

HUMAN MYIASIS IN NORTH AMERICA (1952-1962 inclusive)

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Myiasis is the invasion of body tissues or cavities by the larvae of flies. The terms *canthariasis* and *scoleciasis* are used for similar conditions produced by beetle larvae and moth larvae respectively.

This report analyzes 111 human cases of myiasis, 5 of canthariasis, and 4 of scoleciasis which occurred in North America between 31 Dec. 1951 and 1 Jan. 1963.

Thirty-four of the 120 analyzed cases have not previously been recorded in the literature (Table 1). Previously recorded cases are itemized in the annotated references at the end of the paper.

Incidence of human myiasis is difficult to assess. Undoubtedly, most cases are never recorded. The physician who treats a case seldom submits the larvae for identification, and most laboratories are unable to identify submitted larvae. Larvae forwarded to the Public Health Service for identification are the source of most of the records in Table 1.

All available evidence indicates that myiasis, canthariasis, and scoleciasis are endemic throughout most of the world, myiasis being much more common than canthariasis or scoleciasis.

CLINICAL ASPECTS: The following 11 clinical types are represented in the analyzed cases:

1. Furuncular	42 cases (33%)
2. Enteric	36 cases (28%)
3. Ocular	15 cases (14%)
4. Nasal	10 cases (9.0%)
5. Aural	5 cases (4.5%)
6. Traumatic	5 cases (4.5%)
7. Genito-urinary	3 cases (2.7%)
8. Creeping cutaneous	1 case (0.9%)
9. Lymphatic	1 case (0.9%)
10. Oral	1 case (0.9%)
11. Mammary-lacteal	1 case (0.9%)
TOTAL	120 cases (99%)

ENTOMOLOGICAL ASPECTS: The following 40 different insects are involved in the analyzed cases:

Scientific Name	Common Name	Myiasis Type(s)	Cases
1. <i>Attagenus piceus</i>	black carpet beetle	2	2
2. <i>Boletina birula</i>	fungus gnat	4	1
3. <i>Calliphora vicina</i>	blue bottle fly	2	1
4. <i>Carposina</i> sp.	fruit-worm moth	2	1

Scientific Name	Common Name	Myiasis Type(s)	Cases
5. <i>Cochliomyia hominivorax</i>	primary screw-worm	1,4,6	7+6+3
6. <i>Cochliomyia macellaria</i>	secondary screw-worm	5	1
7. <i>Cuterebra cuniculi</i>	rabbit bot	1	1
8. <i>Cuterebra</i> sp.	rabbit bot	1	3
9. Diptera	fly	4,5	2+1
10. Empididae	dance fly	2	1
11. <i>Eristalis tenax</i>	rat-tail maggot	2,7	2+1
12. <i>Fannia canicularis</i>	lesser house fly	2,7	2+1
13. <i>Haematobia irritans</i>	horn fly	1	1
14. <i>Heliothis zea</i>	corn earworm	7	1
15. <i>Hermetia illucens</i>	soldier fly	2	8
16. <i>Hypoderma bovis</i>	northern cattle grub	1	1
17. <i>Hypoderma lineatum</i>	common cattle grub	1,8	6+1
18. <i>Hypoderma</i> sp.	cattle grub	9	1
19. Lepidoptera	moth	2	1
20. <i>Leptocera venalicia</i>	borborid fly	2	1
21. <i>Micralymna brevilingua</i>		4	1
22. <i>Musca domestica</i>	house fly	1	1
23. <i>Muscina</i> sp.	false stable fly	1	1
24. <i>Muscina stabulans</i>	false stable fly	2	4
25. Muscoidea	muscid fly	2	1
26. <i>Oestrus ovis</i>	sheep bot fly	3,4	14+3
27. <i>Phaenicia cuprina</i>	bronze bottle fly	2	1
28. <i>Phaenicia sericata</i>	green bottle fly	2,5,6,11	1+2+1+1
29. Phalaenidae		2	1
30. <i>Phormia regina</i>	black blow fly	1	1
31. <i>Piophilæ casei</i>	cheese maggot	2	3
32. <i>Sarcophaga clitellivora</i>	flesh fly	5	1
33. <i>Sarcophaga haemorrhoidalis</i>	flesh fly	2	1
34. <i>Sarcophaga</i> sp.	flesh fly	2,6,7,10	4+1+1+1
35. <i>Stasisia rodhaini</i>	lund larva	1	1
36. <i>Tenebroides mauritanicus</i>	cadelle beetle	4	1
37. <i>Trogoderma versicolor</i>	larger carpet beetle	2	1
38. <i>Wohlfahrtia</i> sp.	sarcophagid fly	1	1
39. <i>Wohlfahrtia opaca</i>	sarcophagid fly	1	6
40. <i>Wohlfahrtia vigil</i>	sarcophagid fly	1,3	8+1

Since more than one species is involved in some of the cases, the total of this listing exceeds 120.

Note that 16 of the 40 insects listed are involved in more than one case, seven in more than 5 cases, and two in more than 10 cases.

Of the listed insects, 10 are obligate parasites: *Cochliomyia hominivorax*, *Cuterebra cuniculi*, *Cuterebra* sp., *Hypoderma bovis*, *Hypoderma lineatum*, *Oestrus ovis*, *Stasisia* sp., *Wohlfahrtia opaca*, *Wohlfahrtia* sp., *Wohlfahrtia vigil*.

Stasisia is an African Calliphoridae not established in North America. The case apparently was contracted in Africa.

Six are facultative parasites: *Calliphora vicina*, *Cochliomyia macellaria*, *Phaenicia cuprina*, *Phaenicia* sp., *Phaenicia sericata*, *Phormia regina*. *Sarcophaga* spp. may be either facultative or fortuitous parasites. All others in the list are fortuitous.

GEOGRAPHICAL DISTRIBUTION

Myiasis is probably more uniformly distributed than uniformly reported. A single active scientist may report numerous cases from a single location, while no reports appear from another similar area which undoubtedly has numerous cases.

The number of analyzed cases which occurred in each area is: Georgia, 14; Texas, 11; Ontario and Alabama, 9 each; California, 7; Alberta and New Jersey, 6; Idaho, Oklahoma, and Virginia, 5; Colorado, Louisiana, Minnesota, and Tennessee, 4; Hawaii, 3; Arizona, Arkansas, Kentucky, New York, North Carolina, and Washington, 2; Alaska, Florida, Illinois, Indiana, Maryland, Massachusetts, Michigan, Missouri, North Dakota, Oregon, Puerto Rico, and Wyoming, 1 each.

Thus, 30 states of the United States, 2 Canadian provinces, and Puerto Rico recorded cases of myiasis and related conditions.

TEMPORAL DISTRIBUTION

The yearly totals of documented cases are 1952 (11), 1953 (17), 1954 (16), 1955 (17), 1956 (4), 1957 (15), 1958 (7), 1959 (8), 1960 (7), 1961 (12), 1962 (6). Considering the sporadic nature of case reporting, this is a remarkably uniform rate. 1962 records are probably incomplete due to publishing delays.

The high case average of the first 6 years (13.3 cases/year) as compared to the next 4 years (8.5 cases/year) may be a result of the primary screw-worm eradication program. Thirteen of the 80 cases reported during the first 6 years were caused by the primary screw-worm. If these cases are not tabulated, the "first-six-year" average is 11.1 cases/year.

If the primary screw-worm eradication program continues, no cases of myiasis by this species would be expected except in southern New Mexico, southern Texas, or Puerto Rico, and only rarely there. Hence, the eradication program, conducted primarily for agricultural purposes, has resulted in control of one of the species most commonly causing myiasis in man.

Listing of the cases by months shows January, 6; February, 5; March, 1; April, 2; May, 5; June, 12; July, 18; August, 12; September, 15; October, 11; November, 4; December, 3; month not recorded, 26. Thus, 71% of the cases were noticed clinically in the 5 month period June-October.

It must be remembered that the date is that of clinical detection and not date of original parasitism. With some species, such as *Cuterebra cuniculi*, it is conceivable that a case observed clinically in January was contracted the previous September.

SUMMARY

An analysis is made of 111 cases of human myiasis, 5 of cantharidiasis, and 4 of scoleciasis, which occurred in North America between 31 Dec.

1951 and 1 Jan. 1963. Thirty-four of the cases have not previously been recorded in the literature.

Eleven clinical types are represented of which furuncular, enteric, ocular, and nasal constitute 84% of the cases. Forty different insects are involved in the analyzed cases. Sixteen of these are involved in more than one case, seven in more than five cases, and two in more than 10 cases. Of the 40 listed insects, 10 are obligate parasites.

Cases occurred in 30 states, 2 Canadian provinces, and in Puerto Rico. Cases reported fell from 13.3/year (1952-1957 inclusive) to 8.5/year (1958-1961 inclusive), partly because of the primary screw-worm eradication program. Clinically, 71% of the cases were detected in the 5 month period June-October.

ANNOTATED REFERENCES

Annotations in parentheses at the end of each reference indicate number of cases reported, type of myiasis, kind of insect involved, and place where clinical case occurred. Thus (1,2,1, Ont) signifies one case of enteric myiasis caused by *Attagenus piceus* in Ontario.

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- Anonymous*. 1959. A sarcophagid (*Wohlfahrtia vigil*)—Minnesota. Coop. Econ. Ins. Rept. 9: 587. (1, 1, 40, Minn)
- Anonymous*. 1960. False stable fly (*Muscina stabulans*)—North Dakota. Coop. Econ. Ins. Rept. 10: 472. (1, 2, 24, ND)
- Anonymous*. 1960. Cattle grub (*Hypoderma lineatum*)—California. Coop. Econ. Ins. Rept. 10: 27. (1, 1, 17, Cal)
- Anonymous*. 1961. A soldier fly (*Hermetia illucens*)—Arkansas. Coop. Econ. Ins. Rept. 11: 146. (1, 2, 15, Ark)
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- Goeden, K.* 1962. Northern cattle grub (*Hypoderma bovis*)—Oregon. Coop. Econ. Ins. Rept. 12: 105. (1, 1, 16, Ore)
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- Hodges, F. M., III.* 1955. Cutaneous *Cuterebra* myiasis; an unusual case in an infant. Amer. J. Dis. Children 90(2): 202-204. (1, 1, 8, Wash)
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Wohlrabe, J. C. 1957. Primary cutaneous myiasis. *Minnesota Med.* 40 (5): 323. (1, 1, 40, Minn)

TABLE 1. CASES NOT PREVIOUSLY PUBLISHED.

Myiasis Type	Caused By	Place	Date	By *
furuncular	<i>Cochliomyia hominivorax</i>	Ga.	Jan. 1954	HP
furuncular	<i>Cochliomyia hominivorax</i>	Ga.	Jan. 1954	HS
furuncular	<i>Cochliomyia hominivorax</i>	Ga.	Oct. 1955	HP
furuncular	<i>Cuterebra</i> sp.	La.	Apr. 1955	HP
furuncular	<i>Cuterebra cuniculi</i>	La.	Aug. 1962	HS
furuncular	<i>Phormia regina?</i>	Ida.	Jun. 1959	HP
furuncular	<i>Stasisia rodhani</i>	La.	Jun. 1955	HP
furuncular	<i>Wohlfahrtia</i> sp.	Tenn.	Feb. 1957	HP
enteric? **	Empididae?	Ga.	Feb. 1954	HP
enteric	<i>Eristalis tenax</i>	Ala.	Nov. 1953	HP
enteric	<i>Fannia canicularis</i>	Ala.	Aug. 1957	HP
enteric	<i>Fannia canicularis?</i>	Ga.	Sep. 1957	HP
enteric	<i>Hermetia illucens</i>	Ala.	Dec. 1957	HP
enteric	<i>Hermetia illucens?</i>	Ala.	Dec. 1958	HP
enteric	<i>Hermetia illucens</i>	Ala.	Jul. 1959	HS
enteric	<i>Hermetia illucens</i>	Tenn.	Aug. 1953	HP
enteric	<i>Hermetia illucens</i>	Tenn.	Sep. 1954	HP
enteric	<i>Muscina stabulans</i>	Ga.	May 1954	JL
enteric	Muscoidea	Ga.	Aug. 1959	HS
enteric	<i>Piophilæ casei</i>	Ala.	Apr. 1961	HS
enteric	<i>Sarcophaga</i> sp.	Ala.	Jul. 1959	HS
enteric	<i>Sarcophaga</i> sp.	Ga.	Jun. 1956	HP
enteric	Lepidoptera	La.	Aug. 1957	HP
enteric	<i>Sarcophaga</i> sp.	N. J.	Jul. 1960	HS
enteric	<i>Sarcophaga</i> sp.	Tex.	Jun. 1960	RE
oral	<i>Sarcophaga</i> sp.	Ga.	Sep. 1957	HP
genito-urinary	<i>Sarcophaga</i> sp.	Ga.	Sep. 1957	HP
genito-urinary	<i>Heliothis zea</i>	Va.	Aug. 1962	HP
ocular	<i>Oestrus ovis</i>	Cal.	Sep. 1952	BK
ocular	<i>Oestrus ovis</i>	Cal.	Jun. 1960	BK
ocular	<i>Oestrus ovis</i>	Cal.	Jun. 1961	BK
ocular	<i>Oestrus ovis</i>	Ind.	Jun. 1962	HP
ocular	<i>Wohlfahrtia vigil?</i>	Tenn.	Jun. 1958	HP
nasal	<i>Tenebroides mauritanicus</i>	Ga.	Sep. 1959	HP

* HP = Harry D. Pratt, CDC; HS = Harold George Scott, CDC; JL = John E. Lane, CDC; RE = Richard B. Eads, USPHS, Quarantine Service; BK = Benjamin Keh, California Department of Public Health.

** ? = expressed doubt by reporter regarding correctness of item.