Mosby's HANDBOOK OF PHARMACOLOGY

BRUCE D. CLAYTON

FOURTH EDITION

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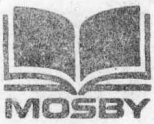

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Compatibility of medications mixed in a syringe

	Alphaprodine	Atropine	Benzquinamide	Butorphanol	Cimetidine	Codeine	Diazepam	Glycopyrrolate	Hydromorphone	Hydroxyzine	Meperidine	Metoclopramide	Morphine	Nalbuphine	Oxymorphone	Pentazocine	Pentobarbital	Promethazine	Scopolamine	Sodium bicarbonate	Thiopental
Alphaprodine	—	Y		P		N	N	Y													
Atropine	Y	—	Y	Y	Y	N	N	Y	P	P	P	P	P	Y		P	P	P	P	N	
Benzquinamide		Y	—			N	N	Y		Y	Y									N	
Butorphanol	P	Y		—		N				Y	P								P		
Cimetidine		Y			—	N		Y													
Codeine						—	N	Y												N	
Diazepam	N	N	N	N	N	N	—	N	N	N	N	N	N	N	N	N	N	N	N	N	
Glycopyrrolate	Y	Y	Y			N	N	—		Y	Y		Y			N	N	N	N	N	
Hydromorphone		P				N			—	Y						P				N	
Hydroxyzine		P				N		Y	Y	—	Y	P	Y	Y		P	P	P	P	N	
Meperidine		P		P		N		Y		Y	—	P	N			P	P	P	P	N	
Metoclopramide		P				N				P	P	—	P			P				N	
Morphine		P				N		Y		Y	N	P	—			P	P	P	P	N	
Nalbuphine		Y				N		Y		Y				—							
Oxymorphone						N		Y							—						
Pentazocine	P	P		P		N	N	Y	P	Y	P		P			—	P	P	P	N	
Pentobarbital	Y	Y	N			N	N	N	N	N	N	N	N	N		P	—	P	P	N	
Promethazine	Y	P		P		N	N	Y	P	Y	P	P	P	Y		P	P	—	P	N	
Scopolamine	P	P		P		N	N	Y	P	Y	P	P	P	Y		P	P	P	—	N	
Sodium bicarbonate		N					N									N				—	
Thiopental							N									N					—

Key: Y = Yes, compatible.
N = No, not compatible.
P = Provisionally compatible, use within 15 minutes of preparation.
— indicates matching entries.
Blank spaces indicate that there is no available data on compatibility.

Ref: Trissel, L.A., Handbook of Injectible Drugs, 4th ed. American Society of Hospital Pharmacists, 1986; Bethesda

Preface
to the fourth edition

The response to the third edition has been most gratifying. The support and suggestions offered by reviewers, colleagues, and students have indicated a need for a fourth edition of *Mosby's Handbook of Pharmacology* with expanded content.

Although those familiar with previous editions of this manual will recognize the format of the present edition, several sections have been added. Over 65 new drugs have been added, bringing the total to more than 500 single-entity agents and over 100 combination products. In an effort to assist Canadian practitioners, those agents that are available in Canada have been so designated.

Significant effort has been made to update and expand descriptions of therapeutic and adverse effects of drugs and the patient parameters that should be monitored to improve therapeutic effect and reduce the incidence of adverse activity. A new subdivision entitled "Pregnancy category" has been added to each of the monographs. This category refers to risk factors associated with the use of that particular agent in pregnant patients. Major updates have been made in the chapters on antibiotics, cardiovascular agents, antihypertensive agents, antidiabetic agents, oral contraceptive agents, and miscellaneous medicinal agents.

I wish to extend a word of thanks to the many students and colleagues who offered suggestions for improvement of this edition.

Special recognition must go to Francine E. Clayton for her patience, support, and excellent secretarial assistance in the preparation of the fourth edition. Special thanks is extended to the John D. Clayton family and the Francis H. Purdy family for their support and encouragement.

Bruce D. Clayton

Preface
to the first edition

No single aspect of patient care demands greater accuracy than drug therapy. The continuing exchange of updated knowledge concerning the more than 7000 principal drugs in today's medical arsenal increases the need for accurate, readily available information. This practical, convenient pocket reference, a thorough compilation of information about the most commonly used single-entity drugs currently on the market, emphasizes the need for knowledge and understanding of precautions and potential drug interactions during administration.

Drugs discussed in the book are categorized in chapters according to their primary pharmacologic activity. Most chapters provide an introduction that briefly discusses pathologic conditions for which the agents are used, how treatment should be approached, and what adjunctive measures should be employed to provide patient comfort and improve therapeutic effectiveness of the agent.

Monographs of drugs are arranged alphabetically by generic name within each chapter. More information about these monographs is contained in the Note to the reader. The individual monograph of each drug lists the generic name and a representative sample of trade names. Under each generic name is the *American Hospital Formulary Service* number that refers the reader to more detailed information about that drug. The category to which the drug belongs follows the AHFS number.

The first section of each monograph includes primary action and use. Knowledge of the mechanism of action is essential to ensure proper utilization of the drug. The actions discussed include the more important mechanisms sufficient for understanding uses and particular side effects, although the discussions in no way reflect the depth of a primary reference text. The most common and frequent

usages for each drug have been included, but no attempt has been made to list historical or investigational uses.

The characteristics section represents a search of the literature for physiologic parameters of the drug. These parameters provide a more complete understanding and thus more effective monitoring of both therapeutic activity and adverse effects. Such characteristics include half-life; extent of protein binding; rates of absorption; onset, peak, and duration of action; sites of metabolism and excretion; and requirements of dosage supplementation in patients undergoing dialysis.

The section on dosage administration in each monograph is more complete than in many other references. It discusses dosage adjustments for neonatal, pediatric, and adult patients in relation to sites of administration and indications for use, while placing emphasis on techniques and rates of administration. Flow rate charts are provided for those drugs administered by continuous infusion to provide accuracy in calculations and to allow closer correlation with dosage and patient response.

One of the most valuable and important units of each monograph is that on special remarks and cautions. This section provides more clinically pertinent information about observation and interpretation of drug response. It does not belabor long lists of side effects that are experienced infrequently or that are based only on theoretical considerations. It includes reminders of information that the patient needs for improved understanding and compliance, warnings about interferences with laboratory tests, and use of the drug during pregnancy and lactation.

The concluding section of each monograph provides the health professional with information on significant interactions with other therapeutic agents. Drug interactions are a frequent cause of adverse effects, decreased compliance, and prolonged hospitalizations. Continual awareness of the possibility of interactions and observation for these complications are the responsibility of all health professionals.

No clinically oriented reference would be complete without charts that summarize frequently used data on administration, dosage adjustments, and monitoring. Hence, the appendixes include tables on mathematical conversions, correlation of body surface area with height and weight, pediatric dosage adjustment charts, and tables on excretion of drugs in breast milk and discoloration of excreta secondary to drug metabolism.

Safe monitoring of therapeutic agents carries enormous implications for every health professional. We believe that this book will serve as a review to help ensure the safe administration of medications. Students and practitioners in the health sciences will find this a useful and convenient source of accurate, readily applicable information.

Sheila A. Ryan
Bruce D. Clayton

Acknowledgments

Permission to use the pharmacologic-therapeutic classification of the *American Hospital Formulary Service* has been granted by the American Society of Hospital Pharmacists. The Society is not responsible for the accuracy of transpositions, or additions, or excerpts from the original context. For complete information concerning all drugs, consult the *American Hospital Formulary Service*. Permission to use excerpts from the *American Hospital Formulary Service* has been granted by the American Society of Hospital Pharmacists. The Society is not responsible for the accuracy of transpositions or excerpts from the original context. This material is copyrighted by the American Society of Hospital Pharmacists, Inc. All rights reserved.

Note to the Reader

Trade name

The trade names represent an arbitrary selection and imply no preference for any brand name or manufacturer. Those brand names designated with a "★" are available only in the United States, while those designated with a "C" are available only in Canada. Brand names without specific designation are available throughout North America.

AHFS

This number directs the user to the *American Hospital Formulary Service* as a source of more complete information on the drug.

Action and use

The mechanisms of action provide an overview and are not meant to include minor or proposed mechanisms. The uses are those generally accepted in medical practice today, however, the dosages and uses suggested do not necessarily have specific approval by the Food and Drug Administration. The manufacturer's product information should be consulted for approval.

Characteristics

A wide degree of clinical variation may alter these parameters. Metabolic and excretory data are based on patients with normal renal and hepatic function. Therapeutic blood-level data may vary between laboratories and the specificity of the assay methods used. Toxic and lethal blood-level data are often based on a few cases, and toxic effects may be intensified by the ingestion of other drugs.

The qualitative effect of dialysis on drug removal is indicated by a *no* or a *yes*. A *no* indicates that dosage adjustment is not indicated after either peritoneal dialysis (P) or hemodialysis (H). A *yes* indicates that enough drug is removed in the dialysate to require an extra maintenance dose to ensure

adequate therapeutic blood levels. It must be emphasized that even though dosage adjustment may not be required, dialysis may still be beneficial in case of poisoning.

Administration and dosage

Dosages given are for adults, children, and neonates. The severity of the disease, as well as the age and state of health of the patient, may alter the dosages. Administration charts are provided for those drugs administered by continuous infusion to provide accuracy in calculations and to allow closer correlation with dosage and patient response. The "notes" contain particular warnings that relate to administration.

Patient considerations

Information provided in these sections include:

The more clinically pertinent side effects. Other sources should be consulted for a complete list of adverse effects.

Advice that should be given to help promote patient understanding and compliance, and to prevent complications in therapy. Data provided on laboratory test interferences. The data often refer to tests run by specific methods, many of which are infrequently used. Consult your laboratory for their methods of assay.

Use of drugs during pregnancy and lactation. Most drugs are not approved for use in pregnancy, and many have restrictions concerning pediatric use resulting from a lack of studies in these patient populations. Consult appropriate texts for use if the benefits of therapy outweigh the risks incurred by such therapy.

Pregnancy category

The definitions (Federal Register 1980; 40:37434–67) of the risk factor categories (A, B, C, D, X) are:

Category A—Drugs for which adequate and well-controlled human studies have failed to demonstrate a risk to the fetus.

Category B—Drugs for which human fetal risk is relatively unlikely based upon either negative animal studies and no adequate and well-controlled human studies, or positive animal studies and negative, adequate and well-controlled human studies.

Category C—Drugs for which human fetal risk is unknown based upon positive animal studies (or no animal studies), and no adequate and well-con-

trolled human studies. Drugs should be given only if the potential benefit justifies the potential risk to the fetus.

Category D—Drugs for which there is positive human evidence of fetal risk available, but the benefits from use in pregnant women may be acceptable despite the risk.

Category X—Drugs for which positive animal studies or positive human evidence of fetal risk is available, and whose use in a pregnant woman is contraindicated.

These categories have been assigned based on the level of risk the drug poses to the fetus. Regardless of the category assigned, a drug should not be used in pregnancy unless clearly needed. The pregnancy categories do not refer to risk associated with breast feeding. A general rule to follow is that if the drug can safely be given directly to the infant, it is generally safe to give to the mother during lactation.

Pregnancy categories for combination products have not been listed. Refer to the monographs on the single entities for the classification. Products for topical application with minimal systemic absorption are generally not classified.

Drug interactions

Those listed are the more common, potentially significant interactions. If a reaction is suspected, consult texts that provide more complete information.

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