International Journal of Research in Pharmacy and Pharmaceutical Sciences
www.pharmacyjournal.in
ISSN: 2455-698X
Received: 26-07-2026, Accepted: 25-08-2026, Published: 09-09-2026
Volume 11, Issue 3, 2026, Page No. 48-53

Comparative study of regulatory approaches for approved generic products across selected countries

Dr. Raviteja Bandla[1], Tirumalasetty Hemanth Kumar[2]
[1] Professor, HOD, Department of Pharmaceutical Chemistry, MAM College of pharmacy, Acharya Nagarjuna University, Andhra Pradesh, India
[2] Department of Regulatory Affairs, MAM College of pharmacy, Acharya Nagarjuna University, Andhra Pradesh, India

Abstract
Generic medicines are essential to improving access to quality-assured therapy while reducing treatment costs. Although regulatory authorities share the common objectives of assuring quality, safety and efficacy, the requirements, dossier structures, bioequivalence expectations, administrative procedures and post-approval change controls differ among jurisdictions.
Objective: To compare selected regulatory approaches used for generic pharmaceutical products, with emphasis on dossier requirements, common technical formats, bioequivalence and reference-product expectations, approval pathways, timelines, and post-approval change management.
Methods: A comparative regulatory review was undertaken using the supplied project chapters covering ASEAN countries, the European Union, Australia, Canada and the United States, together with the regulatory comparison tables and generic-product assessment information contained in the source material. The comparison focused on regulatory authorities, application pathways, CTD/ACTD structure, quality documentation, bioequivalence, stability, reference-product requirements, manufacturing controls and post-approval variations. Current official regulatory information from FDA, EMA, TGA, Health Canada and ASEAN was also used to contextualize the manuscript.
Results: The review identified a common scientific foundation across the selected jurisdictions, particularly the emphasis on pharmaceutical quality, bioequivalence, appropriate manufacturing controls and lifecycle oversight. However, meaningful differences remain in dossier organization, regional administrative requirements, reference-product selection, local bioequivalence expectations, stability documentation, submission procedures and post-approval change classification. Within ASEAN, the ACTD provides a harmonized structure, but country-specific administrative and technical requirements remain important. The supplied assessment of 25 generic products showed that queries differed by market, with stability/COPP and sample issues prominent in Malaysia, dissolution and translated-label issues prominent in Vietnam, and bioequivalence, method/validation, DMF/starting-material and stability questions prominent in Indonesia and Thailand.
Conclusion: Regulatory convergence has substantially reduced duplication, but harmonization has not eliminated country-specific requirements. A successful multi-country generic development strategy should therefore combine a common core dossier with a country-specific regulatory matrix, early reference-product assessment, robust bioequivalence planning, adequate stability data and proactive lifecycle management.

Keywords: Generic medicines, regulatory affairs, bioequivalence, common technical dossier, CTD, ASEAN, European Union, Australia, Canada, United States, post-approval changes

Introduction

Pharmaceutical products cannot be treated as ordinary commercial commodities because their quality, safety and effectiveness have direct implications for public health. Pharmaceutical regulation therefore combines legislative, administrative and technical procedures intended to ensure that medicines are safe, effective, of appropriate quality and accompanied by accurate product information. The supplied project material similarly emphasizes that national regulatory systems pursue broadly comparable public-health goals while differing in implementation, technical requirements and institutional structure.

A generic medicine is generally developed with reference to a previously authorized medicine. In the United States, generic applicants submit an Abbreviated New Drug Application (ANDA) and must demonstrate pharmaceutical equivalence, bioequivalence and the ability to manufacture the product consistently; an independent demonstration of the originator's clinical efficacy and safety is generally not required because the applicant relies on the reference product's established findings.

The European Union similarly provides an abridged pathway for generic medicines because the safety and efficacy of the active substance have already been established for the reference medicine. Applicants generally provide quality information and evidence that the generic produces equivalent exposure to the active substance.

Australia applies a comparable scientific principle. TGA requires generic medicines to be bioequivalent to the relevant reference product, and current guidance specifically addresses bioavailability, bioequivalence and biowaiver evidence. The Australian reference product is generally expected for generic registration, although an overseas reference product may be acceptable when identity with the Australian reference product is adequately demonstrated.

Health Canada likewise requires generic applicants to establish bioequivalence and pharmaceutical equivalence. Generic submissions are reviewed for quality, safety and

efficacy-related regulatory requirements and, when compliant, may result in a Notice of Compliance and Drug Identification Number.

In ASEAN, harmonization has been pursued through instruments including the ASEAN Common Technical Dossier (ACTD) and ASEAN Common Technical Requirements (ACTR). The ACTD provides a common format intended to reduce the time and resources required to prepare registration applications and to facilitate regulatory review and communication.

The supplied project material nevertheless shows that country-specific requirements remain important even within this harmonized framework.

The present study was therefore undertaken to consolidate the supplied regulatory information into a publication-oriented comparative review of generic-product regulatory approaches.

Aim and Objectives

Aim: To compare the regulatory approaches for approved generic pharmaceutical products across selected international jurisdictions and identify similarities, differences and practical regulatory considerations for multi-country registration.

Specific objectives:

- To review the regulatory framework and responsible authorities for generic medicines in selected jurisdictions.
- To compare CTD/ACTD dossier structures and the level of information expected for generic applications.
- To compare bioequivalence, reference-product, dissolution and stability requirements.
- To examine approval pathways and indicative regulatory timelines described in the supplied material.
- To evaluate post-approval change and lifecycle-management approaches.
- To identify recurring regulatory deficiencies and query patterns affecting generic-product submissions.
- To identify areas where regulatory convergence may reduce duplication while preserving country-specific public-health requirements.

Materials and Methods

1. Study design

This work was designed as a descriptive comparative regulatory review. It did not involve human participants, animals, clinical intervention or laboratory experimentation. The unit of analysis was the regulatory requirement or procedure applicable to generic pharmaceutical products in the jurisdictions represented in the supplied project material.

2. Source material

The primary source material comprised the supplied project chapters on the regulatory framework and comparison of ASEAN countries, EU post-approval requirements, Australia, and EU/Canada regulatory procedures, together with the title page and final conclusion chapter. The project material includes comparative tables, country-specific regulatory requirements, approval timelines, generic-product query patterns and post-approval change classifications. The project title identifies the work as a comparison of regulatory approaches for approved generic products.

3. Comparative parameters

The following parameters were extracted and compared: (i) regulatory authority; (ii) legislative and guideline framework; (iii) application route; (iv) CTD/ACTD structure; (v) quality/CMC requirements; (vi) nonclinical and clinical requirements where applicable; (vii) bioequivalence and biowaiver considerations; (viii) reference-product requirements; (ix) stability and dissolution; (x) batch and sample expectations; (xi) approval timelines; and (xii) post-approval variation/change-management procedures.

4. Data synthesis

The findings were synthesized narratively and in comparative tables. Numerical values were retained only where they were explicitly available in the supplied material. Because several source tables were embedded as figures or incompletely extracted tables, the manuscript does not reconstruct missing numerical cells or infer values that were not clearly available.

5. External regulatory contextualization

Current official regulatory sources were consulted to contextualize the supplied material for the United States, European Union, Australia, Canada and ASEAN. These sources were used to clarify current terminology and the continuing regulatory basis for generic medicines, while the project-specific observations and query patterns were retained as source-derived findings.

Results and Discussion

1. Common regulatory foundation

The comparison demonstrates a strong common foundation across jurisdictions. Regulators seek to ensure that marketed medicines meet appropriate standards of quality, safety and efficacy and that product information is accurate. The supplied introductory material explicitly notes that national drug-evaluation systems generally use comparable safety, quality and effectiveness criteria, while procedures and technical requirements may differ substantially.

For generic medicines, the major scientific bridge between the established reference product and the proposed product is bioequivalence, supported by pharmaceutical development, manufacturing controls, analytical testing and stability. This principle is explicitly reflected in current FDA, EMA, TGA and Health Canada descriptions of generic medicines.

Table 1: High-level comparison of generic-product regulatory approaches

Jurisdiction	Primary authority/framework	Generic pathway	Bioequivalence	Key distinguishing feature	Post-approval focus
United States	FDA; FD&C Act/21 CFR; ANDA	ANDA	Required to establish bioequivalence	Centralized FDA review; abbreviated pathway	PAS/CBE/annual-report categories for CMC changes
European Union	EMA + national competent authorities; EU legislation	Generic/hybrid procedures; centralized/decentralized/national routes as applicable	Required/abridged basis for generic applications	Highly harmonized regional framework	Type IA, IB and II variations; lifecycle management

ASEAN	National authorities within ASEAN harmonization framework	ACTD-based national applications	Country-specific implementation within harmonized framework	ACTD/ACTR harmonization with country-specific requirements	Country-specific variation and lifecycle controls
Australia	TGA; Therapeutic Goods Act 1989/Regulations 1990	Category 1/other applicable routes	Generic registration generally requires BE against Australian reference product	Reference-product and bridging considerations	Variation/change controls and ongoing ARTG oversight
Canada	Health Canada	Generic Drug Submission/ANDS	Required with pharmaceutical equivalence	Central review with NOC/DIN outcome	Lifecycle and post-market oversight

The table shows that the regulatory systems are not fundamentally different in their public-health objective, but the operational pathway is jurisdiction-specific. The project conclusion likewise reports similarities in parameters such as sample size and number of samples, alongside differences in document submission requirements.

2. ASEAN regulatory framework and ACTD

ASEAN pharmaceutical harmonization is built around cooperation among national regulatory authorities and common technical approaches. The supplied material describes the ASEAN Pharmaceutical Regulatory Policy, the ASEAN Pharmaceutical Regulatory Framework, the ASEAN Common Technical Dossier and the ASEAN Common Technical Requirements. These initiatives aim to reduce technical barriers, support access to quality medicines and improve regulatory efficiency. The ACTD and ICH CTD have similar overall objectives but differ in organization. In the supplied comparison, the regional administrative component contains application forms, legal documents, GMP-related information and labeling; the quality component covers drug substance and drug product information; nonclinical data are generally not required for ordinary generic applications; and clinical documentation is limited principally to the information necessary for generic equivalence, including bioequivalence where applicableThe study material also identifies important country-level differences. Malaysia is described as having mandatory process validation documentation and specific certificate requirements; Indonesia and Thailand have local bioequivalence expectations in the supplied material; Singapore permits ICH or ACTD eCTD pathways; and Cambodia and Vietnam have country-specific administrative and labeling requirements. The approval timelines reported in the supplied ASEAN table also demonstrate variability. For example, the material reports approximately 240 days for a bridged generic application in Singapore, 210–245 working days for new drugs in Malaysia, 8–12 months in practice for Vietnam, approximately six months for a generic in Cambodia, and approximately 300 days for a new drug in Indonesia. These values should be interpreted as source-reported timelines rather than universal current service standards.

3. Assessment of 25 generic products in ASEAN markets

The supplied project material reports an assessment of 25 generic approved products across ASEAN markets, with findings presented for Myanmar, Cambodia, Vietnam, the Philippines, Singapore, Thailand, Indonesia and Malaysia. The query patterns included translated labels, dissolution profiles, Certificates of Pharmaceutical Product (COPP)/samples, stability data, bioequivalence studies, method/validation and DMF/starting-material information. The source-derived interpretation is that Malaysia generated more queries concerning stability data and COPP/sample requirements; Vietnam generated more queries concerning dissolution testing and translated labels; and Indonesia and Thailand were more likely to generate questions involving bioequivalence studies, methods/validation, DMF or starting-material information and stability data. These findings have a practical implication for regulatory strategy: a harmonized core dossier should not be treated as a complete substitute for country-specific submission planning. Local requirements concerning samples, labels, stability, reference products and bioequivalence can create additional review cycles if they are not addressed before submission.

4. European Union regulatory approach

The EU regulatory system combines centralized and national elements. The supplied material describes marketing authorization as a benefit-risk assessment based on quality, safety and efficacy and identifies national, mutual-recognition/decentralized and centralized routes. For certain categories of medicines, the centralized procedure provides a single EU-wide authorization following scientific assessment. For generic medicines, EMA states that applicants generally rely on the established safety and efficacy of the reference medicine and provide quality information and evidence of equivalent systemic exposure. Post-approval management is a particularly structured component of the EU system. The supplied material describes Type IA minor variations, Type IB variations and Type II major variations. Type IA changes follow a 'do and tell' principle, whereas Type II changes require regulatory approval before implementation. The supplied EU data also indicate that validation deficiencies remain an important source of regulatory queries. In one source period, 48% of submissions triggered requests for clarification or additional information, with frequent problems involving product-information annexes, missing or incorrect modules and application-form deficiencies. A later period showed a lower 34% rate but continued similar categories of validation problems. The regulatory lesson is that technical scientific adequacy alone is insufficient. Administrative completeness, accurate application forms, correct module placement and consistent product information are important determinants of submission quality.

5. Australia: generic registration and bioequivalence

The Therapeutic Goods Administration (TGA) regulates therapeutic goods in Australia. The supplied material describes pre-market assessment, manufacturer licensing and post-market surveillance as core elements of the Australian system. The TGA's generic medicine framework is based on the requirement that a generic be bioequivalent to the existing reference medicine. Current TGA guidance states that registration of a new generic medicine generally requires demonstration of bioequivalence against the Australian reference product, although an overseas reference product may be accepted when identicality with the

Australian product is demonstrated. The supplied Australian table reports requirements involving GMP clearance, DMF or CEP/LoA documentation, reference-product assessment, batch requirements, process validation, stability, photostability, multimedia dissolution and samples. It also reports that overseas and Australian reference products should be demonstrated to be identical when an overseas reference product is used. The supplied material identifies Category 1 applications as including new medicines, new dosage forms, new strengths and new generics, while Category 2 can be used when specified acceptable-country approvals and evaluation reports are available. Category 3 concerns certain quality changes that do not require clinical, nonclinical or bioequivalence data. Current TGA guidance confirms that the registration process is based on CTD-format applications and that category-specific procedures and timelines apply.

6. Canada regulatory approach

Health Canada regulates medicines through a framework covering drug submissions, regulatory review, compliance and post-market activities. The supplied material describes Health Canada as the responsible authority and identifies the management of drug submissions and applications as a central procedural framework. Health Canada's current public information states that generic manufacturers submit a generic drug submission, demonstrate bioequivalence to the brand-name drug and provide information on ingredients, manufacturing, testing and lot release. A compliant product may receive a Notice of Compliance and Drug Identification Number. The supplied comparison of reference-product bridging indicates that physicochemical analysis and dissolution profiles are used in Europe, Australia and Canada, while de-formulation/reverse engineering is described as mandatory in Australia but voluntary in Canada.

7. United States regulatory approach

The United States uses a highly centralized regulatory model under FDA. For generic medicines, the principal abbreviated route is the ANDA. Current FDA information states that an ANDA must demonstrate pharmaceutical equivalence and bioequivalence and show that the product can be consistently and correctly manufactured. The supplied project material gives particular attention to post-approval CMC changes. Under the described framework, major changes require a prior approval supplement, moderate changes may require a CBE supplement, and minor changes may be reported in an annual report. The project also describes a risk-based CMC Post Approval Management Plan intended to support predictable future changes by linking product and process knowledge with regulatory commitments.

8. Reference product, dissolution and stability considerations

Reference-product selection is a major source of cross-country complexity. The supplied comparative table reports that Europe, Australia and Canada use physicochemical analysis and dissolution profiles for reference-product bridging, while the extent and mandatory nature of de-formulation differ. For Australia, the supplied data describe accelerated stability at 40°C/75% RH for six months, intermediate stability at 30°C/65% RH for six months, and long-term conditions of 25°C/60% RH or 30°C/65% RH depending on the reference-product storage condition. Multimedia dissolution is described at pH 1.2, 4.5 and 6.8, including quality-control media. These requirements illustrate why generic development programs should establish the reference-product strategy before pivotal formulation and bioequivalence work. Differences in reference products or market-specific expectations can otherwise generate bridging studies, additional analytical work or regulatory queries.

9. Post-approval and lifecycle management

Post-approval management is a common regulatory responsibility across the jurisdictions reviewed, although the terminology and procedural categories differ. The supplied EU material classifies changes into Type IA, Type IB and Type II variations, with increasing regulatory scrutiny according to the potential effect on quality, safety or efficacy. The supplied Australian material describes prior-approval documentation for manufacturing-site changes, including process validation, GMP certification, comparative batch analysis, dissolution profiles, process comparison and analytical-method validation. The United States framework similarly categorizes CMC changes by regulatory impact, while the project material emphasizes risk-based lifecycle planning. Across systems, the central principle is lifecycle control: approval is not the end of regulatory responsibility. Marketing authorization holders must maintain the dossier, assess changes, maintain manufacturing compliance, monitor product quality and safety, and communicate relevant changes to regulators.

Table 2: Selected regulatory considerations for a multi-country generic development program

Regulatory element	Common expectation	Important jurisdictional variation	Recommended development action
Core dossier	CTD-based quality and administrative information	ACTD/ICH CTD and regional Module 1 requirements differ	Build a global core dossier plus country-specific Module 1 matrix
Bioequivalence	Evidence of equivalence to reference product	Reference product and local-study expectations differ	Confirm reference product and BE strategy before study initiation
Dissolution	Comparative dissolution supports pharmaceutical equivalence	Media, pH conditions and bridging expectations differ	Plan comparative profiles early and retain complete datasets
Stability	Demonstration of shelf-life and storage conditions	Climatic conditions and required time points vary	Prepare a jurisdictional stability matrix
Manufacturing	GMP and validated process/control strategy	Change-control categories and supporting data differ	Maintain robust CMC knowledge and lifecycle change plan
Post-approval	Regulatory notification/approval of relevant changes	EU Type IA/IB/II; US PAS/CBE/annual reporting; country-specific systems elsewhere	Classify changes early and maintain regulatory commitments

10. Overall comparative interpretation

The comparative evidence indicates that regulatory convergence is substantial but incomplete. The scientific core is similar: quality must be demonstrated, the generic must be appropriately comparable with the reference product, manufacturing must be controlled and post-market risks must be managed. The differences arise primarily in the administrative implementation of these principles, including the structure of the dossier, the identity and source of the reference product, local bioequivalence expectations, stability conditions, sample submission, labeling and the classification of post-approval changes.

ASEAN illustrates the advantages and limitations of regional harmonization. ACTD and ACTR reduce duplication and establish common expectations, yet the supplied data show that individual national authorities continue to ask different questions.

The EU provides a more advanced example of regulatory harmonization, particularly in variation management, while the United States demonstrates a centralized federal model and Australia and Canada demonstrate additional reliance and bridging mechanisms. These differences are important for sponsors planning simultaneous or sequential international generic launches.

Practical Regulatory Implications

1. Develop a regulatory intelligence matrix. Country-specific requirements should be mapped before formulation finalization and before preparation of the pivotal dossier.
2. Lock the reference-product strategy early. Differences in reference-product identity and acceptability can influence pharmaceutical equivalence, dissolution, bioequivalence and bridging requirements.
3. Treat Module 1 as a critical component. Administrative deficiencies, labeling inconsistencies and missing declarations can generate avoidable validation queries even when the scientific dossier is strong.
4. Prepare a global stability strategy. Stability conditions and supporting expectations should be mapped against each intended market rather than assumed to be identical.
5. Build lifecycle management into development. Post-approval changes should be classified and supported using a risk-based strategy from the beginning of product development.
6. Use harmonization without assuming uniformity. ACTD/CTD harmonization can reduce duplication, but national administrative and technical requirements must still be verified for every intended market.

Limitations

This study is a descriptive comparative regulatory review rather than a systematic review or quantitative meta-analysis. The supplied project files contain some tables and figures whose numerical values were not completely recoverable in text form; consequently, missing values were not reconstructed. Some regulatory statements in the supplied chapters reflect the regulatory environment at the time those materials were prepared and may not represent the latest national requirements. Current official sources were therefore used for contextual verification of selected generic-product principles. The study should not be interpreted as legal advice or as a substitute for country-specific regulatory consultation before submission.

Conclusion

The comparative study demonstrates that regulatory authorities across the selected jurisdictions share the fundamental objective of protecting public health through assurance of pharmaceutical quality, safety and efficacy.

Generic-product pathways are consequently built around an abbreviated evidence model in which the established reference medicine provides the basis for reliance, while the applicant demonstrates pharmaceutical quality and equivalence through appropriate CMC, bioequivalence, dissolution and stability evidence.

Despite this common scientific foundation, significant differences remain in dossier organization, administrative documentation, reference-product selection, bioequivalence implementation, stability requirements, sample submission, approval timelines and post-approval change procedures.

The supplied ASEAN assessment of 25 generic products illustrates that country-specific regulatory queries remain common even within a harmonized regional framework.

Therefore, the most appropriate strategy for international generic-product registration is not a completely separate dossier for every market, nor a single unchanged global dossier.

A practical approach is a harmonized global core dossier supported by a country-specific regulatory matrix covering administrative documents, reference products, bioequivalence, stability, labeling, samples, fees, timelines and lifecycle changes.

Greater international convergence and mutual reliance may further reduce duplication and improve access to quality-assured generic medicines, but such convergence should continue to preserve scientifically justified national public-health requirements.

References

1. U.S. Food and Drug Administration. Generic Drugs: Questions & Answers. FDA. Current official regulatory information on ANDA requirements and bioequivalence.
2. U.S. Food and Drug Administration. FDA List of Authorized Generic Drugs / Abbreviated New Drug Application resources. FDA.
3. European Medicines Agency. Generic and hybrid medicines. EMA. Official information on generic and hybrid applications.
4. European Medicines Agency. Marketing authorisation. EMA. Official information on EU marketing-authorisation procedures.
5. Therapeutic Goods Administration. Prescription medicines registration process. Australian Government Department of Health and Aged Care.
6. Therapeutic Goods Administration. Prescription medicines: registration of new generic medicines and biosimilar medicines. Australian Government Department of Health and Aged Care.
7. Therapeutic Goods Administration. Providing biopharmaceutic data for medicine applications. Australian Government Department of Health and Aged Care.

8. Therapeutic Goods Administration. Guideline on the investigation of bioequivalence. Australian Government Department of Health and Aged Care.
9. Health Canada. Access to Generic Drugs in Canada. Government of Canada.
10. ASEAN Secretariat. ASEAN Common Technical Dossier. ASEAN Secretariat, 2016.
11. Rägo L, Santoso B. Drug regulation: history, present and future. In: Guide to Good Prescribing / regulatory literature cited in the supplied project material.
12. Lezotre PL. International Cooperation, Convergence and Harmonization of Pharmaceutical Regulations. Academic/technical literature cited in the supplied project material.
13. Worthen DB. Pharmaceutical legislation and regulation. Source cited in the supplied project material.
14. World Health Organization. Pharmaceutical regulatory systems and drug regulatory authority functions. WHO literature cited in the supplied project material.
15. Van Norman GA. Drugs, devices, and the FDA: Part 1 and related regulatory comparison literature cited in the supplied project material.
16. Bloem LT and colleagues. European post-approval regulatory actions and lifecycle decision-making, as cited in the supplied project material.