

Arthropod Venoms

Editor
Sergio Bettini



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Preface

Arthropod venoms have received much attention and have played an important role in folklore and medicine since ancient times. Scorpion envenomation, "tarantism," bee and wasp stings are among those subjects about which most has been speculated and written in the past. In the last 50 years or so, a great number of scientific papers have been devoted to arthropod venoms, but only a few volumes have been designed to collect this rapidly increasing material, and these are not recent. Of late, the chemistry and mode of action of several arthropod venoms have been thoroughly studied, and some of these substances will probably be used as pharmacological tools and also as therapeutic agents.

The aim of the present volume is to collect in manual form new information as well as the old notions on arthropod venoms.

Even though it was our intention to present a volume on arthropod venoms, and not on venomous arthropods, inevitably we were forced to include information on venom-producing organisms as well. We assumed, in fact, that those scientists for whom the present manual is primarily intended (biochemists, particularly comparative biochemists, and pharmacologists) should be familiar with the biologic elements concerning the venom-producing species; which should show them how important it is to operate in close collaboration with biologists specialized in venomous arthropod systematics and biology. Furthermore, the distribution, ethology, and ecology of venomous species should be thoroughly known if the specific therapy and prevention of envenomation are to be correctly undertaken by clinicians and public health specialists respectively. For these reasons the reader, besides an introductory chapter on arthropod systematics, will find in the first part of each chapter much space devoted to the distribution and biology of the venomous species.

The origin and nature of animal substances called venoms and the concept of toxicity have been much debated throughout the years and several definitions of the term "venom" have been given by different authors. In our volume the proposed definition is the old one of E.N. PAWLOWSKY (*Gifttiere und ihre Giftigkeit*. Jena: G. Fischer, 1927), later adopted by E. KAISER and E. MICHL (*Die Biochemie der tierischen Gifte*. Wien: F. Deuticke, 1958) which reads as follows: "Those substances are considered venoms which, due to their chemical characteristics, after their penetration into the human or animal body can cause, even in small doses, alterations in their health, or death." By following such a definition, the authors were allowed to include in this volume topics regarding all toxic substances derived from arthropods, even those not originating from venomous apparatuses.

The concept of toxic properties of tissues has been well treated already by M. PHISALIX (*Animaux Venimeux et Venins*. Paris: Masson, 1922) and recently

by E. HABERMAN (Chemistry, Pharmacology, and Toxicology of Bee, Wasp, and Hornet Venoms. In: *Animals and their Venoms*, Vol. III, Eds. W. Bücherl and E. Buckley. New York: Academic Press, 1971). Obviously the limits of this concept are vague: many substances present in arthropods, for instance, may cause toxic phenomena if administered in high doses. As HABERMAN states, the frontier between "simple" body constituents and "venom" is not sharply marked: an example is given by biogenic amines which are present both in tissues and in venoms. On the other hand, in some cases (e.g., bee venom) when the venom is administered at very low doses, the original sense of the term gives way to its conceptual opposite, that of medicament.

We have deemed it useful to broaden the subject by also including in the volume the arthropod defensive substances, some of which are not to be considered as toxic *sensu stricto*, even though they do induce profound behavioral modifications in other species. This type of compound appears more puzzling if, for instance, we consider that some ketones are utilized by ants both for defensive and communicative functions (M.S. BLUM and H.R. HERMAN, Chapter 25).

The limits to be attributed to the term venom could not, therefore, be fixed *a priori*, but were left in each case to the judgment of the individual authors.

As initially planned, the volume should have also included chapters dealing with species belonging to orders less known for their poisonous characteristics. It is well known that the saliva of Diptera, for instance, often causes local and general toxic phenomena not to be attributed to allergic responses only (e.g., toxic reactions due to bites of tabanid larvae, asilids, simuliids, ceratopogonids, etc.). Information in such a field, however, is so scanty that we had to abandon the idea. On the other hand, a great deal has already been published on insect allergy, a topic more pertinent to the field of immunology. On this subject, excellent reviews have been presented by S. SHULMAN (Allergic responses to insect bites. *Annual Rev. Entomol.* **12**, 323–346, 1967), B.F. FEINGOLD, E. BENJAMINI and D. MICHAELI (The allergic responses to insect bites. *Annual Rev. Entomol.* **13**, 137–158, 1968) and C.A. FRAZIER (*Insect Allergy*, St. Louis: W.H. Green, 1969), to which the reader is referred.

The volume has been divided into 26 chapters, each one related to a specific zoologic group, this being the only possible way of arranging the abundant material on the various subjects without risking many omissions or repetitions. Unfortunately, as will be noted by the careful reader, a few were unavoidable. The existence of a very large number of arthropod-borne toxic substances, and of even larger number of specialists, 43 of whom were invited to participate in the preparation of the present volume, made this drawback inevitable.

In order to cover the naturalistic as well as the biochemical and pharmacologic aspects of each chapter, more than one author was often needed. Though this represented an advantage as far as the thorough treatment of the subject was concerned, it negatively influenced the uniformity of the volume because of the diverse nature and amount of information available for each topic.

The authors of the volume are among the most qualified specialists in their fields. They were asked to include in their chapters all that is known on the subject, so as to match the purpose and tradition of the monographs published by the *Handbook of Experimental Pharmacology*.

Editing of the present volume started in January 1974. The mailing of the first group of invitations coincided with one of the most serious postal strikes in Italy, so that a great deal of mail went astray. This, plus the courteous declining by some scientists and the delay of others in providing the manuscripts caused the volume to be published at the end of 1977 and consequently a few of the chapters may be somewhat outdated.

I wish to express my gratitude to all authors who have taken on the burden of this task with enthusiasm and skill: they should be praised for the high standard of their reviews. Thanks are due to Professor P. BRIGNOLI for the time he has devoted to discussing some of the naturalistic problems of the volume. I am particularly indebted to Miss A.M. LOPOMO for her excellent secretarial work. I also wish to thank member of the staff of Springer-Verlag, who were extremely cooperative in the preparation of the volume.

In January of this year we received the very sad news that our Japanese colleague Professor Y. HASHIMOTO, who had prepared jointly with Professor S. KONOSU the chapter "Venoms of Crustacea and Merostomata", had died on 23 September 1976. I am sure that I share the feelings of all the other authors in expressing our deep sorrow and sympathy to Professor HASHIMOTO's family and to all those who have had the pleasure of working with him.

August 1977

SERGIO BETTINI

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