HANDBOOK OF DRUGS AND CHEMICALS USED IN THE TREATMENT OF FISH DISEASES

HANDBOOK OF DRUGS AND CHEMICALS USED IN THE TREATMENT OF FISH DISEASES

A Manual of Fish Pharmacology and Materia Medica

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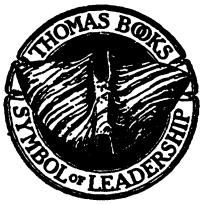

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To the living memory of my father
Walter Nelson Herwig (1911–1969)

FOREWORD

SINCE MAN FIRST BEGAN to keep fish in ponds and tanks, he has had to contend with a broad spectrum of disease problems. By "trial and error" methodology, a body of knowledge developed from those trials that were successful. This, in turn, has led to the development of what can be termed, for lack of a better name, fish pharmacology. Over the years, many successful, and some not so successful, disease treatments have been described in a wide variety of publications. However, many of these articles are not readily available, are obscure, or have never found their way into translation from foreign publications. Therefore, professional fish culturists and amateur aquarists (hobbyists) alike have depended on a handful of "medicine cabinet" remedies. Although these remedies are widely used with qualified success, fish fanciers and workers in this field have expressed a need for a comprehensive guide to alternate solutions and remedies.

There are many reference works regarded as indispensable by professionals in various fields. Writers frequently refer to the ever-useful thesaurus, chemists use *The Merck Index,* doctors have their *P.D.R. (Physicians' Desk Reference),* and new parents read Dr. Spock. However, there never has been such a comprehensive reference work for the fish hobbyist or aquaculturist.

From years of research and review of all the available literature, Nelson Herwig has produced a reference that satisfies this need. This amazingly thorough review of the published literature includes almost every remedy imaginable, including, for the sake of thoroughness, some of questionable merit (noted as such). What was begun as a personal compilation of the available literature has been expanded into a comprehensive reference volume to the chemicals and drugs that have been used in the treatment of

fish diseases. Thus, another tool has been added to our resources, one which will be used frequently and will be well appreciated. It is hoped that this work will act as a springboard, inspiring others to contribute to this body of knowledge.

LOUIS E. GARIBALDI

FOREWORD

FOR THOUSANDS OF YEARS man has cultured fish. The species of fish raised have varied from climate to climate and geographic area to geographic area, but the final result has been the same in each instance, an endeavor that has brought food and aesthetic pleasure to mankind. The publication of this book brings to mind the responsibilities of various professions for the health of fish associated with such culture.

Contemporary fish culture has reached new heights of productivity. More and more in the modern world, fish are commercially produced for human consumption and placed in aquaria for their aesthetic beauty. In both instances the animals are raised in confined areas with high population densities. Husbandry of this type may lead to severe disease problems and costly epizootics.

Disease has always been a problem, and the literature surrounding the area is plentiful. The foundation of our knowledge concerning these diseases was laid by investigators from many different scientific fields: fishery biology, bacteriology, virology, parasitology, and ichthyology. The foundation is a firm one, and much is owed to the early and contemporary work of these scientists.

One notes, however, a startling absence of medically trained individuals among the ranks of those concerned with fish health. In fact, the contribution from members of the medical field has been minimal. The major responsibility for the health and welfare of all animals, both companion and food producing, should lie with the veterinary profession. There seems to be little question that medically trained individuals could make a major contribution towards the prevention, diagnosis, and treatment of fish diseases. The veterinarian, with his knowledge of anatomical pathology, clinical pathology, and medical techniques, is in a

unique position to assist the culturist. He has been trained to appreciate epizootiological problems and the relationships of large numbers of animals to their environment. The responsibility to make a contribution, however, lies with the veterinary profession. Members of the veterinary profession must recognize this responsibility and join hands with those of other professions who have and will continue to address themselves to fish health problems.

A major problem to culturists and other scientists concerned with fish diseases is access to the literature. Much has been written, but it is literally scattered far and wide and is often out of date or inaccessible. In addition, one of the least carefully investigated areas of fish health is therapeutics. *Handbook of Drugs and Chemicals Used in the Treatment of Fish Diseases* addresses itself to both problems. It brings under one cover much of the knowledge concerning drugs used to treat diseases of fish, and it does so in a logical and easily accessible manner. It is a careful work, encompassing years of painstaking research and attention to detail. Now culturists, hobbyists, and scientists alike can come to one source to gather information on piscine therapeutics. The work will serve as a reference for years to come and is in this respect a contribution of some consequence to the field of fish health.

While this book is essentially a compilation of drugs used to treat fish, it should stand as a challenge to veterinary pharmacologists and all scientists concerned with fish diseases to advance our knowledge in the field and to recognize the contributions that may be made by all, medical and nonmedical scientists alike.

R. E. Wolke, D.V.M.

PREFACE

THE ART AND SCIENCE of fish medicine is in the dark ages, but it does exist. From the rank amateur hobbyist who comes into the pet store and exclaims, "My fish have all died, how come?," or says, "I think my fish are sick, I need some fish medicine," to the academic expert who is the accepted authority and whose best answer is, "Try it, who knows, it might work," or "Authority No. 256 recommends it in his paper," very few really know how, why, or even if most drugs and medications work on fish. Confusing opinions are rampant. It is into this seething cauldron of confusion that I pour this effort. I know not whether it will fan the flames of controversy or quench the fires of ignorance. But I do know this: I am no authority. I have not written this book because I knew the answers, but because I didn't, and in all too many instances still do not. When I found an answer to my questions or even the remote likelihood of an answer, I wrote it down. Soon, people began coming to me for answers to their fish problems. My "answers" are the product of other authorities' answers with a smattering of my own practical experience of the past twenty-two years of fish keeping thrown in for good measure.

It must be noted that there may be some drugs that the reader feels should have been included. Their absence here does not infer their ineffectiveness, nor does the inclusion of a drug signify its endorsement. Being a compilation of my own and others' research, the reader may find discrepancies with his own evidence. If so, I welcome any comments and criticisms which will enlighten both our boundaries of knowledge.

N.H.

ACKNOWLEDGMENTS

I WOULD LIKE to extend my heartfelt thanks to Mr. Felix Saucedo, graphics illustrator at the San Antonio Zoo, who in his spare time with just a few deft strokes of his pen reproduced all the chemical formulae and graphs contained herein, which had defied my own best efforts for years.

Also, thanks go to Mr. Joseph Noto, commercial artist, who stepped in at the last minute with some essential additions and corrections when Felix was indisposed with a broken leg.

N.H.

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HANDBOOK OF DRUGS AND CHEMICALS USED IN THE TREATMENT OF FISH DISEASES

PART I

FISH PHARMACOLOGY

Chapter 1

THERAPEUTICS IN FISH DISEASES

TYPES OF THERAPY OTHER THAN DRUG THERAPY

EVEN THOUGH THIS BOOK DEALS in detail only with drugs, other forms of therapy are just as important and ofttimes may be even more important than medication. My failure to consider these methods in detail here should in no way be regarded as an indication of their lack of usefulness in practice.

Regulation of Activity as Therapy

Regulation of activity by increasing or decreasing a fish's movements by physical restraint, expansion or reduction of swimming area, removal or addition of objects or decorations in tanks, and increasing water flow, thereby forcing swimming movements, may all be at times considered as forms of treatment. However, these methods are little used as a form of treatment other than to provide stimulation of blood circulation, remove noxious or toxic substances from the body through increased respiration, or prevent parasites from becoming attached. Therefore, no further consideration of these methods will be given in this text.

Physiotherapy

Physiotherapy of fish diseases is obtained primarily through the use of heat, i.e. raising the temperature to speed up the life cycle of pathogenic organisms so that a drug may act on a particular stage of its life cycle. Conversely, lowering the temperature to slow down the life cycle of a pathogenic agent until more appropriate treatment can take effect may also be an important type of therapy. Massage of the body parts is generally never attempted

in fishes and should probably be discouraged at all times, with the possible exception of stripping in the case of an egg-bound female. Ice may be floated in plastic bags in overheated aquaria to prevent anoxia or brain damage caused by heat stroke. There is evidence to indicate that some disorders—forms of exophthalmus, for instance—may be alleviated by placing a sick fish under long wave ultraviolet light for several hours each day (Bevan and Zeiller, 1960).

Psychotherapy

Psychotherapy is usually not thought of as being possible or is of limited concern in treatment; however, provisions for the psychological needs of a fish may be therapeutic (Gr. *therapeutikos*—healing, curative, alleviative) or prophylactic in nature. Providing suitable hiding places or specific types of plants may be exceedingly important, preventing both anaphylactic shock and/or tissue trauma caused by the fish fleeing into solid objects or glass walls. It is also possible that some types of drugs may affect or alter a fish's normal behavior patterns. Careful observation is indicated when treating fish diseases. Turning off the lights and allowing a fish to rest in the dark or putting an opaque screen around a tank may be all that is required for recovery from acute shock.

Surgery

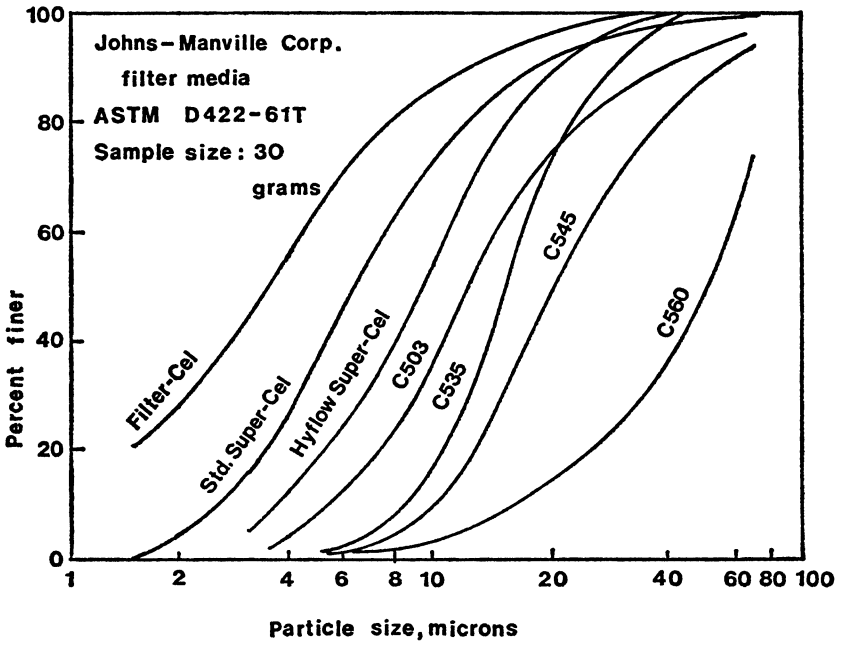
Surgery of fishes is at present confined to the body surfaces. Removal of external parasites with forceps or clipping a diseased or injured fin is pretty much the extent to which surgery can at present be carried out safely. However, internal surgery of the visceral cavity has been successfully performed experimentally, and the time is soon coming when rare or endangered fishes will be able to undergo extensive abdominal surgery. Tumor removal by surgical means is not now uncommon. Nodules produced by the viral disease lymphocystis may be surgically excised, which is the only effective treatment known in this case.

Diet or Nutritional Therapy

Diet or nutritional therapy is yet another aspect of treatment that is often not regarded as a ways and means of preventing or correcting disease conditions. Yet nutritional diseases and disorders, particularly the avitaminoses, are a major reason for the lowered resistance leading to the outbreak of diseases by pathological organisms, as well as being debilitating or fatal in their own right. An entire encyclopedia could be written on this facet of diseases and therapeutics of fishes. Technically, the vitamins themselves are drugs. They are not included in this work because of their intricate interrelationship with food and nutrition, and it is felt that other sources can provide more of the essential detail necessary for their thorough coverage. However, a study of nutritional disorders, particularly in diseases of the liver, should not be neglected.

Regulation of Environment

The regulation of environment as therapy primarily entails water quality and its management by physical, chemical, or mechanical means. Adequate and well-managed filtration systems either with or without carbon or charcoal would fall under this heading. Its importance in preventing the occurrence or inhibiting the spread of disease cannot be overemphasized. A diatomaceous earth filter in aquaria can remove bacteria, provided a proper grade of filter media is used *(see* Fig. 1-1a and 1-1b), and some types of bacteria will adsorb to activated carbon granules. Another form of environmental regulation therapy would include the planting of reeds in a pond or of sticking bamboo stakes in the bottom for the fish to scratch themselves against in order to remove parasites (Hoffman and Meyer, 1974). All are forms of therapy utilizing the physical environment. Water pollution and toxins can also be placed here as a major source of disease and disorders of fishes, and their elimination or control can be considered a form of treatment. Toxicology (Gr. *toxikos*—poison; *logos*—knowledge of) of fishes is still in its infancy, but it is a rapidly growing area of study by environmental ecologists. I have for the most part arbitrarily placed it outside the scope of this book, although it will be discussed briefly in a later section.



Product	Mean particle size, microns
Johns-Manville	
Celite 560	50
Celite 545	21.0
Celite 535	16.2
Celite 503	12.8
Hyflo Super-Cel	9.5

Figure 1-1a.

Immunization

Immunization is a very complex aspect of fish medicine. The natural production of antigens and antibodies and their induced production through the use of vaccines and serums is an interesting study. Much has been done in this area, particularly in the viral diseases of Salmonidae used as food. The methods and pro-