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## Bee Stings and "Allergic" Reactions<sup>1</sup>

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A bee sting is always potentially serious. The severity and duration of a reaction can vary from one person to another. In addition, one's own reaction to a bee sting may differ between occurrences. Most persons experience a local non-serious allergic reaction to bee venom. However, depending on the location and number of bee stings received, as well as the ever-present possibility of a severe allergic reaction to bee venom, a serious reaction can be precipitated that can be life-threatening.

The honey bee's barbed sting cannot be withdrawn by the insect once it has penetrated the skin. The bee's only means of escape is to tear away part of its abdomen leaving behind the sting with its venom sac attached. The muscles of the sting apparatus continue to pulsate after the bee has flown away, driving the sting deeper into the skin and injecting more venom. For this reason the sting apparatus should be scraped (not pulled) out of the skin as soon as possible after a sting is received.

Recommendations for someone getting stung include notifying a companion in case assistance becomes necessary, **immediately** removing the sting apparatus by scraping it out of the skin, and applying ice which helps reduce swelling and pain. If you

suspect a serious reaction, then it is advisable to seek medical assistance.

The following information is provided for those who wish to know more about possible reactions to stings. In all cases, when in doubt ask assistance from a qualified medical professional.

Two kinds of reactions are usually associated with bee stings and those of other stinging insects as well: (1) local or (2) systemic, allergic or life-threatening. There is agreement that a local reaction is generally characterized by: pain, swelling, redness, itching and a wheal surrounding the wound made by the stinging apparatus. This is the reaction of the vast majority of persons and those suffering it are considered to be at little risk of death, unless the mouth or throat is affected so that the respiratory tract is obstructed. Nevertheless, many in the general population continue to believe that because they "swell up," they are at risk of losing their life when stung by bees. Ironically, it may in fact be the reverse. Those far more at risk may show no reactions to stings at all.

For the beekeeping community, an authoritative review was published in 1982 by Harry R. C. Riches, "Hypersensitivity to Bee Venom," *Bee World*, Vol.

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63, Number 1, pp. 7-72. Dr. Riches classified bee venom hypersensitivity into two categories. Type I is the usual reaction resulting from venom components affecting mast cells which then release histamine (associated with pain and swelling) and other chemicals. Type III reactions are delayed responses to stings, produced by a substance called precipitin. They are considered extremely rare.

Dr. Riches' Type I bee venom hypersensitivity reactions were listed in increasing order of severity as large local reactions, systemic reactions and anaphylaxis. Systemic reactions, he said, were generalized reactions occurring within a few minutes of a sting. Mildest symptoms were flushing of the skin, followed by an itchy nettle-rash and more serious included chest wheeze, nausea, vomiting, abdominal pains, palpitations and faintness. In addition, the speed of onset of a reaction was an indication of its seriousness. Anaphylaxis, he said, occurred within seconds or minutes of a sting. Common initial symptoms are chest wheeze, nausea, vomiting, and confusion followed by falling blood pressure leading to death.

According to Dr. Riches, treatment of local reactions included removing the stinging apparatus and applying calamine or cold compresses (not substances containing antihistamines which can cause skin irritation). Stings inside the mouth and on the eyeball require special attention and are so very serious, he concluded, that a veil should always be worn when working bees. For treatment of systemic reactions Dr. Riches recommended adrenaline administered according to severity of symptoms by inhalation to injection by syringe, and for anaphylaxis, adrenaline injected intramuscularly.

Type III bee venom hypersensitivity reactions were grouped as arthus type, serum sickness and others. Arthus reaction becomes apparent 8-12 hours after a sting and could persist two to three days. It is associated with an excess of precipitins and often causes tissue damage, blistering and bruising. Serum sickness is more likely after an episode of multiple stings (malaise, fever, joint pains, skin rashes, swelling of lymph glands, kidney disturbances) and may develop three to ten days after a sting. Finally, very rare medical disorders such as encephalitis,

polyneuritis and renal failure have followed insect stings.

The latter appears to be a major symptom of mass bee attacks in Latin America by Africanized honey bees. This, however, is something totally different than incidents where one or a few bees are involved. Any person regardless of sensitivity to bee venom receiving an enormous number of stings might be susceptible to renal failure or other severe symptoms simply because their body was challenged by a great quantity of toxin.

A quick glance at Dr. Riches' categories and symptoms indicates a good deal of overlap between symptoms and treatment of systemic and anaphylactic reactions. In addition, the general tone of Dr. Riches' article appears to be one suggesting that most systemic reactions are life-threatening to some degree. Many physicians agree with this, some preferring to call any allergic or systemic reaction "life-threatening".

This life-threatening bias has little basis, according to Dr. Howard S. Rubenstein who published "Bee-Sting Diseases," *The Lancet*, February 27, 1982 pp. 496-599. Dr. Rubenstein begins with the statement: "Many of the large number of people who are stung each year by bees experience frightening systemic-reactions, but the vast majority of such reactions are not life-threatening. There is no evidence that the very few who die as a result of a bee sting come from the pool of those who once before sustained a systemic reaction. On the contrary, no reaction at all may be a more ominous predictor of a lethal outcome on a subsequent sting." Death from bee stings comes about through a number of mechanisms, Dr. Rubenstein said, the most important of which appears to be atherosclerosis (build up of deposits in the arteries). Also, external factors affect mortality such as environmental temperature and site of the sting. Disagreement over bee-sting diseases, according to Dr. Rubenstein, is caused by four sources of confusion: (1) the frightening presentation of the systemic reaction; (2) misuse of the term "anaphylaxis"; (3) multiple causes of "bee-sting" deaths; and (4) lack of information about the systemic reaction.

The frightening aspect of being stung cannot be ruled out as a cause of a systemic reaction, Dr. Rubenstein said. "A patient who suddenly develops hives, shortness of breath (sometimes with bronchospasm), and giddiness or syncope (sometimes with hypotension) is terrified, as are those about him. The patient may think he is going to die, as may his family or physician. What people need to know, therefore, is that the vast majority of patients, particularly if aged under 25, will quickly recover." In addition, according to Dr. Rubenstein, patients who have these terrifying experiences need to know that there is no evidence either that they came to the brink of death or that they are at greater risk of dying from a subsequent sting than anyone else.

It is this last statement that raises a few eyebrows; conventional wisdom in the past has accepted that reactions are likely to get infinitely worse with each sting after a person suffers a systemic reaction. It is lamentable, Dr. Rubenstein said, that in bee sting cases physicians did not check vital signs before administering adrenaline; even more lamentable is that patients who die as a result of stings generally have post mortem diagnosis of atherosclerosis, not anaphylaxis. Anaphylaxis is very rare in humans, he said, and except in specific cases in which it truly applies, should be replaced by the neutral, non-prognostic, non-frightening and non-specific term "systemic reaction." Multiple causes of bee sting deaths are the rule, rather than simple anaphylaxis, according to Dr. Rubenstein. Other potential complications besides atherosclerosis include sepsis, cerebral oedema, defibrination syndrome, haemorrhages, emboli and neuroencephalomyelitis variants. The fact that 90% of those who die after a bee sting are over 25, whereas most who sustain allergic reactions are children argues strongly against allergy. Only 12% of adults in one set of necropsy findings died of anaphylaxis, 20% had severe and 42% mild atherosclerosis and about one-third had pulmonary oedema.

Fright cannot be ruled out, Dr. Rubenstein said, nor can very warm environmental temperature. As he stated: "One may readily see how (1) a hot summer day, plus (2) strenuous exercise, plus (3) coronary

atherosclerosis, plus (4) a bee may add up to death, whether or not one invokes an allergic mechanism..." Finally, there is a lack of detailed epidemiological study on systemic reactions, according to Dr. Rubenstein. Often cited studies showed that systemic reactions to bee stings were rather frequent, benign and self-limiting, with a prevalence in the U.S. of 0.4% to 0.8%. The authors of two studies of 8000 boy scouts which produced the above figures found no reason for alarm and did not call the reactions they witnessed either life-threatening or anaphylactic. Another study revealed that prevalence of sustained systemic reactions was no greater in an allergic population than the population at large, again not referring to those experienced as life-threatening or anaphylactic, and further arguing against an allergic basis. In two more studies where the combined number of systemic reactions reached over 700, no deaths were reported.

Given this evidence, Dr. Rubenstein found it difficult to understand the following statements: "As many as 4 people per 1000 may have serious systemic reactions and therefore live in real fear of the sequelae of a subsequent sting." "Fear of fatal reactions and the consequent change in life-style is more widespread because 0.4 to 0.8 percent of the U.S. population has survived a systemic reaction to a sting." "Four out of every 1000 persons are so allergic to insect venom that a single bee sting can produce a fatal systemic reaction in their bodies within 15 minutes." These statements, he concluded, suggest a deadly epidemic. The anxiety of the authors, he charged, has been transmitted to patients and physicians and unnecessarily terrified hundreds of thousands because they are not supported by any epidemiological study. Thus, Dr. Rubenstein concluded: "...when those at risk are unidentifiable and so few; when the experiment justifying the treatment is so seriously flawed; when the treatment itself is not without risk, has not been shown to do the job intended for it, and is very costly; then we cannot justify it." All this appears to be good news for those who can now inform the curious that according to at least one physician, risk of fatality from a systemic or allergic reaction to bee sting is lower than previously thought. What must be emphasized, however, is that environmental factors and physical well being of the individual being stung cannot be ignored when

judging who is at risk of dying from a bee sting. Nor can perceptions by the individual being stung. Panic by the person stung or those around him/her can produce a systemic reaction in itself.

In the 1992 edition of *The Hive and the Honey Bee*, Dadant & Sons, Inc., pp. 1219-1220, Dr. Justin Schmidt reiterates many of Rubenstein's points concerning allergic, life threatening reactions: "In sting-induced deaths, the venom toxins, themselves, are of no direct consequence in causing death. Hence, adult (or large) size is not of intrinsic benefit. What are important are: 1) How long the body had had to experience previous stings and develop sensitization, 2) how well and how normally the immune system functions, and 3) how the rest of the body reacts during an acute anaphylactic episode. Increased age adversely affects all these factors...In oversimplified terms, venom-induced allergy can be viewed as a malfunctioning of the immune system and its system of regulation."