New and Nonofficial
DRUGS

AN ANNUAL COMPILATION OF AVAILABLE INFORMATION ON DRUGS, INCLUDING THEIR THERAPEUTIC, PROPHYLACTIC AND DIAGNOSTIC STATUS, AS EVALUATED BY THE COUNCIL ON DRUGS OF THE AMERICAN MEDICAL ASSOCIATION

1963

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Preface

New and Nonofficial Drugs is an annual publication by the Council on Drugs of the American Medical Association (A.M.A.), containing descriptions of drugs evaluated on the basis of available laboratory and clinical evidence. Its scope comprises agents proposed for use in or on the human body for the diagnosis, prevention or treatment of disease, whether or not their usefulness has been definitely established. It is not a collection of "accepted drugs"; in fact some are viewed with disfavor. Descriptions are limited to individual drugs generally available in the United States that have not been included in the *Pharmacopeia of the United States* (*U.S.P.*), *The National Formulary* (*N.F.*) or *New and Nonofficial Drugs* (*N.N.D.*) for a prior cumulative period of 20 years. Older drugs not currently described may be mentioned as a part of introductory information on related drugs when this is necessary to provide proper orientation or perspective. In the sections which have been completely rewritten for this edition, drugs are described for at least 5 years after their first inclusion in *New and Nonofficial Drugs*. In these sections, drug descriptions are retained for longer periods only when, in the opinion of the Council, such retention is warranted because of the drug's importance in therapy, the amount of its use or misuse, its potentiality for adverse reactions, additional information about its pharmacological action, or for other reasons.

Each drug is described in the form of a monograph to provide the following information: The nonproprietary name adopted by the Council; chemical or biologic identity; actions and uses, including comparisons with related drugs, limitations, adverse reactions, contraindications or precautions; dosage and routes of administration; preparations and their available sizes or strengths; known sources of supply together with the commercial name or names of preparations marketed in the U.S.; year of commercial introduction in the U.S.; year of insertion of original monograph in *New and Nonofficial Drugs* and year of the most recent revision. Monographs, arranged alphabetically according to their nonproprietary titles, are grouped under chapters according to pharmacological action or clinical use. To avoid duplication of information in monographs on drugs that have similar actions, uses or dosage, reference may be made to other monographs or to general statements designed to cover groups of related agents. Cross references also may be made to monographs describing drugs that share actions or uses of drugs described in different chapters. The complete organizational names and addresses of commercial sources of drugs are listed in a separate appendix.

Monographs and supplemental statements authorized by the Council before July 1, 1960 were published in full in *The Journal*

of the American Medical Association. Those completed subsequent to this date may not have appeared in their entirety in THE JOURNAL, but have been summarized in the Council's column, *New Drugs and Developments in Therapeutics.* Copies of the complete monograph statements on which the summaries are based are available from the Secretary upon request prior to their publication in *New and Nonofficial Drugs.* All Council monographs and supplemental statements are incorporated into *New and Nonofficial Drugs* at annual intervals.

Criticism of *N.N.D.* is invited with a view to further improvements.

The Council appreciates the assistance provided by consultants in the evaluation of drugs and in the work of its committees during the preceding year. An annual list of the names of these individuals is included in each volume. The Council is especially appreciative of the assistance of Ralph G. Dorn, M.D., Muriel Norden, M.A., and Morton J. Rodman, Ph.D.

Acknowledgment also is made of the assistance of Beverly Rodgers, Nancy Smith, and Dora von Albert of the publications section of the Council on Drugs.

WM. C. SPRING, JR., M.D.
Secretary of the Council

Monographs Added to N.N.D. 1963

The following monographs have been added for drugs evaluated since the previous edition of *N.N.D.*

Amitriptyline Hydrochloride
Buclizine Hydrochloride
Chlordiazepoxide Hydrochloride
Chlormezanone
Colistimethate Sodium
Colistin Sulfate
Dimethindene Maleate
Dydrogesterone
Emylcamate
Hydroxyphenamate
Isocarboxazid
Mephenoxalone
Mepivacaine Hydrochloride
Methandrostenolone
Nandrolone Phenpropionate
Norethynodrel with Mestranol
Oxymetholone
Oxyphenbutazone
Pancrelipase
Phenyramidol Hydrochloride
Piminodine Ethanesulfonate
Potassium and Magnesium Aspartates
Propiomazine Hydrochloride
Sodium Methicillin
Sodium Oxacillin
Stanozolol

Monographs Omitted from N.N.D. 1963

The following monographs appearing in the previous edition of *N.N.D.* have been omitted, for these drugs are considered well known because of their inclusion in *N.N.D.*, *U.S.P.*, or *N.F.* for a cumulative period of 20 years:

Aluminum Phosphate Gel, N.F.
Benzalkonium Chloride, U.S.P.
Diethylstilbestrol, U.S.P.
Iodopyracet Compound
Methacholine Bromide, N.F.
Nikethamide, N.F.
Sodium Ascorbate
Vasopressin Tannate, U.S.P.

Based on the procedure described in the Preface, the following monographs have been omitted from the revised sections of this edition of *N.N.D.*:

Amphetamine Phosphate, N.F.
Benzestrol, N.F.
Benztropine Methanesulfonate, N.F.
Caramiphen Hydrochloride
Chlorotrianisene, N.F.
Chondodendron Tomentosum Extract, Purified
Cycrimine Hydrochloride, N.F.
Decamethonium Bromide
Dextro Amphetamine Sulfate, U.S.P.

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Dienestrol, U.S.P.
Diethylstilbestrol Dipropionate, N.F.
Dimercaprol, U.S.P.
Dimethyl Tubocurarine Chloride
Dimethyl Tubocurarine Iodide, N.F.
Disulfiram
Edrophonium Chloride, U.S.P.
Estradiol, N.F.
Estradiol Cyclopentylpropionate, N.F.
Estradiol Dipropionate, U.S.P.
Estradiol Valerate
Estrogenic Substances, Conjugated, U.S.P.
Ethinyl Estradiol, U.S.P.
Ethopropazine Hydrochloride
Gallamine Triethiodide
Hexestrol, N.F.
Lututrin
Mephenesin, N.F.
Mephenesin Carbamate
Methallenestril
Methamphetamine Hydrochloride, N.F.
Phenaglycodol
Piperazine Estrone Sulfate, N.F.
Pipradrol Hydrochloride, N.F.
Procyclidine Hydrochloride
Progesterone, U.S.P.
Promethestrol Dipropionate
Promoxolane
Succinylcholine Chloride, U.S.P.
Trihexyphenidyl Hydrochloride, U.S.P.
Tubocurarine Chloride, U.S.P.

The following monographs for previously described drugs are omitted because they are no longer commercially available in the United States:

Furaltadone
Methoxypromazine Maleate
Relaxin
Triparanol
Zoxazolamine

Purposes, Principles and Procedure of the Council on Drugs

The Council on Drugs is a standing committee of the Board of Trustees of the American Medical Association, created and organized in 1905 as an advisory body to provide authoritative and unbiased information on drugs.

General Purpose

The function of the Council on Drugs is to examine and evaluate available evidence relating to the actions, uses, dosage, hazards and other pertinent properties of drugs and to encourage rational therapy by timely, informative reports to the medical profession.

Principles Governing the Evaluation of Drugs Described in New and Nonofficial Drugs

The Council evaluates evidence pertaining to the safety and usefulness of medicinal agents offered or intended for use in or on the human body for the diagnosis, prevention or treatment of disease. Reports of these evaluations are published for the information of the medical profession.

The Council considers for evaluation drugs with a single active ingredient or extracts from a single source. Combinations or mixtures containing two or more active ingredients may receive consideration only if it is deemed desirable to present the Council's views regarding any such preparation for the information of the medical profession.

In evaluating drugs the Council considers scientific clinical and laboratory evidence (published or unpublished) submitted by manufacturers and such other reports as may be available. The Council also endeavors to obtain the opinions and advice of other experts who serve in a consultant capacity. The Council does not conduct clinical and laboratory tests or experiments in evaluating drugs.

The Council wishes to keep its published statements up to date. This aim will be more easily achieved when the Council receives promptly and voluntarily from the pharmaceutical industry all toxicological, pharmacological, and clinical data in their possession pertaining to eligible drugs, whether or not they have been evaluated previously. Also, the Council maintains constant surveillance of the literature and welcomes the reporting of new information at any time from investigators and practitioners.

The views of the Council with respect to the actions, uses, dosage,

contraindications, hazards, limitations and other pertinent characteristics of each newly evaluated drug are incorporated into a monograph, a digest of which is submitted to the Editor of *The Journal of the American Medical Association* for publication in the Council column, New Drugs and Developments in Therapeutics, either in full or in summary form. Interim copies of the complete monograph on which the digest is based are available from the Secretary upon request until the complete monograph statements subsequently appear in the Council's annual publication, *New and Nonofficial Drugs*.

If the Council's reevaluation of a drug reveals a significant change in its status, such information is submitted to the Editor of THE JOURNAL for publication and is subsequently incorporated in *New and Nonofficial Drugs*.

The Council encourages the early adoption of a nonproprietary name (resulting from negotiation between the manufacturer and the Nomenclature Committee of the American Medical Association-United States Pharmacopeia) for general use in identifying each drug. Each drug evaluated is described by a nonproprietary name; trademark or proprietary names of the drug, when known, are also listed in alphabetical order. Drugs are listed under all these names in the General Index.

A separate appendix gives the complete names and addresses of all commercial sources of drugs listed in *New and Nonofficial Drugs*.

The Council does not accept, endorse, recommend or guarantee any individual brand or preparation of a drug described in *New and Nonofficial Drugs*. The Council does not undertake to test or analyze samples or to review or investigate manufacturing and control procedures. The Council does not purport to ascertain whether or not any firm has complied with federal, state or municipal laws and regulations.

When the Council has knowledge that a drug is no longer available commercially or when it has been included in the *United States Pharmacopeia, National Formulary,* or *New and Nonofficial Drugs* for 20 years, or when, after the drug has been included in *New and Nonofficial Drugs* for at least 5 years, in the opinion of the Council further inclusion would not serve the purpose of *New and Nonofficial Drugs,* the monograph may be deleted.

Specific Procedure

Drug Evaluation

1. All pharmacological and clinical evidence or data in the form of published and unpublished reports on a new drug that are made available to the Council office are first referred to a number of recognized experts who are asked to serve in a temporary consultant capacity and to express their views regarding the adequacy of the evidence for the claimed uses of the drug, including its limitations, contraindications, hazards and dosage.

2. A member of the Council staff then prepares a proposed monograph on the new drug based on the evidence and the views of the consultants.

3. All the available evidence, together with the views expressed by the consultants and a draft of the proposed monograph, is transmitted to a member of the Council who serves as a referee.

4. The referee reviews the transmitted information and returns the proposed monograph with his comments, including any suggestions for modification.

5. The proposed monograph as amended by the referee is transmitted to the consultants previously contacted and to the pharmaceutical firm or firms that supplied the evidence and data on which the evaluation is based in order that they may have an opportunity for comment or criticism.

6. The proposed monograph is then presented, along with the comments of the referee and those of the consultants and the cooperating firm or firms, to the members of the Council for consideration.

7. The proposed monograph is revised in accordance with the comments and criticisms of the members until it is satisfactory to the Council as a whole and authorized for publication in *New and Nonofficial Drugs*.

8. The Council's views, as expressed in monographs which are authorized for annual publication, will be submitted periodically to the Editor of THE JOURNAL for prior publication therein, in full or in summary form. Credit will be given in conjunction with such published statements on drugs to firms which have supplied evidence or data to the Council.

9. Provision also will be made for periodic publication of significant changes in the status or proposed new uses of previously evaluated drugs as further evidence accumulates. A similar procedure for evaluation is followed in these instances as with the initial consideration of a new drug.

Nonproprietary (Generic) Terminology

1. The Council encourages all manufacturers who have discovered or developed a new drug to submit a proposed nonproprietary name (or names) to the Secretary, Council on Drugs, at such time as its preliminary clinical evaluation indicates that more extensive clinical testing is warranted, or sooner if possible. These submissions will be referred to the joint Nomenclature Committee of the American Medical Association-United States Pharmacopeia for its consideration.

2. The initial submission of nonproprietary terminology should be accompanied by disclosure of the manufacturer's code number, the chemical name (*Chemical Abstracts* index names only are to be used) and the structural formula of the compound when these are known or by a description of the source and general method of preparation that accurately defines the product. The submission should also indicate the general pharmacological class or area of intended clinical use of the drug and, when available, the trade name which is to be applied.

3. The Nomenclature Committee and Council staff will review the proposed name(s) and, if necessary, negotiate with the manu-

facturer to ensure that a convenient and appropriate nonproprietary name is adopted for each new drug. The guiding principles for devising international nonproprietary names of the World Health Organization are regarded as helpful but not definitive in achieving this purpose. Copies of these guiding principles are available from the office of the Council on Drugs.

4. Upon agreement between the manufacturer and the Nomenclature Committee on a suitable nonproprietary name, and with the express permission of the manufacturer (which can be given with the initial submission of a proposed nonproprietary name), the Council then transmits the proposed name to the World Health Organization, the British Pharmacopoeia Commission, and the representatives of the French Codex, the Nordic Pharmacopoea, the United States Pharmacopeia, and the National Formulary for their simultaneous consideration. In the case of serums or vaccines, the proposed terminology is also transmitted to the Division of Biologic Standards of the National Institutes of Health.

5. In the absence of serious objection from the foregoing agencies, or known conflict with established nonproprietary or trade names, after a waiting period of 30 days, the proposed name is considered to be acceptable to all concerned. The adoption is recorded as final by the Council and the manufacturer is so informed. While this adoption is for national use, the Council staff will exert its best efforts to effect international adoption of the same terminology through the mechanisms of the World Health Organization.

6. Each nonproprietary name adopted in accordance with the provisions of this cooperative nomenclature program will be published as the United States Adopted Name (USAN) in the New Names section of the *Journal of the American Medical Association.* This will be the designation used if, and when, the drug is admitted to the *United States Pharmacopeia* or *National Formulary.* The USAN name will also be indicated by appropriate notation in the *American Drug Index,* 1963.

OFFICIAL AND REGULATORY AGENCIES

There are several official and quasi-official bodies concerned with standards, distribution, labeling and advertising of drug products. In order that the functions of these agencies may be understood and their spheres of influence as they pertain to medicinal agents defined, the following brief descriptions of their organizations and duties are given:

The United States Pharmacopoeial Convention: Under the General Committee on Revision, the United States Pharmacopoeial Convention issues at 5-year intervals (formerly 10-year intervals) the *United States Pharmacopeia*. The United States Pharmacopoeial Convention is a private body composed of representatives from medical schools, pharmacy schools, state medical associations, state pharmaceutical associations, the American Medical Association, the American Pharmaceutical Association, the American Chemical Society and many other scientific and trade associations and also various interested federal bureaus and departments.

Under authority of the Federal Food, Drug and Cosmetic Act, the *United States Pharmacopeia* is an official standard for the products described therein. Products are considered for inclusion in the *Pharmacopeia* by the Committee on Revision on the basis of demonstrated therapeutic value or pharmaceutic necessity.

The American Pharmaceutical Association: The *National Formulary* is issued by the Committee on the National Formulary elected by the Council of the American Pharmaceutical Association. Admission of products to the *National Formulary* is based upon therapeutic value as well as upon the extent of use of the drug and the apparent need for official standards of certain drugs not necessarily widely used.

Under authority of the Federal Food, Drug and Cosmetic Act, the *National Formulary* is an official compendium, and drugs described therein must meet the standards set forth in that publication.

The Food and Drug Administration: This agency is part of the United States Department of Health, Education and Welfare and is charged with the enforcement of the Federal Food, Drug and Cosmetic Act, the Caustic Poison Act and several other statutes. The Food and Drug Administration is directed by the Commissioner of Foods and Drugs and maintains district offices and laboratories in Boston, Buffalo, New York, Philadelphia, Baltimore, Atlanta, Cincinnati, St. Louis, Chicago, New Orleans, Kansas City, Minneapolis, Denver, Los Angeles, San Francisco and Seattle. The administrative offices and special laboratories are located in Washington.

The Federal Food, Drug and Cosmetic Act regulates the labeling of drug products, but its authority does not extend to advertising.

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Seizure of offending goods or criminal prosecution of responsible firms or persons in federal courts are among the methods used to enforce the provisions of the Act. In addition, repeated violations may be enjoined by the courts.

Violations may consist of either adulteration or misbranding or both. Adulteration refers to illegal deviations in composition of an article whereas misbranding refers to illegal statements made in the labeling or required statements omitted from the labeling.

Labeling refers not only to the labels on the immediate containers of drugs but also to circulars, pamphlets, brochures, etc., which accompany the article either physically or as a result of coming to rest with the article in the hands of the consumer.

The Food, Drug and Cosmetic Act prohibits certain things from appearing in the labeling, i.e., any statement that is false or misleading. It also requires certain things to appear in the labeling, such as a statement of the quantity of contents, the name and address of the manufacturer, packer or distributor, the name and quantity of certain specific narcotic or habit-forming drugs together with a statement "Warning: May be habit-forming," the common or usual name of each active ingredient and the quantities of certain specified ingredients, adequate directions for use and adequate warnings against possible misuse. The Act further prohibits the distribution of drugs that may be dangerous to health under the conditions of use prescribed or recommended in the labeling or of drugs which are deceptively packaged. New drugs may not be introduced into interstate commerce unless an application has been permitted to become effective. Such an application must show by adequate scientific evidence that the drug is safe for use under the conditions proposed for its use. To obtain an effective application, the applicant must show that the new drug is safe but is not required to prove efficacy. A new drug distributed for study before an application for it has become effective must be labeled "Caution: New Drug—Limited by Federal law to investigational use."

Certain drugs containing insulin, penicillin, streptomycin, bacitracin, tetracycline, chloramphenicol and chlortetracycline are subject to special control. Samples of each batch of these drugs are examined by the Food and Drug Administration for compliance with standards set forth in regulations issued by the Administration. Each batch must be certified as complying with these standards before the batch may be distributed. Such batches of these drugs are referred to as "certified drugs."

An amendment to the Food, Drug and Cosmetic Act requires that drugs that are not suitable for use in self-medication be restricted to prescription sale. These must be labeled "Caution: Federal law prohibits dispensing without prescription." Prescriptions for these drugs cannot be refilled except as authorized by the physician, either by notation on the original prescription or by subsequent written or oral communication to the pharmacist.

The Public Health Service: This agency also is a part of the United States Department of Health, Education and Welfare. Among the many functions of the Public Health Service is the regulation of biologic products. The Division of Biologics Standards of the

National Institutes of Health administers that part of the Public Health Service Act of 1944 which incorporates the former Viruses, Serums, Toxins and Analogous Products Act.

The control exercised by the Public Health Service Act extends only to biologic products which are defined as "any virus, therapeutic serum, toxin, antitoxin, or analogous product applicable to the prevention, treatment, or cure of diseases or injuries of man." By further definition, the term "biologic products" is extended to cover trivalent arsenical compounds. Pentavalent arsenical compounds are controlled under the Federal Food, Drug and Cosmetic Act by administrative agreement between the Public Health Service and the Food and Drug Administration.

The control exercised by the Public Health Service over biologic products is through the inspection and licensing of establishments producing such products and by the examination and licensing of the products themselves. It is illegal, therefore, to produce any biologic product in an establishment that has not been duly licensed by the Public Health Service or to ship in interstate commerce any biologic product for which a license has not been issued and which is not effective at the time of shipment.

In order for a biologic product to be licensed under the provisions of the Public Health Service Act, it must meet the standards prescribed by the Division of Biologics Standards of the National Institutes of Health, and each batch must be tested for compliance with these standards. The labels of these products must bear the proper name of the product, the name, address and license number of the manufacturer, the lot number and the expiration date. Under certain conditions, and in the case of certain products, additional information may be required to appear on the label.

The Federal Trade Commission: The Federal Trade Commission is an independent agency of the Federal Government directly responsible to the President. The Commission administers several laws, the principal one being the Federal Commission Act. The principal provisions of this act have to do with the regulation of trade practices.

The Federal Trade Commission is composed of five members, appointed by the President. Not more than three of the members may be of any one political party, and the members serve for 7-year terms. The work of the Commission is organized under divisions, and that having to do with drug products is known as the Medical Advisory Division.

The principal power of the Federal Trade Commission with respect to drugs lies in Section 15 of the Federal Trade Commission Act which was amended by the Wheeler-Lea Act in 1938 giving the Commission control over the advertising of Foods, Drugs and Cosmetics. Although the Commission has broad power to prevent the dissemination of false or misleading advertising to the general public, this power is circumscribed with respect to advertisements directed to the medical profession. The Act states "No advertisement of a drug shall be deemed to be false if it is disseminated only to members of the medical profession, contains no false repre-

sentations of a material fact, and includes, or is accompanied in each instance by truthful disclosure of, the formula showing quantitatively each ingredient of such drug."

The enforcement of the Federal Trade Commission Act rests with the Commission. Trial of issues involved in violations is held before a Trial Examiner who reports his findings to the Commission. Final disposition of the case rests with the Commission. Violations of Commission "cease and desist" orders or appeals from Commission orders are considered by the Federal Courts. In many instances, controversies may be settled by stipulations between the Commission and respondents.

The United States Treasury Department: The Bureau of Narcotics of the United States Treasury Department administers the Harrison Narcotic Act. This Act is part of the Internal Revenue Code and is primarily a taxing measure. The Act provides for the payment of certain taxes and the affixing of revenue stamps to lots of narcotic drugs.

Under the Harrison Narcotic Act (1914), opium and coca leaves or any derivative thereof or marihuana or any derivative thereof are defined as being subject to the Act. By subsequent amendments, further drugs have been declared addiction-forming or addiction-sustaining upon a finding by the Secretary of the Treasury after due notice and an opportunity for a public hearing. Examples of drugs which have been proclaimed subject to the Act include anileridine, meperidine, methadone, and phenazocine.

Although a tax measure, the Harrison Narcotic Act prescribes rigid controls over the transportation and distribution of narcotic drugs. Only physicians duly licensed under this Act may prescribe these drugs, and the form of such prescriptions and their handling is set forth in considerable detail.

The Post Office Department: The Fraud section of the post office under the direction of the Solicitor enforces the law pertaining to the fraudulent use of the mails. The use of the United States mails is a privilege and not a right and may be denied to those who use it for the purpose of defrauding the public. Therefore, the solicitation of customers and the shipping via the mails of drugs for which fraudulent claims are made may be the basis for the issuance of a "fraud order" and the suspension of all mail service to the guilty party. Determination of the guilt is made by the Solicitor after a hearing before him in which the facts are presented. Repeated violations or efforts to avoid compliance with such fraud orders may lead to criminal prosecution in the Federal Courts.

THE METRIC SYSTEM

Formerly almost every country had its own system of weights and measures, a practice that resulted in much confusion. The one system that is used almost universally and exclusively in the exact sciences is the metric system, which is based on the decimal system and has for its units the meter and the gram.

The Council on Drugs has adopted the use of the metric system in any publication for which it has sole responsibility. For this reason a table of equivalents will be provided in each book for those who are familiar only with the apothecary system. Physicians are urged to use the metric system exclusively in writing prescriptions, and to abbreviate gram(s) as Gm. (with a capital G) to avoid confusion with a carelessly written abbreviation gr. for grain(s).

Table of Metric Doses with Approximate Apothecary Equivalents

The approximate dose equivalents in the following table represent the quantities that would be prescribed, under identical conditions, by physicians trained, respectively, in the metric or in the apothecary system of weights and measures.

When prepared dosage forms such as tablets, capsules, pills, etc., are prescribed in the metric system, the pharmacist may dispense the corresponding approximate equivalent in the apothecary system, and vice versa. However, this does not authorize the alternative use of the approximate dose equivalents given below for specific quantities on a prescription that requires compounding, nor in converting a pharmaceutical formula from one system of weights or measures to the other system; for such purposes exact equivalents must be used.

Weights	
Metric	Approximate Apothecary Equivalents
30 Gm.	= 1 ounce
15 Gm.	= 4 drachms
10 Gm.	= 2½ drachms
7.5 Gm.	= 2 drachms
6 Gm.	= 90 grains
5 Gm.	= 75 grains
4 Gm.	= 60 grains (1 drachm)
3 Gm.	= 45 grains
2 Gm.	= 30 grains (½ drachm)
1.5 Gm.	= 22 grains
1 Gm.	= 15 grains
750 mg.	= 12 grains
600 mg.	= 10 grains
500 mg.	= 7½ grains
450 mg.	= 7 grains
400 mg.	= 6 grains

Weights	
Metric	Approximate Apothecary Equivalents
300 mg.	= 5 grains
250 mg.	= 4 grains
200 mg.	= 3 grains
150 mg.	= 2½ grains
120 mg.	= 2 grains
100 mg.	= 1½ grains
75 mg.	= 1¼ grains
60 mg.	= 1 grain
50 mg.	= ¾ grain
40 mg.	= ⅔ grain
30 mg.	= ½ grain
25 mg.	= ⅜ grain
20 mg.	= ⅓ grain
15 mg.	= ¼ grain
12 mg.	= ⅕ grain
10 mg.	= ⅙ grain

Table of Metric Doses with Approximate Apothecary Equivalents—Continued

Weights

Metric	Approximate Apothecary Equivalents
8 mg.	= 1/8 grain
6 mg.	= 1/10 grain
5 mg.	= 1/12 grain
4 mg.	= 1/15 grain
3 mg.	= 1/20 grain
2 mg.	= 1/30 grain
1.5 mg.	= 1/40 grain
1.2 mg.	= 1/60 grain
1 mg.	= 1/60 grain

Weights

Metric	Approximate Apothecary Equivalents
0.8 mg.	= 1/80 grain
0.6 mg.	= 1/100 grain
0.5 mg.	= 1/120 grain
0.4 mg.	= 1/150 grain
0.3 mg.	= 1/200 grain
0.25 mg.	= 1/250 grain
0.2 mg.	= 1/300 grain
0.15 mg.	= 1/400 grain
0.1 mg.	= 1/600 grain

Liquid Measures

Metric	Approximate Apothecary Equivalents
1000 ml.	= 1 quart
750 ml.	= 1½ pints
500 ml.	= 1 pint
250 ml.	= 8 fl. ounces
200 ml.	= 7 fl. ounces
100 ml.	= 3½ fl. ounces
50 ml.	= 1¾ fl. ounces
30 ml.	= 1 fl. ounce
15 ml.	= ½ fl. ounce (4 fl. drachms)
10 ml.	= 2½ fl. drachms
8 ml.	= 2 fl. drachms
5 ml.	= 75 minims (1¼ fl. drachms)
4 ml.	= 1 fl. drachm

Liquid Measures

Metric	Approximate Apothecary Equivalents
3 ml.	= 45 minims
2 ml.	= 30 minims
1 ml.	= 15 minims
0.75 ml.	= 12 minims
0.6 ml.	= 10 minims
0.5 ml.	= 8 minims
0.3 ml.	= 5 minims
0.25 ml.	= 4 minims
0.2 ml.	= 3 minims
0.1 ml.	= 1½ minims
0.06 ml.	= 1 minim
0.05 ml.	= ¾ minim
0.03 ml.	= ½ minim

1 Troy or Apothecary ounce = 31.1 grams (Gm.)
1 Avoirdupois ounce = 28.35 grams (Gm.)
1 Avoirdupois pound = 453.6 grams (Gm.)

NOTE—A milliliter (ml.) is the approximate equivalent of a cubic centimeter (cc.).

Approximate Equivalents of Kilograms in Pounds for Calculating Doses in Proportion to Body Weight

120 kg. =	265 lb.
110 kg. =	243 lb.
100 kg. =	220 lb.
90 kg. =	198 lb.
80 kg. =	176 lb.
75 kg. =	165 lb.
70 kg. =	154 lb.
65 kg. =	143 lb.
60 kg. =	132 lb.
55 kg. =	121 lb.
50 kg. =	110 lb.
45 kg. =	99 lb.
40 kg. =	88 lb.
35 kg. =	77 lb.
30 kg. =	66 lb.
25 kg. =	55 lb.
20 kg. =	44 lb.
15 kg. =	33 lb.
10 kg. =	22 lb.
5 kg. =	11 lb.
4 kg. =	8.8 lb.
3 kg. =	6.6 lb.
2 kg. =	4.4 lb.

Approximate Corresponding Average Height in Adults

Men	Women
5 ft. 11½ in.	
5 ft. 9 in.	
5 ft. 6 in.	5 ft. 10½ in.
5 ft. 3 in.	5 ft. 6 in.
5 ft. ½ in.	5 ft. 1½ in.
	4 ft. 9 in.

Approximate Corresponding Average Age and Height in Children

14 yr.	5 ft. 2 in.
13 yr.	5 ft.
12 yr.	4 ft. 9½ in.
11 yr.	4 ft. 7½ in.
9½ yr.	4 ft. 4½ in.
7½ yr.	4 ft. ½ in.
5½ yr.	3 ft. 7 in.
3 yr.	3 ft. 1 in.

Calculation of Drug Dosage in Children

Numerous empirical rules, usually based on age or weight, have been formulated for the determination of dosage in children. However, the dose of many drugs is not always a simple linear function of body weight and to calculate the dose as so much per kilogram of body weight is often inaccurate. Experience has shown that the dose of many drugs is more nearly proportionate to weight to the 0.7 power (Wt. $^{0.7}$). The *surface area of the body* (in square meters) may also be calculated approximately by Wt. $^{0.7}$. It is suggested, therefore, that the use of square meters of surface area, rather than weight, provides a more accurate method of adjusting the dosage to the size of the patient. The validity of this method of dosage calculation has been criticized on the grounds that body surface area may not be directly related to physiologic and metabolic function. However, the surface area rule does provide a practical and useful basis for the estimation of drug dosage in children. Thus, dosage may be expressed as grams or milliliters of a given drug *per square meter of surface area* rather than per unit of body weight. Calculation of a fractional exponential function of weight is too forbidding for practical use, but the task may be simplified by employing the following table.

It must be emphasized that, in both children and adults, any

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