INTEGRATION OF TRADITIONAL NATURAL MEDICINE AND PHYTOTHERAPY INTO THE PHARMACOLOGY CURRICULUM II

INTEGRACIÓN DE LA MEDICINA TRADICIONAL NATURAL Y FITOTERAPIA EN EL PLAN DE ESTUDIOS DE FARMACOLOGÍA II

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ABSTRACT

A didactic module on Traditional Natural Medicine and Phytotherapy was proposed for integrating the Pharmacology syllabus II, together with the principle of education by practicing at work to strengthen students' professional skills. The methodology was descriptive-propositional, including a systematic literature review (2020-2025) and an analysis of nine university curricula which revealed only a secondary presence of these contents. This curricular integration makes possible to have more competent, holistic, and critical health professionals able to lead a safe and rational use of Phytotherapy in clinical practice while ensuring patient safety. Validation by specialists confirmed proposal's high relevance, consistency and applicability.

KEYWORDS: curriculum integration; medical education; pharmacology; traditional natural medicine

RESUMEN

Se propuso un módulo didáctico sobre Medicina Tradicional Natural y Fitoterapia para integrar en el plan de estudios de Farmacología II, alineándolo con el principio de educación al trabajo para fortalecer las competencias profesionales de los estudiantes. La metodología fue descriptiva-propositiva, que incluyó una revisión sistemática de literatura (2020-2025) y un análisis de nueve planes de estudio universitarios, se diagnosticó una presencia secundaria de estos contenidos. Esta integración curricular forma profesionales de la salud más integrales, críticos y competentes capaces de liderar un uso seguro y racional de la fitoterapia en la práctica clínica al garantizar la seguridad del paciente. La validación por especialistas confirma la alta pertinencia, coherencia y aplicabilidad de la propuesta.

PALABRAS CLAVE: integración curricular; educación médica; farmacología; medicina tradicional natural

INTRODUCTION

The World Health Organization understands Traditional Medicine as the sum of knowledge, skills and practices based on the theories, beliefs and indigenous experiences of different cultures, explicable or not, which are used in health maintenance and the prevention, diagnosis, improvement or treatment of physical and mental illnesses (WHO, 2023).

Traditional Natural Medicine (henceforth TNM) is a fundamental pillar of health systems in many cultures and is the first line of care for a significant percentage of the world's population. The World Health Organization (henceforth WHO) reports that up to 80% of the population in some Asian and Latin American countries depends on TNM for their primary health needs. This therapeutic paradigm, which includes phytotherapy, is based on the use of natural resources, mainly medicinal plants, whose knowledge has been transmitted from generation to generation (World Health organization, 2025).

In parallel, Pharmacology, as the science that studies the history, origin, properties and effects of drugs, has experienced an extraordinary advancement, supported by the scientific method (Ritter et al., 2020); however, its teaching, particularly in the Pharmacology II course, which usually delves into organic systems and specific drugs, often focuses predominantly on chemically synthesized medications, leaving aside the vast universe of active principles of plant origin and their validated therapeutic applications. It is at this intersection that the opportunity for integration arises.

Phytotherapy, understood as the use of plant-derived products for therapeutic purposes, is the most solid bridge between TNM and modern pharmacology (Velázquez et al., 2024). Many conventional drugs, such as digoxin, morphine or aspirin, have their origin in ethnobotanical knowledge (Heinrich et al., 2020). Ignoring this connection in academic training generates a disconnection between scientific knowledge and the real health practices of the population. This integrative approach aligns perfectly with the concept of Education for Work, a pedagogical principle that links academic training with the competencies and skills required in the real work environment (Moreno et al., 2021).

A study showed that in the United States, more than 30% of patients attending medical consultation simultaneously consume some herbal-based product, and more than 40% often do so without informing their physician (Rashrash et al., 2017). In Lithuania, according to data collected from 2019 to 2021, 77.8% used herbal preparations based on the pharmacist's recommendation or their own initiative (Sile et al., 2023).

In Cuba, in this regard, various strategies have been outlined in recent years to stably and gradually link the resources of natural and traditional medicine with wide coverage, both in Primary Health Care (PHC) and in hospital care. The prevalence of consumption is high, with a prevalence of use between 60 and 85% (Dueñas et al., 2023).

Training professionals capable of critically evaluating, safely recommending and managing interactions between herbal medicines and conventional drugs is not an option but an imperative need for patient safety and treatment efficacy.

However, this reality contrasts with a significant training gap: most Pharmacology II curricula do not formally and systematically integrate content on TNM and Phytotherapy. This omission means that future doctors, pharmacists and nurses are not sufficiently prepared to safely and effectively address the high population consumption of herbal supplements and herbal medicines they will encounter in their clinical practice, constituting an educational problem with direct implications for patient safety and quality of care.

This work seeks to close this educational gap, training more complete, competitive professionals aligned with contemporary health demands. Its general objective is to propose an integrative-didactic module on Traditional Natural Medicine and phytotherapy to strengthen the professional competencies of Pharmacology II students, aligning it with Education for Work principles, through a review of updated scientific evidence, analysis of labor market needs and the structuring of theoretical-practical content applicable to real clinical scenarios.

DEVELOPMENT

A descriptive-propositional study was carried out following the route proposed by (Llanos & Alvarado, 2023), structured in four phases:

1. Systematic Literature Review (2020-2025): A search was conducted in PubMed, Scopus, and SciELO databases using MeSH terms: «Phytotherapy», «Education, Pharmacy», «Plants, Medicinal», «Medicine, Traditional» and their equivalents in Spanish. Original articles and conference papers published in the last five years addressing the integration of TNM into pharmacological or medical education were included.

2. Analysis of Formative Needs: 9 curricula and programs for the Pharmacology II course in different universities in Europe, Latin America including Cuba were considered (Aldana et al., 2021; Serra & Deguisa, 2025; Sollet et al., 2023; University of Compostela, 2025; University of Granada, 2025; University of Sonora, 2025; Leonardo DaVinci University, 2025; National Autonomous University of Mexico, 2025). Topics, objectives and analysis of correspondence with the graduate's exit profile

were correlated. This course was selected as it belongs to the fourth year of study in Medical Sciences, where the foundations of integral knowledge are being established to identify the presence and depth of content related to TNM and phytotherapy.

3. Design of the Proposal: Based on the previous phases, a 30-hour module was designed, including learning objectives, thematic content, methodological strategies (lectures, botanical identification workshops, analysis of clinical cases on interactions) and a competency-based evaluation system.

4. Validation by Expert Judgment: Once the module was designed, its validation proceeded using the expert judgment technique. A panel of 5 specialists with over 10 years of experience in Pharmacology and Natural and Traditional Medicine was intentionally selected. Selection criteria included relevant professional experience and publications in the area. Experts evaluated the proposal through an instrument with a Likert scale (1 to 5) that assessed the module's pertinence, internal coherence, applicability and relevance, plus space for qualitative observations and suggestions.

The literature review showed a growing consensus on the need to incorporate TNM into higher education in Medical Sciences. A cross-sectional study in Brazil revealed that 71% of pharmacy students considered their training in phytotherapy «insufficient» or «very insufficient» (de Morais et al., 2021).

On the other hand, the analysis of curricula showed that only 2 of the 9 curricula reviewed included a specific topic on phytotherapy, with an average workload that did not exceed 5% of the total subject hours.

In contrast, evidence on population use is overwhelming. A 2023 meta-analysis confirmed that the prevalence of herbal product use in patients with chronic diseases in Latin America is 40%, highlighting its use for digestive, respiratory conditions and as a complement in oncology (Yang et al., 2023).

Based on these findings, the module proposal was designed, structured into four units. An integrative didactic module is a self-contained and flexible learning unit (Beraza & Cerdeiriña, 2010), specifically designed for student to develop competencies through deliberate connection of knowledge, skills and perspectives from different disciplines or areas (Beane, 2010). Its goal is to overcome the fragmentation of knowledge, presenting a central theme or problem in a holistic and contextualized way, fostering deeper and more meaningful learning. It is a compound concept set up from the intersection of several pedagogical ideas; their combination is a practical application of well-established pedagogical principles by authors working on these topics. The units are described below:

Unit 1: Fundamentals of TNM and Legal Framework

Learning Objectives: To define the concepts of Traditional Natural Medicine and phytotherapy, differentiating them from other alternative therapies. To recognize the historical, cultural and socioeconomic importance of TNM at global and local levels. To identify and analyze the national and international legal framework regulating the use, registration and dispensing of phytotherapeutic products.

Thematic Content:

Topic 1.1: Key concepts: Traditional Medicine, Complementary and Alternative Medicine, Phytotherapy, Natural Products.

Topic 1.2: History and evolution of TNM. Epistemological bases. Ethnobotany and Ethnopharmacology as discovery tools.

Topic 1.3: Current situation, Usage statistics and Regulatory framework (MINSAP Resolution No. 452/2019).

Methodological Strategies:

Interactive Lecture: Presentation of fundamental concepts, enriched with real statistical data on their global use.

Analysis of Legal Cases: Real or simulated cases will be presented on the registration of an herbal drug, a health alert due to contamination of an herbal product or an ethical conflict in recommendation.

Competency-based Evaluation System:

Individual critical essay: «Analyze the importance of a robust regulatory framework for phytotherapeutic products in your country, considering patient safety perspectives, population access and economic development».

Evaluation: Analysis capacity, integration of regulations, argumentative clarity and correct use of bibliographic references will be assessed.

Unit 2: Active Principles, Pharmacokinetics and Pharmacodynamics of Phytomedicines

Learning Objectives: To classify the main groups of active principles of plant origin and relate them to their pharmacological activity. To explain the absorption, distribution, metabolism and excretion processes of phytomedicines, identifying their particularities. To analyze the mechanisms of pharmacological action of phytomedicines, from a molecular and systemic perspective.

Thematic Content:

Topic 2.1: Active Principles: Alkaloids, Carbohydrates, Glycosides, Flavonoids, Tannins, Essential Oils, Resins. Chemical structure and structure-activity relationship.

Topic 2.2: Pharmacokinetics in Phytotherapy: Factors influencing bioavailability (preparation form, plant matrix). Concept of "phytocomplex" and its debate.

Topic 2.3: Pharmacodynamics: Mechanisms of action. Synergy and antagonism among plant components.

Methodological Strategies:

Lecture: Exposition of pharmacological bases, using concrete examples such as morphine (alkaloid) or digoxin (glycoside).

Botanical and Phytochemical Identification Workshop: In a laboratory or with dried plant material, students will morphologically identify common plants and associate their active principles with reported therapeutic activity.

Problem-Solving Session: Exercises to calculate equivalent doses from standardized extracts and predict pharmacokinetic behavior based on the liposolubility of an active principle.

Competency-based Evaluation System:

Laboratory report from the workshop + pharmacokinetic problems questionnaire.

Evaluation: To the report, accuracy in identification, correctness in active principle-effect association and quality of observations will be assessed. For the questionnaire, correct applicability of pharmacokinetic models will be evaluated.

Unit 3: Scientific Evidence of Medicinal Plants by Systems (Cardiovascular, Nervous, Digestive)

Learning Objectives: Critically evaluate the available scientific evidence on the efficacy and safety of frequently used medicinal plants in the cardiovascular, nervous and digestive systems. To apply knowledge of the evidence to justify a recommendation or a contraindication in a simulated clinical scenario.

Thematic Content:

Topic 3.1: Cardiovascular System: Allium sativum (Garlic) for hypertension and hyperlipidemia; Orthosiphon stamineus Benth (Kidney tea) for mild heart failure. Evidence and precautions.

Topic 3.2: Nervous System: Justicia pectoralis Jacq (Tilo) for mild to moderate depression; Passiflora incarnata L (Passiflora) for insomnia. Mechanisms and critical interactions.

Topic 3.3: Digestive System: Aloe vera (Aloe) for constipation; Matricaria recutita (Chamomile) for dyspepsia; Mentha piperita (Peppermint) for irritable bowel syndrome.

Methodological Strategies:

Lecture: Presentation of evidence by systems, highlighting the level of evidence for each plant.

Analysis of Clinical Cases: Groups will be formed to analyze cases such as «Hypertensive patient consuming garlic and presenting bleeding risk» or «Depressed patient consuming Tilo and anticoagulants».

Guided Bibliographic Search and Analysis: Students, in groups, will search for the latest meta-analysis or clinical trial on an assigned plant and present a critical summary to their peers.

Competency-based Evaluation System:

Resolution of a complex clinical case in teams and presentation of the bibliographic analysis.

Evaluation: The ability to identify the problem, search and select relevant evidence, make evidence-based therapeutic decisions and communicate conclusions clearly and structured will be assessed.

Unit 4: Safety, Pharmacological Interactions and the Role of the Health Professional

Learning Objectives*:* To identify the most common adverse reactions and pharmacological interactions associated with phytomedicines. To develop effective communication skills for taking a history on TNM use and patient education. To assume the role of the health professional as risk manager and educator in the rational use of phytotherapy.

Thematic Content:

Topic 4.1: Safety in Phytotherapy: Direct toxicity, allergic reactions, contaminants (heavy metals, pesticides, adulteration with drugs).

Topic 4.2: Herb-Drug Interactions: Mechanisms (induction/inhibition of cytochrome P450, modulation of transporters like P-gp). High-risk examples.

Topic 4.3: Education for Work: How to ask about TNM use in the anamnesis. Communication strategies to advise or discourage a product. Use of reliable databases.

Methodological Strategies:

Lecture: Exposition of interaction mechanisms and risk profiles of the most problematic plants.
Clinical Simulation Workshop: Students will practice in simulated scenarios:

- Scenario 1: Anamnesis to a «patient» who conceals the use of herbal supplements.
- Scenario 2: Explaining to a «patient» why they should discontinue Tilo if they consume medications with an [anticoagulant] effect.

Analysis of Pharmacovigilance Cases: Review of real health alerts published by regulatory agencies (US FDA, European Medicines Agency (EMA), local agency on herbal products.

Competency-based Evaluation System:
Practical evaluation of the clinical simulation using an observation rubric.

Evaluation

Criteria to be evaluated:

- Technical skill: Correctly identifies interactions/risks.
- Communication: Expresses clearly, with empathy and language accessible to patient.

- Professionalism: Maintains an ethical attitude and respect for patient's beliefs.
- Resolution: Offers a clear and safe alternative or action plan.

The proposed evaluation combines a theoretical exam (40%), a virtual herbarium of 20 common-use plants (30%) and the resolution of a simulated clinical case on a drug-herb interaction (30%).

Design and Application of the Validation Process by Expert Judgment

To validate the proposal, an expert judgment methodology was implemented. The expert judgment technique is a social research technique aimed at obtaining a reliable group opinion from a panel of experts. It is a method of structuring communication among a group of people who can provide valuable contributions to solving a complex problem (Suárez & Telles, 2024).

It comprised four fundamental stages: formation of a panel of five specialists in Pharmacology and Natural Medicine, selected through competence and experience criteria; design of an evaluation instrument with a Likert scale and open questions; application of the instrument to assess the module's pertinence, internal coherence, applicability, and relevance and integral analysis of responses using quantitative and qualitative methods. The validation process reflected a high level of consensus among specialists.

On a scale of 1 to 5, the module obtained an overall mean score of 4.7; the best-rated criteria were pertinence (4.8) and relevance for training (4.8), followed by internal coherence (4.6) and applicability (4.5). Qualitatively, experts highlighted the updating of scientific evidence, the practical orientation towards real clinical scenarios and the alignment with the Education for Work principle as main strengths. Suggestions focused on increasing the number of hours for the simulation workshop and delving deeper into interactions with high-risk medications, adjustments that were incorporated into the final version of the proposal.

The results confirm the existence of a significant disparity between the widespread use of TNM in real clinical practice and the scant regulated training received by Pharmacology students. This gap represents a risk to patient safety, as professionals lack the tools to advise or warn about the use of these products.

The presented proposal aligns with WHO recommendations on integrating TNM into national health systems and directly responds to the Education for Work principle. By exposing students to simulated clinical cases and the analysis of scientific evidence, transversal competencies highly valued in the labor market are developed, such as critical thinking, patient communication and information management on complementary therapies.

Validation by expert judgment corroborates the perceived solidity and usefulness of the proposal. The high scores in pertinence and relevance underline that the module addresses a genuine formative need and is aligned with the demands of the current professional profile. Qualitative comments reinforce that the design is pedagogically sound and applicable, validating the theoretical-practical integration approach and the link with Education for Work. The suggestions received allowed optimization of the proposal, ensuring its suitability for implementation. The main limitation of this study is that it is a theoretical proposal, whose implementation and efficacy must be validated in a future intervention study. However, the design is based on real data and recent scientific evidence, which increases its potential applicability and relevance. Future research should evaluate the impact of this integration on professional performance and patient clinical outcomes.

CONCLUSIONS

This study demonstrates that the integration of Traditional Natural Medicine and phytotherapy into the Pharmacology II curriculum is an imperative educational need and a direct response to the demands of the current health context. The evidence gathered confirms the existence of a profound disconnection between academic training, focused on synthetic drugs and clinical reality, where a high percentage of the population uses herbal products. Its value lies in a structure that transcends the theoretical, focusing on the development of practical

competencies such as patient communication, critical evaluation of literature and management of interactions that are directly transferable to the work environment. This curricular integration trains more well-rounded, critical and competent health professionals, capable of leading the safe and rational use of phytotherapy. Closing this educational gap directly impacts the quality of care and patient safety, constituting a necessary step towards a more articulated health system, respectful of traditional knowledge and rigorously scientific.

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