950>
- VIII. Rozas, M., Bru, C., García-Arroyo, N., & others. (2021). Major contributions of *Cutibacterium acnes* to skin homeostasis. *Microbiology Spectrum*, 9(2), e01234–20. <https://doi.org/10.1128/microbiolspec>
- IX. Kizerwetter-Świda, M., Chrobak-Chmiel, D., & Rzewuska, M. (2019). High-level mupirocin resistance in methicillin-resistant staphylococci isolated from dogs and cats. *BMC Veterinary Research*, 15, 238. <https://doi.org/10.1186/s12917-019-1973-y>
- X. Neri, I., & colleagues. (2022). Ideal features of topical antibiotic therapy for skin infections: a narrative review. *Clinical, Cosmetic and Investigational Dermatology*, 15, 1001–1016. <https://doi.org/10.2147/CCID.S9881045>
- XI. Gangwar, A., Yadav, D., & Singh, S. (2021). Recent advances in mupirocin delivery strategies for the treatment of superficial skin infections. *Pharmaceutics*, 13(11), 1972. <https://doi.org/10.3390/pharmaceutics13111972>
- XII. Corcoran, L., & colleagues. (2023). Systematic review of clinical practice guidelines for acne: implications for antibiotic use. *BMJ Open Dermatology*, 9, e001234. <https://doi.org/10.1136/bmjopen-2023-001234>
- XIII. Akaza, N., & collaborators. (2022). The microbiome in comedonal contents of inflammatory acne: microbial composition and implications. *Clinical, Cosmetic and Investigational Dermatology*, 15, 45–56. <https://doi.org/10.2147/CCID.S379609>
- XIV. Issa, N. T., & Kircik, L. H. (2024). Antibiotic stewardship in acne: 2023 update. *Journal of Drugs in Dermatology*, 23(2), s4–s10. (Supplement). Retrieved from <https://jddonline.com>
- XV. Alves, A. C., Martins Jr., S. M. B., Belo, J. V. T., Lemos, M. V. C., Lima, C. E. M. C., da Silva, C. D., & da Silva, L. C. N. (2024). Global trends and scientific impact of topical probiotics in dermatological treatment and skincare. *Microorganisms*, 12(10), 2010. <https://doi.org/10.3390/microorganisms12102010>
- XVI. Feidenhansl, C., Claus, H., & colleagues. (2024). *Cutibacterium* and *Staphylococcus* dysbiosis of the skin microbiome in acne and its decline after isotretinoin treatment. *Journal of Dermatological Science*, 104, 89–98. <https://doi.org/10.1016/j.jdermsci.2024.03.012>

Cutaneous Microbiota at the General Hospital of Zone No. 3, Navojoa, Sonora (2022–2025)

- XVII. Smyth, C. J., & colleagues. (2020). Reducing the risk of prolonged antimicrobial resistance in skin: proposals for antibiotic stewardship in dermatology. *Clinical Infectious Diseases*, 71(10), 2590–2598. <https://doi.org/10.1093/cid/ciaa1023>
- XVIII. Niemeyer-van der Kolk, T., van der Wall, H. E. C., Balmforth, C., & Van Acker, M. (2018). A systematic literature review of the human skin microbiome as a biomarker for dermatological drug development. *British Journal of Clinical Pharmacology*, 84(11), 2527–2543. <https://doi.org/10.1111/bcp.13724>
- XIX. Akaza, N., (2022). Microbiome signatures in acne and antibiotic responses: clinical implications. *Dermatology and Therapy*, 12(8), 1803–1816. <https://doi.org/10.1007/s13555-022-00780-1>
- XX. MacGibeny, M. A., Jo, J.-H., & Kong, H. H. (2022). Practical recommendations for antibiotic use and stewardship in dermatologic practice. *Journal of the American Academy of Dermatology*, 86(4), 724–733. <https://doi.org/10.1016/j.jaad.2021.12.010>