

# Textbook of INDUSTRIAL PHARMACOGNOSY



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DR. KUMARASWAMY GANDLA, SAYYADA SALEHA MOMINA,  
DR. K.SUDHEER KUMAR & DR. K. SURESH

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Dr. Kumaraswamy Gandla, Sayyada Saleha Momina,  
Dr. K. Sudheer Kumar & Dr. K. Suresh



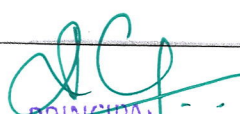
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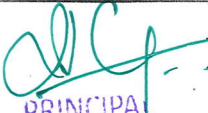
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Dr. Kumaraswamy Gandla (M.Pharm.Ph.D.) currently working as Professor and Head, Department of Pharmaceutical Analysis at Chaitanya (Deemed to be University), Hanumakonda, Telangana, India. He has published more than 25 patents, 4 Text Books published, 172 Research articles in national and international journals and also has presented & attended several national and International conferences. He guided more than 60 students B.Pharm. and M.Pharm. and few Research scholars pursuing Ph.D. under his supervision. He is an Editorial board member and regular reviewer in the editorial board for 75 national, International journals and also life member of Laboratory Animal Scientists' Association-India, (LASA), Association of Chemistry Teachers (ACT), & Indian Society of Analytical Scientists, Indian Society for Technical Education, Association of Pharmaceutical Teachers of India (APTI) and The Indian Pharmaceutical Association (IPA)



SAYYADA SALEHA MOMINA (M.Pharm., Ph.D) currently working as Assistant Professor, Department of Pharmacognosy and Phytochemistry at Max Institute of Pharmaceutical Sciences, Khammam, Telangana, India. B.Pharm & M.Pharm (Gold medalist) from Kakatiya University, Warangal. She has published 25 Research articles in various National and International journals, published an Australian Patent grant. She has presented and participated several National and International conferences. Having a lifetime membership in Indian Pharmaceutical Association (IPA).



Dr. K.SUDHEER KUMAR M.Pharm., Ph.D currently working as Associate Professor and Head, Department of Pharmacognosy at Dr. Samuel George Institute of Pharmaceutical Sciences Markapur, Prakasam District Andhra Pradesh, India. He has published 15 Research articles in national and international journals and also has presented & attended several national and International conferences. He guided 20 B.Pharm. & M.Pharm. Students for project works.



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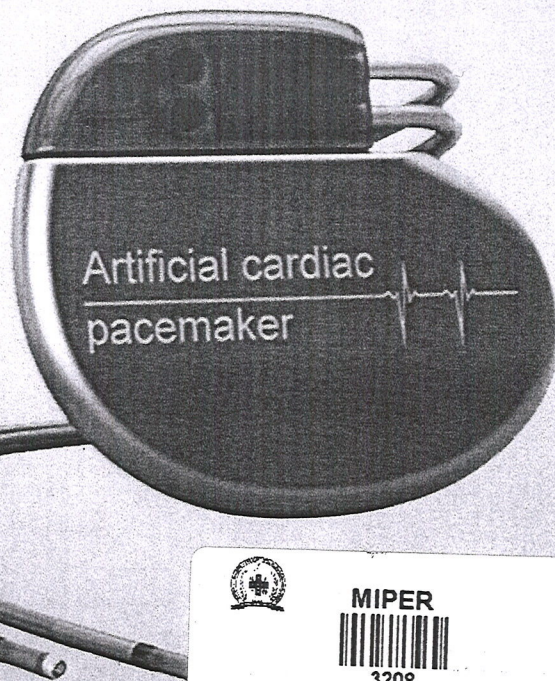
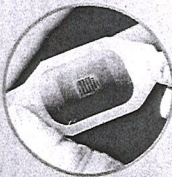
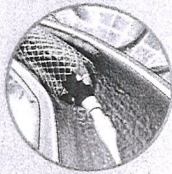
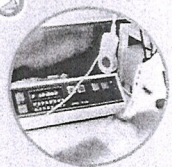
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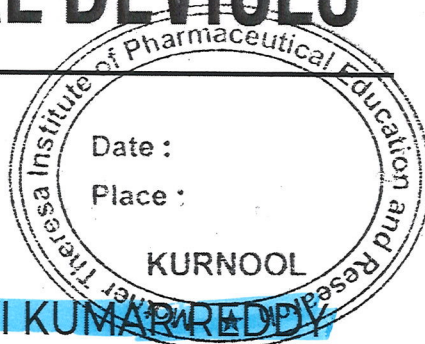
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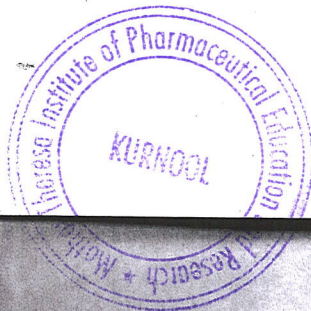
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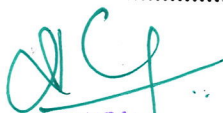
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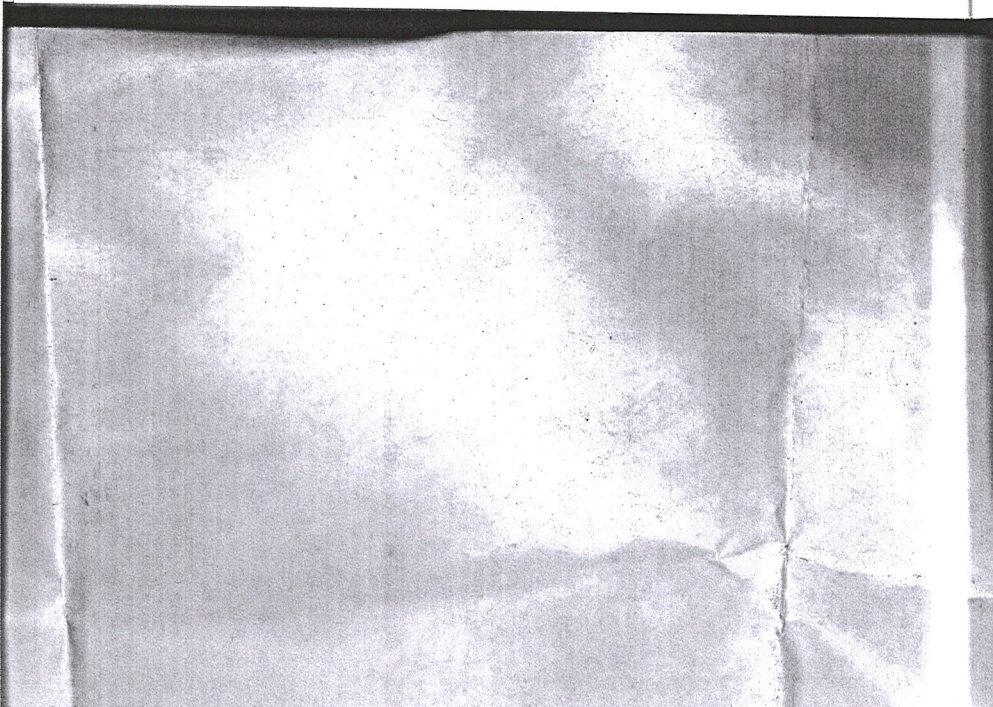
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# A Hand Book on Medical Devices

Medical devices have revolutionized the practice of medicine, enabling earlier and more accurate diagnoses, minimally invasive treatments, and improved quality of life for patients. These devices assist in the prevention, diagnosis, monitoring, treatment, and management of various medical conditions. They range from simple, handheld devices to sophisticated, complex systems that integrate advanced technologies. The importance of medical devices lies in their ability to bridge the gap between medical knowledge and patient care, translating scientific advancements into practical applications. This book aims to provide a comprehensive overview of medical device development and applications. It will delve into various aspects, including design principles, regulatory considerations, clinical validation, manufacturing processes, quality assurance, and post-market surveillance. Each chapter will focus on specific topics within the broader domain of medical devices, providing insights, case studies, and practical guidance for professionals involved in this field.

## About the Author



Dr. Ravi Kumar is a Professor & Principal of Mother Theresa Institute of Pharmaceutical Education & Research (MIPER), Kurnool, AP. Dr. Ravi Kumar has more than 15 years of experience working in the pharmaceutical education sector. The field of pharmaceutical regulatory affairs is one of his main areas of competence. Dr. Ravi Kumar led more than 20 Post Graduate students exclusively on regulatory affairs during this time, he produced high-quality projects and scientific papers. He taught Regulations of Drugs, Biologicals, Nutraceuticals, and Medical Devices to M. Pharmacy (Regulatory Affairs) students. Writing books on pharmaceutical regulatory affairs, which can help students of B. Pharmacy and M. Pharmacy by providing the fundamental information and also serving the needs of examination purposes, became a subject of great interest to the author.

You may reach the author at:

✉ [ravikumarreddy.juturi@gmail.com](mailto:ravikumarreddy.juturi@gmail.com)




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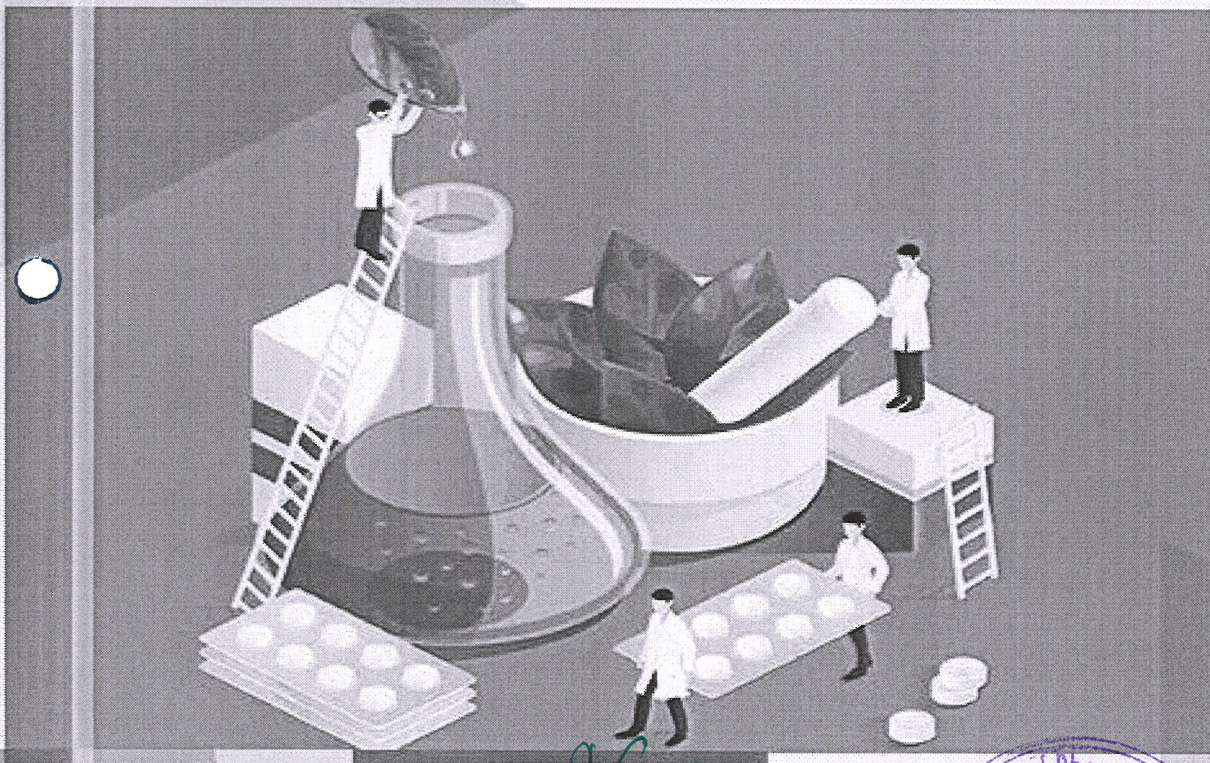
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# A TEXT BOOK FOR PHARMACOLOGY

Mr. Raghuv eer Rodda, Mrs. M Rehana Bhanu



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## PREFACE

Our dedication to using pharmacology specialists to maintain an up-to-date and thorough textbook has continued in the form of the sixth edition of Modern Pharmacology With Clinical Applications. The work focuses on the clinical use of medications within a context of the main principles of pharmacology and is written with the intent that it be utilized over the course of a single semester. It's designed for both graduate and undergraduate students in fields including medicine, osteopathy, dentistry, pharmacy, and advanced nursing.


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## 2

## Mechanisms of Drug Action

RECEPTORS

Most medications start their impact in cells by combining with a specific molecular structure either on the cell's surface or within the cell, according to a basic principle of pharmacology. A receptor is a term for this kind of molecular structure. When a medicine binds to its receptor, the receptor undergoes a molecular alteration, such as a shift in configuration or charge distribution, which sets off a cascade of events. This idea is relevant not just to the workings of pharmaceuticals, but also to naturally occurring chemicals like hormones and neurotransmitters. In fact, many medications are able to mimic the actions of hormones or transmitters because they bind to the same receptors as these naturally occurring chemicals. All drug receptors are presumed to be neurotransmitter, hormone, or other physiological substance receptors because of this generalization. When a pharmacological receptor is identified, it often prompts researchers to look for other endogenous compounds that bind to the same receptors. For instance, endogenous peptides with morphine-like action were discovered to exist. Since then, some of these peptides have been isolated and categorized into two groups: endorphins and enkephalins (see Chapter 26). The analgesic effects of endorphins and enkephalins are mimicked by medications like morphine, which bind to the same receptors.

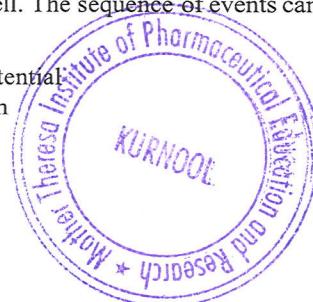
DRUG RECEPTORS AND BIOLOGICAL RESPONSES

Although the term *receptor* is convenient, one should never lose sight of the fact that *receptors are in actuality molecular substances or macromolecules in tissues that combine chemically with the drug*. Since most drugs have a considerable degree of *selectivity* in their actions, it follows that the receptors with which they interact must be equally unique. Thus, *receptors will interact with only a limited number of structurally related or complementary compounds*.

The drug-receptor interaction can be better appreciated through a specific example. The end-plate region of a skeletal muscle fiber contains large numbers of receptors having a high affinity for the transmitter acetylcholine. Each of these receptors, known as nicotinic receptors, is an integral part of a channel in the postsynaptic membrane that controls the inward movement of sodium ions (see Chapter 28). At rest, the postsynaptic membrane is relatively impermeable to sodium. Stimulation of the nerve leading to the muscle results in the release of acetylcholine from the nerve fiber in the region of the end plate. The acetylcholine combines with the receptors and changes them so that channels are opened and sodium flows inward. The more acetylcholine the end-plate region contains, the more receptors are occupied and the more channels are open. When the number of open channels reaches a critical value, sodium enters rapidly enough to disturb the ionic balance of the membrane, resulting in local depolarization. The local depolarization (end-plate potential) triggers the activation of large numbers of voltage-dependent sodium channels, causing the conducted depolarization known as an action potential. The action potential leads to the release of calcium from intracellular binding sites. The calcium then interacts with the contractile proteins, resulting in shortening of the muscle cell. The sequence of events can be shown

Ach + receptor  Na<sup>+</sup> influx  action potential  
 increased free Ca<sup>++</sup>  contraction

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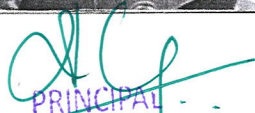


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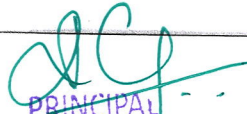
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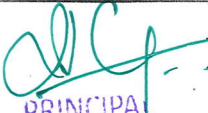
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SAYYADA SALEHA MOMINA (M.Pharm., Ph.D) currently working as Assistant Professor, Department of Pharmacognosy and Phytochemistry at Max Institute of Pharmaceutical Sciences, Khammam, Telangana, India. B.Pharm & M.Pharm (Gold medalist) from Kakatiya University, Warangal. She has published 25 Research articles in various National and International journals, published an Australian Patent grant. She has presented and participated several National and International conferences. Having a lifetime membership in Indian Pharmaceutical Association (IPA).



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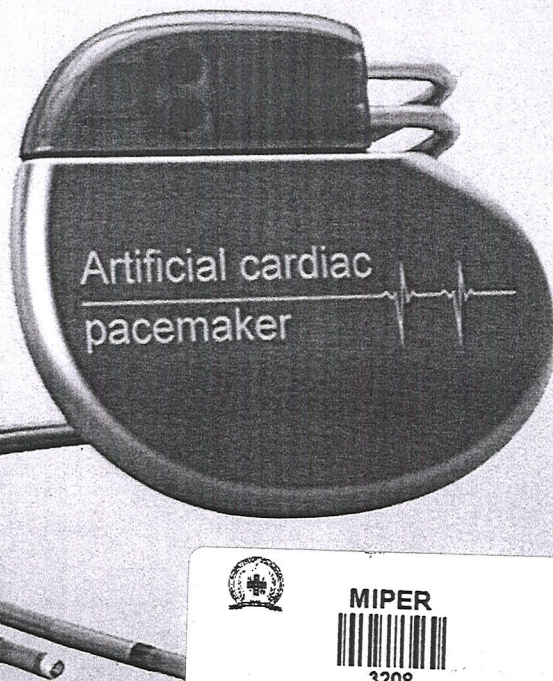
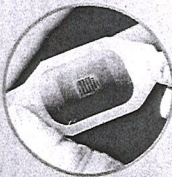
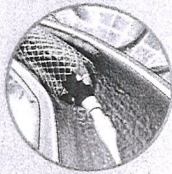
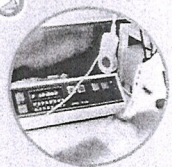
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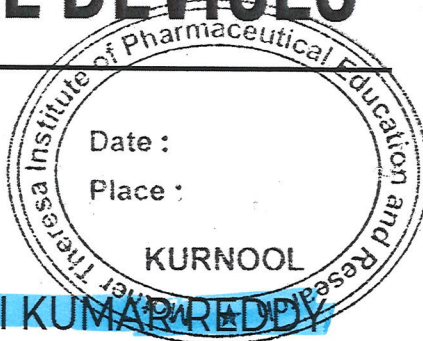
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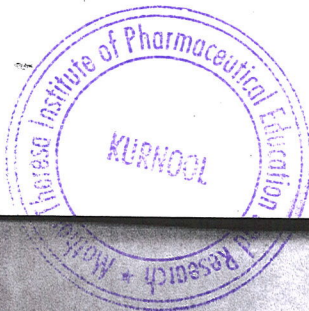
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# A Hand Book on Medical Devices

Medical devices have revolutionized the practice of medicine, enabling earlier and more accurate diagnoses, minimally invasive treatments, and improved quality of life for patients. These devices assist in the prevention, diagnosis, monitoring, treatment, and management of various medical conditions. They range from simple, handheld devices to sophisticated, complex systems that integrate advanced technologies. The importance of medical devices lies in their ability to bridge the gap between medical knowledge and patient care, translating scientific advancements into practical applications. This book aims to provide a comprehensive overview of medical device development and applications. It will delve into various aspects, including design principles, regulatory considerations, clinical validation, manufacturing processes, quality assurance, and post-market surveillance. Each chapter will focus on specific topics within the broader domain of medical devices, providing insights, case studies, and practical guidance for professionals involved in this field.

## About the Author



Dr. Ravi Kumar is a Professor & Principal of Mother Theresa Institute of Pharmaceutical Education & Research (MIPER), Kurnool, AP. Dr. Ravi Kumar has more than 15 years of experience working in the pharmaceutical education sector. The field of pharmaceutical regulatory affairs is one of his main areas of competence. Dr. Ravi Kumar led more than 20 Post Graduate students exclusively on regulatory affairs during this time, he produced high-quality projects and scientific papers. He taught Regulations of Drugs, Biologicals, Nutraceuticals, and Medical Devices to M. Pharmacy (Regulatory Affairs) students. Writing books on pharmaceutical regulatory affairs, which can help students of B. Pharmacy and M. Pharmacy by providing the fundamental information and also serving the needs of examination purposes, became a subject of great interest to the author.

You may reach the author at:

✉ [ravikumarreddy.juturi@gmail.com](mailto:ravikumarreddy.juturi@gmail.com)




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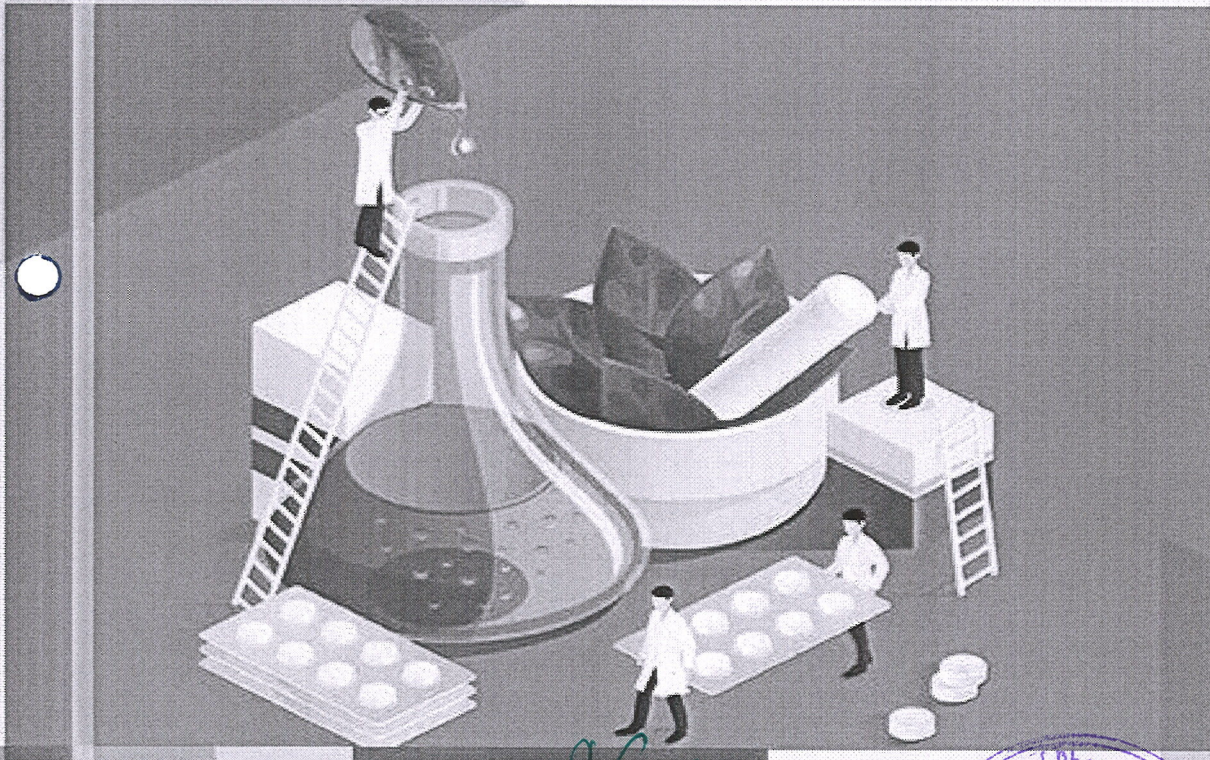
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# A TEXT BOOK FOR PHARMACOLOGY

Mr. Raghuv eer Rodda, Mrs. M Rehana Bhanu



*[Signature]*  
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## PREFACE

Our dedication to using pharmacology specialists to maintain an up-to-date and thorough textbook has continued in the form of the sixth edition of Modern Pharmacology With Clinical Applications. The work focuses on the clinical use of medications within a context of the main principles of pharmacology and is written with the intent that it be utilized over the course of a single semester. It's designed for both graduate and undergraduate students in fields including medicine, osteopathy, dentistry, pharmacy, and advanced nursing.


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## 2

## Mechanisms of Drug Action

RECEPTORS

Most medications start their impact in cells by combining with a specific molecular structure either on the cell's surface or within the cell, according to a basic principle of pharmacology. A receptor is a term for this kind of molecular structure. When a medicine binds to its receptor, the receptor undergoes a molecular alteration, such as a shift in configuration or charge distribution, which sets off a cascade of events. This idea is relevant not just to the workings of pharmaceuticals, but also to naturally occurring chemicals like hormones and neurotransmitters. In fact, many medications are able to mimic the actions of hormones or transmitters because they bind to the same receptors as these naturally occurring chemicals. All drug receptors are presumed to be neurotransmitter, hormone, or other physiological substance receptors because of this generalization. When a pharmacological receptor is identified, it often prompts researchers to look for other endogenous compounds that bind to the same receptors. For instance, endogenous peptides with morphine-like action were discovered to exist. Since then, some of these peptides have been isolated and categorized into two groups: endorphins and enkephalins (see Chapter 26). The analgesic effects of endorphins and enkephalins are mimicked by medications like morphine, which bind to the same receptors.

DRUG RECEPTORS AND BIOLOGICAL RESPONSES

Although the term *receptor* is convenient, one should never lose sight of the fact that *receptors are in actuality molecular substances or macromolecules in tissues that combine chemically with the drug*. Since most drugs have a considerable degree of *selectivity* in their actions, it follows that the receptors with which they interact must be equally unique. Thus, *receptors will interact with only a limited number of structurally related or complementary compounds*.

The drug-receptor interaction can be better appreciated through a specific example. The end-plate region of a skeletal muscle fiber contains large numbers of receptors having a high affinity for the transmitter acetylcholine. Each of these receptors, known as nicotinic receptors, is an integral part of a channel in the postsynaptic membrane that controls the inward movement of sodium ions (see Chapter 28). At rest, the postsynaptic membrane is relatively impermeable to sodium. Stimulation of the nerve leading to the muscle results in the release of acetylcholine from the nerve fiber in the region of the end plate. The acetylcholine combines with the receptors and changes them so that channels are opened and sodium flows inward. The more acetylcholine the end-plate region contains, the more receptors are occupied and the more channels are open. When the number of open channels reaches a critical value, sodium enters rapidly enough to disturb the ionic balance of the membrane, resulting in local depolarization. The local depolarization (end-plate potential) triggers the activation of large numbers of voltage-dependent sodium channels, causing the conducted depolarization known as an action potential. The action potential leads to the release of calcium from intracellular binding sites. The calcium then interacts with the contractile proteins, resulting in shortening of the muscle cell. The sequence of events can be shown

Ach + receptor  Na<sup>+</sup> influx  action potential  
 increased free Ca<sup>++</sup>  contraction

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