

EPIDEMIOLOGY OF LATRODECTISM

SERGIO BETTINI

Department of Parasitology, Istituto Superiore di Sanità, Rome, Italy

Abstract—The main epidemiological characteristics of latrodectism and the difficulties encountered in their study are discussed. The geographical and seasonal distribution, and the biological and human factors that may influence this phenomenon are considered. The frequency of latrodectism in certain classes of people, the age groups affected and the sex ratio are also discussed. The world literature on epidemic outbreaks is listed. The epidemic of latrodectism that occurred in Italy in 1946-51 is fully reviewed and commented on, and the duration of hospital stay and mortality of the 946 cases involved are reported. The probable causes of epidemics of latrodectism are briefly summarized.

LATRODECTISM is endemic in agricultural regions infested by species of the genus *Latrodectus** and is characterized by epidemic outbreaks. Normally the cases are few. In limited areas no cases may be reported for several years (silent phase), as in the Greek island of Lemnos (Table 1), in which a typical silent phase lasted six years — from 1949 to 1954.[1]

TABLE 1. LATRODECTISM ON THE ISLAND OF LEMNOS, GREECE [1]

Year	No. of cases	Year	No. of cases	Year	No. of cases
1930	3	1941	0	1952	0
1931	0	1942	3	1953	0
1932	4	1943	0	1954	0
1933	1	1944	0	1955	3
1934	0	1945	3	1956	0
1935	0	1946	1	1957	0
1936	1	1947	0	1958	1
1937	0	1948	1	1959	6
1938	3	1949	0	1960	0
1939	0	1950	0	1961	2
1940	2	1951	0		

In more extensive areas of infection, as in central Italy,[2-8] the number of cases may show a steady trend with minor variations except during epidemic outbreaks.

Because of the silent phases, the epidemiology of latrodectism is particularly difficult to study. In fact, researchers often have ignored latrodectism in limited areas of observation during years characterized by the silent phase. When an outbreak occurs, the phenomenon may be considered as importation. This has been the case in many of the earlier epidemics [7]. In addition, the patients may not report to the physician, [9,10] or if they do the practitioner may not care to publish a limited number of cases. On the other hand, he may

*To avoid confusion, the old nomenclature as reported in the literature previous to the work of LEVI [11] will be used in this report.

wish to report a large number of cases that may have occurred in an epidemic, in an attempt to prove the efficacy of a particular treatment.

The biologists, on their part, often have gathered information on *Latrodectus* just after the epidemic phase has subsided. Since their work is limited to a few years, such studies have contributed little to knowledge of the fluctuation of population densities. Hence, very limited, scattered information is available on the epidemiology of latrodectism.

A fairly good map showing the worldwide distribution of latrodectism may be obtained by limiting the area to the distribution of *Latrodectus* species within the 20° C isotherms of January for the northern hemisphere and of July for the southern hemisphere (as reported by LEVI [11]).

It is interesting that latrodectism is sometimes abundant only in certain restricted zones, despite the wide distribution of a particular species in a given area. Two thirds of all cases reported in one century (1826-1926) in the United States, for instance, were from California, [12] and practically all cases reported in Italy during the years 1949-51 occurred in four central provinces of the Tyrrhenian coast [6]. Several factors may be responsible, among which are fluctuations in the densities of the human and spider populations, and variations in spider biology and reporting.

The distribution throughout the world follows the pattern of the preferential habitats of the species. However, different populations of the same species may prefer different habitats. Thus, envenomation by *L. tredecimguttatus* in the Mediterranean area (Spain, France, Italy, Yugoslavia, Greece and Israel) is limited mainly to the dry coastal plains and low hills, whereas latrodectism from *L. tredecimguttatus* (formerly variety *erebus*) in Russia is confined to the arid inland plains.

The seasonal incidence of latrodectism may vary according to the territory and the species involved. In temperate countries the high densities of female spiders and the agricultural activities common to the hot months of the year contribute to the high frequency of cases during summer. Fig. 1, a typical graph, shows the result of a survey in central Italy,

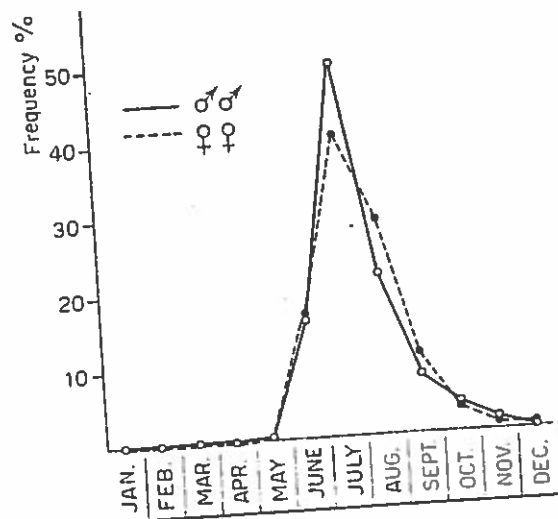


FIG. 1. MONTHLY FREQUENCY OF 711 MALE AND 235 FEMALE PATIENTS WITH LATRODECTISM (CAUSED BY *L. tredecimguttatus*) IN THE PROVINCES OF VITERBO, GROSSETO, ROME AND LATINA FROM 1938 to 1958 [6]

and represents 946 cases reported for the years 1938-58. In tropical countries, however, the incidence of latrodectism throughout the year may be represented by a different type of curve, for the spider density may show less seasonal differences and the agricultural practices also may vary in seasonal intensity.

The phenology of the species also greatly influences the seasonal incidence of latrodectism. Fig. 2 portrays 60 cases of latrodectism from *L. mactans*, of North America, as reported by BOGEN [9]. This graph shows a wider distribution of cases throughout the year,

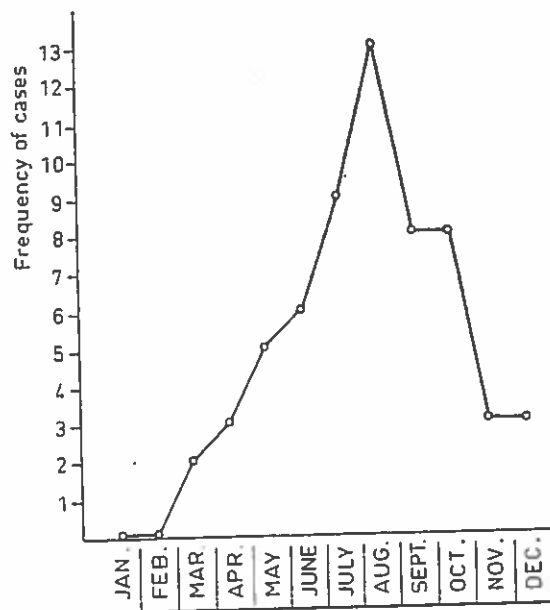


FIG. 2. MONTHLY FREQUENCY OF PATIENTS WITH LATRODECTISM (CAUSED BY *L. mactans*) TREATED AT LOS ANGELES GENERAL HOSPITAL FROM 1915 to 1931 [9]

although the maximum frequency is still confined to the hot months. The graph prepared by WIENER [13] on 163 cases from *L. hasselti*, of Australia (Fig. 3) shows the same trend. In latrodectism from both *L. mactans*, of North America, and *L. hasselti*, of Australia, the species habitat is peculiar and closely associated with man throughout the year. The maximum frequency during the hot months is most probably caused by the greater density of the spider population in the summer. The monthly distribution of latrodectism caused by these two, more domestic, species is quite different from that due to strictly wild species, such as *L. tredecimguttatus*.

The trend of endemic latrodectism may slowly increase, under certain circumstances and for various reasons, as in the case of *L. mactans* in North America and Argentina, where the spider, according to BOGEN [9] and ROMAÑA and ABALOS [14], has gradually invaded wider territories and has become more closely associated with man. In the case of *L. hasselti*, in Australia, the endemic increase is more apparent than real, for, according to WIENER [13], physicians were, for various reasons more willing to report such cases from 1957 onward.

The peculiar phenology of each species of the genus, and even of each population, greatly influences the modalities through which man is bitten. Some spider populations, as *L. tredecimguttatus*, *L. mactans* of South America, *L. menavodi* and *L. indistinctus*, for

instance, live in the fields (on grain, legumes and the like), while others, as *L. mactans* of North America, have closer contacts with man (as in privies and garages). This is epidemiologically important for, in the first instance, farmers constitute the class most frequently bitten (in Italy, 70 per cent). The yearly peak occurs during harvest time. In the second instance, the victims may belong to almost any class [9] and the yearly peak depends more on the spider density than on the increased probability of man-spider contact.

Moreover, the phenology of the various *Latrodectus* species could also exert an effect on the age frequency of the cases. Curiously enough, there is little difference in this respect between latrodectism in epidemic form, from definitely wild species (*L. tredecimguttatus*), and latrodectism in endemic form from the two more domestic species (*L. mactans* of North America and *L. hasselti*), (Figs. 4 and 5).

Latrodectism caused by wild species and poisoning by the more domestic ones show no marked differences in sex ratio (24.7 per cent for *L. tredecimguttatus* [6] 29.6 per cent for *L. hasselti* [13] and 11.6 per cent for *L. mactans* [9]).

Latrodectism in certain regions may be the result of the bite of sympatric species living in different "eco-niches", as in the case of *L. tredecimguttatus* and *L. revivensis* in Israel [15]. In such cases the epidemiology of latrodectism is complicated by a more difficult problem.

The fact that some *Latrodectus* species may induce symptoms of minor intensity in man, as reported for *L. geometricus* and *L. pallidus*, further complicates the epidemiological picture. These species may be sympatric with more poisonous ones, as *L. geometricus* with *L. mactans* in North America [16]; *L. pallidus* with *L. tredecimguttatus* and *L. revivensis* in Israel [15]; *L. geometricus* with *L. indistinctus* in South Africa [17]. The possibility of

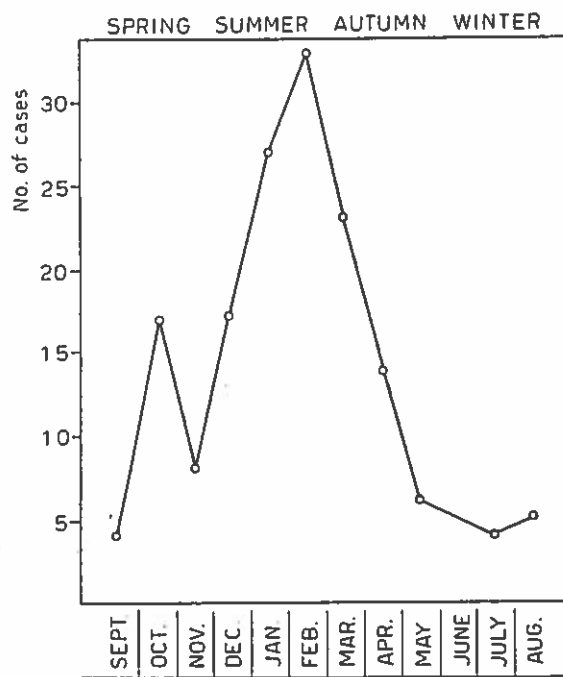


FIG. 3. MONTHLY FREQUENCY OF LATRODECTISM (CAUSED BY *L. hasselti*) IN AUSTRALIA FROM 1935 TO 1961 [13]

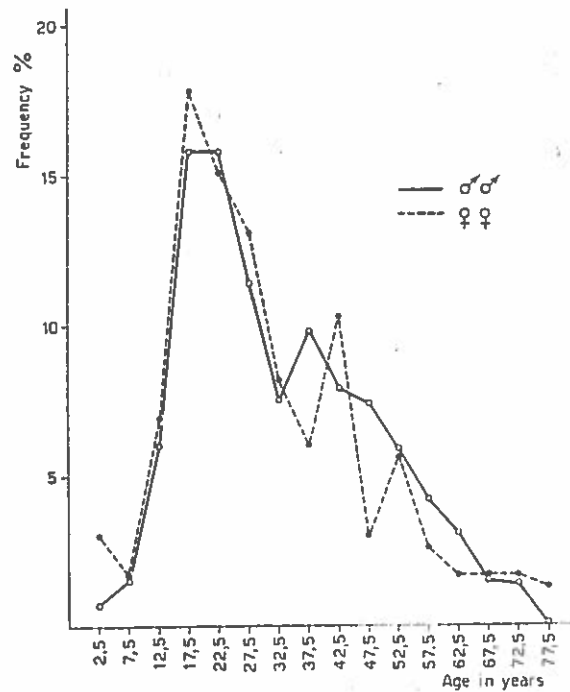


FIG. 4. AGE DISTRIBUTION OF 711 MALE AND 235 FEMALE PATIENTS WITH LATRODECTISM (CAUSED BY *L. tredecimguttatus*) IN THE PROVINCES OF VITERBO, GROSSETO, ROME AND LATINA FROM 1938 TO 1958 [6]

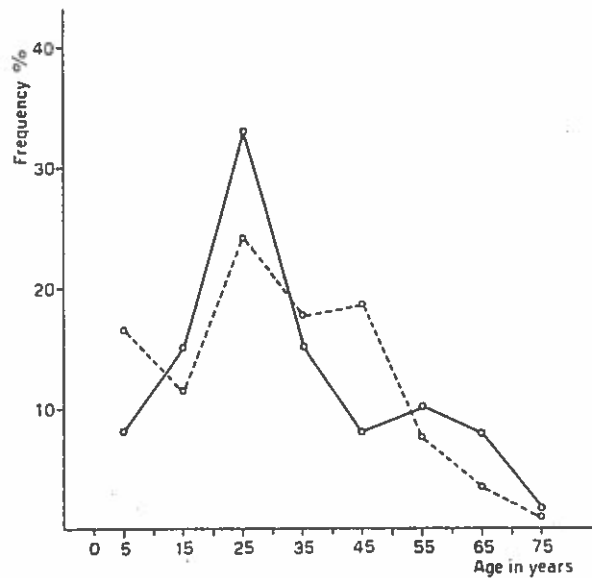


FIG. 5. AGE DISTRIBUTION OF 60 CASES OF LATRODECTISM (CAUSED BY *L. mactans*) TREATED AT LOS ANGELES GENERAL HOSPITAL FROM 1915 TO 1931 [9] AND OF 152 CASES (CAUSED BY *L. hasselti*) IN AUSTRALIA FROM 1935 TO 1961 [13]. CONTINUOUS LINE: CASES CAUSED BY *L. mactans*. DOTTED LINE: CASES CAUSED BY *L. hasselti*

distinguishing the more severe from the less severe types of latrodectism from an epidemiological point of view is remote indeed.

Many epidemics of latrodectism have been reported in the world literature (Table 2). The duration of the epidemics, according to the various authors, has varied considerably—from one to six years. In Volterra the episode lasted three to four years, and the recent epidemic involving Italy and Yugoslavia lasted nearly six years.

TABLE 2. EPIDEMICS OF HUMAN LATRODECTISM THROUGHOUT THE WORLD [7]*

Year	Locality	No. of cases	<i>Latrodectus</i> Species	Author
1786-89	Volterra (Italy)	39	<i>tredecimguttatus</i>	TOTI [25]
1790	Volterra (Italy)	very abundant	"	ROSSI [26]
1830	Tarragona (Spain)	a high number of cases among the harvesters	"	GRAËLLS DE LA PAZ [27]
1833	Corsica (France)		"	CAURO [28]
1834	Barcelona (Spain)		"	GRAËLLS DE LA PAZ [29]
1838-39	East Russia		<i>tredecimguttatus</i> var. <i>erebus</i>	MOTSCHULSKY AND BECKER [30]
1868	Samara (Russia)	43 (2 lethal cases)	"	SCHTSCHENSNOWITSCH [21]
1878-79	Marseille (France)	a true epidemic	<i>tredecimguttatus</i>	DAX [31] ROÜET†, MARIGNAN [32]
1904	Ssir Darja (Russia)		"	ROSSIKOW [33]
1910	Uruguay	an exceptionally high number of cases	<i>mactans</i>	PHISALIX [34]
1925-26	Bulgaria	87	<i>tredecimguttatus</i>	DRENSKY [35]
1926-27	Dalmatia (Yugoslavia)	many cases	"	MARETIĆ‡
1946-50	Central Italy	492	"	BETTINI <i>et al.</i> [3-8]
1946	Montenegro (Yugoslavia)	several cases	"	RAMZIN [36]
1948	Dalmatia (Yugoslavia)	8	"	SKARICA [37]
1948-53	Istria (Yugoslavia)	180	"	MARETIĆ <i>et al.</i> [17]

*For some of the epidemics the authors have omitted the number of cases. The authors have been quoted verbatim to emphasize the importance of each phenomenon.

†Quoted by DAX [31]

‡From the journal *Priroda* (personal communication from Z. MARETIĆ).

Curiously enough, the total number of epidemics in the world is quite low, and most of them have been reported from Europe, whereas latrodectism in its endemic form is a world-wide phenomenon. Moreover, the abundance of *Latrodectus* is far greater in certain other places than it is in Europe (e.g., in northern Argentina 100,000 female spiders were to be collected in one year for venom research*). The low density of the human population or the scarcity of contact between spider and man or both may be an explanation, but the possibility still remains that many cases are not reported. Finally, it should be added that

* Personal communication from Dr. J. W. ABALOS.

the literature we were able to consult for the present communication is deficient. It is probable, therefore, that the list of epidemics reported in Table 2 is incomplete.

The epidemic that occurred recently in Italy and Yugoslavia, which covered a period of twenty-one years (1938-58) has been studied by us on a vast territory in central Italy (provinces of Grosseto, Viterbo, Rome and Latina). A total of 946 cases was reported [3-6]. The research method employed has been described in detail elsewhere [3].

Fig. 6 shows the trend of case frequency for the four provinces studied. The highest peak occurred in 1947, but the actual increase in case frequency started in 1946 and ended in 1951-52. Fig. 7 shows the frequency of cases separately for each province. The peak frequency for Latina, Viterbo and Rome occurred in 1948 and in 1950 for Grosseto. This finding should be compared with the report of MARETIĆ [18], who stated that the maximum frequency of cases in Istria (Yugoslavia) was observed in 1948.

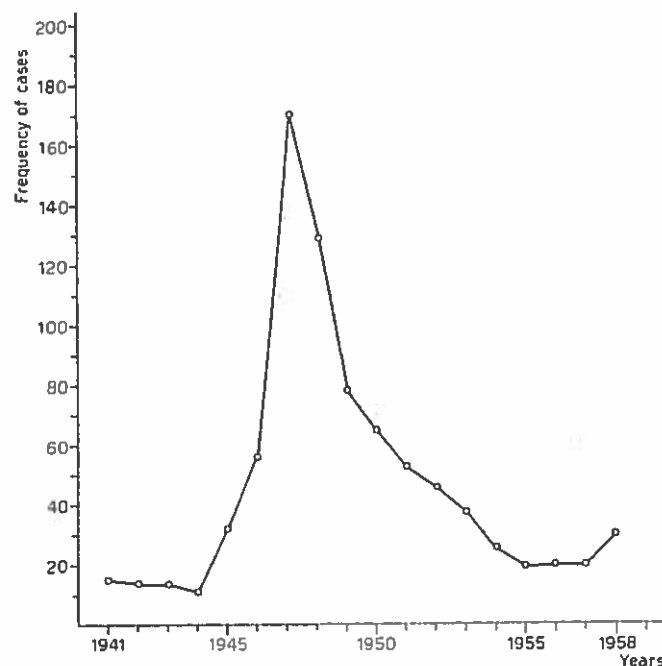


FIG. 6. YEARLY FREQUENCY OF LATRODECTISM (CAUSED BY *L. tredecimguttatus*); POOLED DATA FOR THE PROVINCES OF VITERBO, GROSSETO, ROME AND LATINA FROM 1941 TO 1958 [6].

The commonest duration of hospital stay was two days, as shown in Fig. 8. This is in agreement with BOGEN's [9] findings in 60 cases (two to three days duration), whereas WIENER [13] reports that, in latrodectism treated with specific serum, the duration of illness in 143 cases was less than one day, and from six to eight days when no antivenin was used. The average duration of illness for 145 cases reported by SAMPAYO [19] was 8.2 days. According to SAVOURAS [1] the duration of illness in 43 cases was two to eight days. In RUSSELL's series of 19 cases [20] hospitalization in adults was of one day's duration with treatment, while in children it was two days with treatment (personal communication). Since the clinical picture is the same for the bite of all species of *Latrodectus*, excluding the

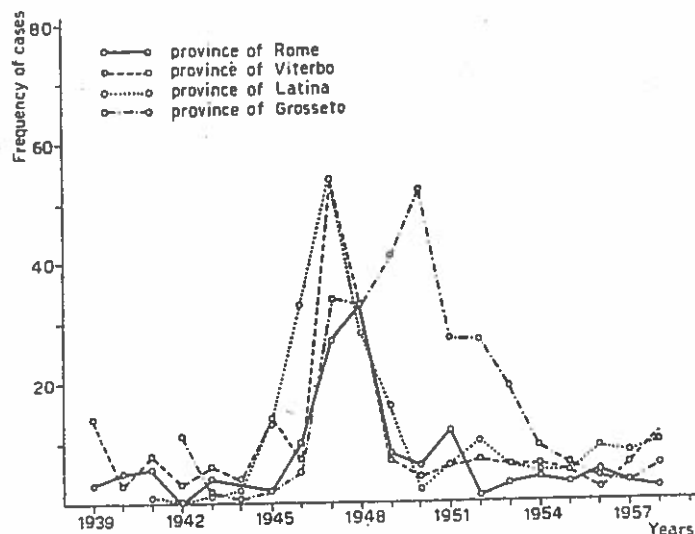


FIG. 7. YEARLY FREQUENCY OF LATRODECTISM (CAUSED BY *L. tredecimguttatus*) FOR THE PROVINCES OF VITERBO, GROSSETO, ROME AND LATINA FROM 1939 TO 1958 [6]

less toxic *L. geometricus* and *L. pallidus*, it is obvious that the duration of hospital stay depends on the therapeutic management rather than on the course of the poisoning.

Of 946 cases reported by us, only 2 (about 0.2 per cent) were fatal. This percentage is very low in comparison with the mortality of the pre-serum period (4.6 per cent in Greece [1] 4 per cent in Russia [21] for *L. tredecimguttatus*, 8 per cent [12], 4.4 per cent [9] and 6.2 per cent [22] for *L. mactans* in North America and 6.1 per cent for *L. hasselti* [13]. Our low mortality is closer to that reported in South America for *L. mactans* (from none on 10 cases [23] to "very scarce" in a survey of all cases in Argentina [19]).

The causes of epidemics of latrodectism in general have been fully analyzed and discussed in a previous paper [9]. The factors that may alter the frequency of the bites are those that determine:

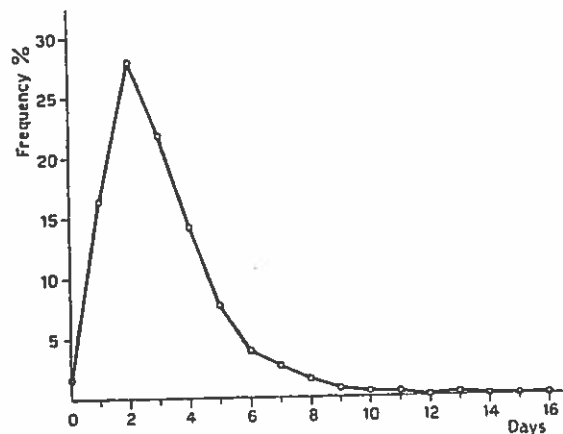


FIG. 8. DURATION OF HOSPITAL STAY FOR 944 CASES OF LATRODECTISM IN THE PROVINCES OF VITERBO, GROSSETO, ROME AND LATINA FROM 1938 TO 1958 [6]

- (1) the variations in the density of the human population;
- (2) variations in the density of the spider population; and
- (3) variations in the frequency of man-spider contacts.

The second category seems to be the one concerned most directly with the outbreak of epidemics of latrodectism. With regard to the recent epidemic in Italy, it seems logical to hypothesize that certain meteorological conditions may have disturbed the natural balance of the parasites and predators of *L. tredecimguttatus* [24] and that the density of the parasites may have decreased at different rates of speed in different territories, thus permitting the spider population to multiply freely during certain years.

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