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# A Century and a Half of Research on the Stable Fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae), 1862-2011: An Annotated Bibliography

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# A Century and a Half of Research on the Stable Fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae), 1862-2011: An Annotated Bibliography

K.M. Kneeland, S.R. Skoda, J.A. Hogsette,
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## Abstract

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The stable fly, *Stomoxys calcitrans*, is a cosmopolitan pest of livestock, wild animals, pets and humans. It is a primary pest of cattle in the United States, estimated to cause more than $1 billion in economic losses annually. It also causes dissention at the rural-urban interface and is a problem in recreation areas such as Florida beaches and the Great Lakes. Due to its pestiferous nature and painful bite, methods to control stable flies have been investigated for over a century. A large amount of research has been reported on stable fly biology, ecology, genetics, physiology, and vector competence. For this bibliography, literature has been gathered from journals and other resources available to the authors, and a selected number of articles have been annotated. This bibliography represents an update of literature published since 1980; literature from pre-1980 was included if copy could be ascertained.

**Keywords:** ectoparasites, biting flies, livestock parasites, livestock pests, parasite transmission, pest management, veterinary entomology.

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## Introduction

The stable fly, *Stomoxys calcitrans,* is a cosmopolitan pest of livestock, wild animals, pets and humans. It is a primary pest of cattle in the United States, estimated to cause more than $1 billion in economic losses annually. It also causes dissention at the rural-urban interface and is a problem in recreation areas such as Florida beaches and the Great Lakes. Due to its pestiferous nature and painful bite, methods to control stable flies have been investigated for over a century. A large amount of research has been reported on stable fly biology, ecology, genetics, physiology, and vector competence. For this bibliography, literature has been gathered from journals and other resources available to the authors, and a selected number of articles have been annotated. This bibliography represents an update of literature published since 1980; literature from pre-1980 was included if copy could be ascertained. For additional listings of stable fly literature, see also the following two bibliographies:

Rasmussen, R.L., and J.B. Campbell. 1978. Bibliography of the Stable Fly *Stomoxys calcitrans* (L). Report No. 8, June 1979. Agricultural Experiment Station, University of Nebraska-Lincoln, 47 pp.

Morgan, C.E., G.D. Thomas, and R.D. Hall. 1983. Annotated Bibliography of the Stable Fly, *Stomoxys calcitrans* (L.), Including References on Other Species Belonging to the Genus *Stomoxys.* North Central Regional Research Publication No. 291. University of Missouri Agricultural Experiment Station Research Bulletin 1049, Columbia, MO.

## References

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Abasa, R. O. 1983. Effects of temperature, relative humidity, lipid and water content on post-oviposition development of eggs of *Stomoxys calcitrans*. Entomol. Exp. & Appl. 33: 259-262.

Abbink, J. 1991. The biochemistry of imidacloprid. Pflanzenschutz-Nachrichten Bayer 42: 183-195.

Adams, J. R., and A. J. Forgash. 1966. The location of the contact chemoreceptors of the stable fly, *Stomoxys calcitrans* (Diptera: Muscidae). Ann. Entomol. Soc. Am. 59: 135-141.

Adams, J. R., P. E. Holbert, and A. J. Forgash. 1965. Electron microscopy of the contact chemoreceptors of the stable fly, *Stomoxys calcitrans* (Diptera: Muscidae). Ann. Entomol. Soc. Am. 58: 909-917.

Aders, W. M. 1917. Insects injurious to man and stock in Zanzibar. Bull. Entomol. Res. 7: 391-401.

Adkins, T. R., W. G. Ezell, Jr., D. C. Sheppard, and M. M. Askey, Jr. 1972. A modified canopy trap for collecting Tabanidae (Diptera). J. Med. Entomol. 9: 183-185.

Agee, H. R., and R. S. Patterson. 1983. Spectral sensitivity of stable, face, and horn flies and behavioral responses of stable flies to visual traps (Diptera: Muscidae). Environ. Entomol. 12: 1823-1828.

Aguiar-Valgode, M., and E. M. V. Milwared-de-Azevedo. 1992. Determination of thermal requirements of *Stomoxys calcitrans* (L.) (Diptera, Muscidae), under laboratory conditions. Mem. Institute Oswaldo Cruz 87: Supp. 1: 11-20. (In Portugese).

The development of eggs, larvae and pupae of *Stomoxys calcitrans* was studied at 20. 25, 30 amd 35°C. Duration of each stage decreased with increased temperature. The best temperature for development was 25°C, and 35°C proved harmful to larval development.

Ajidagba, P., C. W. Pitts, and D. E. Bay. 1983. Early embryogenesis in the stable fly (Diptera: Muscidae). Ann. Entomol. Soc. Am. 76: 616-623.

Ajidagba, P. A., D. E. Bay, and C. W. Pitts. 1985. Morphogenesis of the external features of the first-stage larva of the stable fly (Diptera: Muscidae). J. Kans. Entomol. Soc. 58: 569-577.

Allan, S. A., J. F. Day, and J. D. Edman. 1987. Visual ecology of biting flies. Ann. Rev. Entomol. 32: 297-316.

Alzogaray, R. A., and D. A. Carlson. 2000. Evaluation of *Stomoxys calcitrans* (Diptera: Muscidae) behavioral response to human and related odors in a triple cage olfactometer with insect traps. J. Med. Entomol. 37: 308-315.

Behavioral responses of stable flies to chemostimulants were categorized into 4 steps: activation, orientation, attraction and probing. The main stimuli included human breath, a human hand, and $CO_2$. The highest response occurred when there was no air flow to disperse the odor. $CO_2$ induced activation but not probing.

Ameri, M., X. Wang, M. J. Wilkerson, M. R. Kanost, and A. B. Broce. 2008. An immunoglobulin binding protein (Antigen 5) of the stable fly (Diptera: Muscidae) salivary gland stimulates bovine immune responses. J. Med. Entomol. 45: 94-101.

A stable fly salivary gland protein, a homolog of insect antigen 5, was tested to determine whether the protein suppressed bovine lymphocyte production, to determine specificity of the protein, and to test whether calves immunized with Ag5 would produce antibodies and memory lymphocytes. A recombinant form of the protein was used in the study, as well as the natural form.

Amor, T. B., and G. Jori. 2000. Sunlight-activated insecticides: historical background and mechanisms of phototoxic activity. Insect Biochem. Mol. Biol. 30: 915-925.

Anderson, J. F., and W. H. Frost. 1912. Transmission of poliomyelitis by means of the stable fly (*Stomoxys calcitrans*). Public Health Rep. 27: 3-5.

Transmission of poliomyelitis by stable flies was tested using monkeys. Two monkeys were inoculated with the virus, and then exposed to several hundred stable flies. The flies were then allowed to bite healthy monkeys. The healthy monkeys that were bitten by the flies which had fed on the inoculated monkeys soon also acquired the disease. It was concluded that poliomyelitis could be transmitted by the bite of stable flies.

Anderson, J. F., and W. H. Frost. 1913. Poliomyelitis. Further attempts to transmit the disease through the agency of the stable fly *Stomoxys calcitrans*. Public Health Rep. 28: 833-837.

Anderson, J. R. 1964. Methods for distinguishing nulliparous from parous flies and for estimating the age of *Fannia canicularis* and some other Cyclorraphous diptera. Ann. Entomol. Soc. Am. 57: 226-236.

Anderson, J. R. 1966. Recent developments in the control of some arthropods of public health and veterinary importance: Muscoid flies. Bull. Entomol. Soc. Am. 12: 342-348.

Anderson, J. R. 1974. Symposium on reproduction of arthropods of medical and veterinary importance. II. Meeting of the sexes. J. Med. Entomol. 11: 7-19.

Anderson, J. R. 1978. Mating behavior of *Stomoxys calcitrans*: effects of a blood meal on the mating drive of males and its necessity as a prerequisite for proper insemination of females. J. Econ. Entomol. 71: 379-386.

This research describes the mating behavior of *Stomoxys calcitrans,* comparing blood-fed (BF) and non-blood-fed (NBF) males with receptive and non-receptive females. It tests the virility and mating aggressiveness of BF vs. NBF males, as well as the ability of each test group to inseminate the receptive females. It was reported that only 6.31% of the NBF males were able to inseminate the receptive females, and it was a partial insemination. BF males were able to fully inseminate all the females within 12-24 hours. Reportedly, a blood meal causes the cells to enlarge around the ejaculatory duct, resulting in the accessory glands producing enough seminal fluid to transfer the sperm. However, after inseminating 2 or 3 females, the males lose their mating drive. Dissection of the accessory glands showed that the seminal fluid was depleted. It was concluded that male *Stomoxys calcitrans* need a blood meal before they can properly inseminate a female.

Anderson, J. R., and J. H. Poorbaugh. 1964. Observations on the ethology and ecology of various Diptera associated with northern California poultry ranches. J. Med. Entomol. 1: 131-147.

Anderson, J. R., and C. H. Tempelis. 1970. Precipitin test identification of blood meals of *Stomoxys calcitrans* (L.) caught on California poultry ranches, and observations of digestion rates of bovine and citrated human blood. J. Med. Entomol. 7: 223-229.

Andress, E. R., and J. B. Campbell. 1994. Inundative releases of pteromalid parasitoids (Hymenoptera: Pteromalidae) for the control of stable flies, *Stomoxys calcitrans* (L.) (Diptera: Muscidae) at confined cattle installations in West Central Nebraska. J. Econ. Entomol. 87: 714-722.

Anon. 1911. The domestic flies. Brit. Med. J. 2: 449-450.

Anon. 1915. Flies in France and Gallipoli. Brit. Med. J. 2: 184-185.

Anon. 1917. Mosquitoes and flies in the epidemiology of acute poliomyelitis. Brit. Med. J. 2: 429-430.

The experiments of Rosenau and Brues, which exposed flies to monkeys infected with poliomyelitis and subsequently allowed them to bite healthly monkeys, was cited, as well as experiments conducted by Frost. It was concluded that the transmission of poliomyelitis by flies was mechanical only, that flies were not biological vectors.

Anon. 2002. Guide to pest surveillance during contingency operations. Armed Forces Pest Management Board Technical Guide No. 43. Defense Pest Management Information Analysis Center, Washington, DC.

Anon. 2009. Personal protective measures against insects and other arthropods of military significance. Armed Forces Pest Management Board Technical Guide No. 36.

Anthony, C. 2005. Control of stable flies and house flies. Cooperative Extension Service Publ. 2045, College of Agriculture & Biological Sciences, South Dakota State Univ., USDA.

Reviews the economic importance of controlling stable flies and house flies on cattle. Describes the feeding habits, life cycle and breeding habits of the flies in South Dakota, as well as control methods. Suggests IPM as the most effective method of control.

Antonelli, A. L., and C. Ramsay. 2004. Livestock pest study guide. WSU Extension Misc. Pub. 0052.

Anziani, O. S., A. A. Guglielmore, and M. M. Volpogni. 1995. Distribución estacinal de *Stomoxys calcitrans* en un rodeo lechero da la provincial de Santa Fé. Argent. Rev. Med. Vet. 75: 330-332. (In Spanish).

Apperson, C. S., and R. C. Axtell. 1981. Arthropods associated with shoreline deposits of Eurasian Watermilfoil in the Currituck Sound, North Carolina. J. Georgia Entomol. Soc. 16: 53-59.

Appleby, J. E., and F. W. Fisk. 1959. Stable fly rearing. Proceedings in North Central Branch. Entomol. Soc. Am. 14: 41-42.

Ascoli-Christensen, A., J. F. Sutcliffe, and P. J. Albert. 1990. Effect of adenine nucleotides on labellar chemoreceptive cells of the stable fly, *Stomoxys calcitrans*. J. Insect Physiol. 36: 339-344.

Ascoli-Christensen, A., J. F. Sutcliffe, and C. J. Straton. 1990. Feeding response of the stable fly, *Stomoxys calcitrans* (L.), to blood fractions and adenine nucleotides. Physiol. Entomol. 15: 249-259.

Laboratory experiments were conducted to study the feeding response of stable flies to whole blood, plasma, erythrocyte fractions, platelets and saline. The flies fed on whole blood, plasma and erythrocyte fractions but not the platelets or saline, indicating that the phagostimulants could be ATP, ADP, AMP and cAMP.

Ascoli-Christensen, A., J. F. Sutcliffe, and P. J. Albert. 1991. Purinoceptors in blood feeding behavior in the stable fly, *Stomoxys calcitrans.* Physiol. Entomol. 16: 145-152.

Ascunce, M. S., C. C. Yang, C. Geden, and D. Shoemaker. 2009. Twenty-three new microsatellite loci in the stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae). Mol. Ecol. Resour. 9: 271-273.

Twenty-three microsatellite markers were isolated from *Stomoxys calcitrans*, 17 of which were polymorphic. Number of alleles per locus ranged from 2-9. Three microsatellite loci isolated by Gilles et al. (2004) were used for comparisons, and were successfully isolated.

Ashrafi, S. H. 1960. The study of phosphomonoesterases in the stable fly, *Stomoxys calcitrans* (L.). PhD dissertation, Graduate School, The Ohio State University, Columbus, Ohio.

Ashrafi, S. H. 1964. The cultivation and nutritional requirements of *Stomoxys calcitrans*. Bull. World Health Org. 31: 519-520.

A new method of rearing stable flies (modified from Champlain & Fisk 1954) is described. Adults are housed in larger cages, 36 X 36 X 36 inches, and fed blood with 5% sodium citrate to prevent coagulation. Larval medium is a modified CSMA. Eggs were buried 1" deep, kept at 28°C and 50% RH, which prevented fungal growth. A layer of sand was placed on the larval medium to prevent fungal growth, water was sprinkled on it on day 2, and a crust formed on day 6. The crust was crumbled into a fine consistency and watered. It was watered again on the 9$^{th}$ day which caused the mature larvae to begin pupariation.

Ashrafi, S. H., and F. W. Fisk. 1961. Acid phosphatase in the stable fly, *Stomoxys calcitrans*. Ann. Entomol. Soc. Am. 54: 598-602.

Ashrafi, S. H., and F. W. Fisk. 1961. Histochemical localization of phosphatases in the stable fly, *Stomoxys calcitrans* (L.), using Naphthol AS-Phosphate. Ohio J. Sci. 61: 7.

Atkinson, E. T. 1916. The fly pest in Gallipoli. J. Naval Med. 2: 147-152.

Avancini, R. M. P., and G. A. R. Silveira. 2002. Age structure and abundance on populations of Muscoid flies from a poultry facility in Southern Brazil. Mem. Inst. Oswaldo Cruz, Rio De Janeiro 95: 259-264.

Flies were collected in sweep nets at different places in and around a poultry facility in Brazil. The two most numerous species (*M. domestica and M. stabulans*) were analyzed for gonadotrophic profile. Stable flies were the least numerous species captured, and only newly emerged females and females ready to oviposit were collected. This led to the conclusion that stable flies use the poultry facility specifically to lay their eggs.

Axtell, R. C. 1967. Macrochelidae (Acarina: Mesostigmata) as biological control agents for synanthropic flies. Proc. 2nd Int. Cong. Acarol. 1967: 401-416.

A review of the biology and life history of Macrochelidae, with emphasis on the efficacy of *Macrocheles muscaedomesticae* as a biological control agent for the house fly, *Musca domestica.* The mite is known to parasitize other dung-breeding diptera including *Stomoxys calcitrans*. However, *S. calcitrans* is not as attractive to the mite as *M. domestica* and seems to lack the nutrients needed by the mite. It has been reported that *M. muscaedomesticae* could destroy 3-4 stable fly eggs per day if offered these eggs in laboratory tests.

Axtell, R. C. 1970. Integrated fly-control program for caged-poultry houses. J. Econ. Entomol. 63: 400-405.

Axtell, R. C. 1985. Arthropod pests of poultry, pp. 269-295. *In* R. E. Williams, R. D. Hall, A. B. Broce and P. J. Scholl, (eds). Livestock Entomology. John Wiley and Sons, New York.

Azevedo, J. F., and H. Moreira. 1946. Um caso de miase interna devida a *Stomoxys calcitrans*. Lisbon Instituto de Medicina Tropical. 3: 467-473. (In Portuguese).

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Bai, M. G., and T. Sankaran. 1977. Parasites, predators and other arthropods associated with *Musca domestica* and other flies breeding in bovine manure. Entomophaga 22: 163-168.

Bailey, D. L., and D. W. Meifert. 1973. Feeding incidence of stable flies on beef cattle, as influenced by temperature, relative humidity, and light. Environ. Entomol. 2: 1125-1126.

Bailey, D. L., T. L. Whitfield, and B. J. Smittle. 1973. Flight and dispersal of the stable fly. J. Econ. Entomol. 66: 410-411.

Flight mill studies and release-recapture experiments were conducted to evaluate the dispersal capabilities of stable flies. Flies were found to fly up to 29 km in the flight mill. Very few flies in the release-recapture experiment were recovered because the flies were not attracted to the traps. Flies were found up to 2 miles from the release site. These experiments were conducted to evaluate the possibility of using the sterile insect technique for the control of stable flies.

Bailey, D. L., T. L. Whitfield, and G. C. LaBrecque. 1975. Laboratory biology and techniques for mass producing the stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae). J. Med. Entomol. 12: 189-193.

Techniques for rearing stable flies for the sterile male release program are described. The program is designed for rearing 1 million flies per week. Laboratory life cycles at different temperatures are studied to determine the number of eggs per fly and length of life stages. A modified larval rearing medium is described which consists of wheat bran, bagasse (sugar cane waste) and water.

Bailie, H. D., and J. C. Woods. 1980. Pyrethroids, their use in the control of animal ectoparasites. Elsevier Scientific Pub. Com. pp. 256-280.

Bailie, H. D., and D. W. T. Morgan. 1980. Field trials to assess the efficacy of permethrin for the control of flies on cattle. Vet. Rec. 106: 124-127.

Baird, W. H. W. 1930. Veterinary entomology research. Ann. Rep. Dept. Vet. Sci. Anim. Husb. Tanganyika Terr. pp. 43-48.

Baker, A. W. 1917. Preliminary notes on the use of repellents for horn flies and stable flies on cattle. Toronto, 47th Annual Report of the Entomological Society of Ontario for 1916, pp 52-56.

Baker, A. W., and O. A. College. 1918. The effect of stable fly and horn fly attacks on milk production. 48th Annual Report of the Entomological Society of Ontario for 1917, 1917-1918, pp 91-93.

Baker, K. P., and P. J. Quinn. 1978. A report on clinical aspects and histopathology of Sweet Itch. Equine Vet. J. 10: 243-248.

Baldrey, F. S. H. 1911. The evolution of *Trypansoma evansi* through the fly: *Tabanus* and *Stomoxys*. J. Trop. Vet. Sci. 6: 271-282.

Experiments were conducted with Tabanids and *Stomoxys calcitrans* to determine if these flies were cyclical vectors of *Trypanosoma evansi*, the causative agent of Surra disease. The experiments were unable to verify cyclical development of the parasites in the intestines of the flies.

Ball, S. G. 1984. Seasonal abundance during the summer months of some cattle-visiting Muscidae (Diptera) in northeast England. Ecol. Entomol. 9: 1-10.

Ball, S. G., G. R. Port, and M. L. Luff. 1985. Aspects of the reproduction biology of some cattle-visiting Muscidae (Diptera) in north-east England. Vet. Parasitol. 18: 193-196.

Flies were captured in Manitoba traps and by sweep netting around cattle and frozen until dissection. Parameters measured were wing length and damage, stage of ovarian development, number of eggs in one ovary, and amount of blood feeding. The survey concentrated on the 2 most numerous muscids, *Hydrotaea irritans* and *Morellia simplex*, however data is included for two Stomoxyine species, *S. calcitrans* and *Haematobosca stimulans*.

Ballard, R. C. 1957. An analysis of *Stomoxys calcitrans* (L.) for vitamin A. J. Econ. Entomol. 50: 836-837.

Two populations of laboratory reared stable flies (2500 and 3500 flies) were analyzed for the presence of Vitamin A in their bodies, to investigate whether the vitamin was necessary for vision in this species. One population was fed dextrose, the other was fed blood. No Vitamin A was found in either population, but the researchers suggested that it may be found if only the heads were analyzed.

Ballard, R. C. 1958. Response of *Stomoxys calcitrans* (L.) to radiant energy and their relation to absorption characteristics of the eye. Ann. Entomol. Soc. Am. 51: 449-464.

Barker, R. W., B. Stacey, and R. Wright. Beef cattle ectoparasites. Oklahoma Cooperative Extension Service VTMD-7000. Oklahoma State University, Division of Agricultural Sciences and Natural Resources.

Barnes, J. R., and J. Fellig. 1969. Synergism of carbamate insecticides by phenyl 2-propynyl ethers. J. Econ. Entomol. 62: 87-89.

Barr, R. B. 1974. Symposium on reproduction of arthropods of medical and veterinary importance. V. Reproduction in Diptera of medical importance with special reference to mosquitoes. J. Med. Entomol. 11: 35-40.

Barros, A. T. M., W. W. Koller, J. B. Catto, and C. O. Soares. 2010. *Stomoxys calcitrans* outbreaks in pastured beef cattle in the state of Mato Grosso do Sul, Brazil: Surtos por Stomoxys calcitrans em gado de corte no Mato Grosso do Sul 30: 945-952.

Bartlett, C. 1985. An olfactometer for measuring the repellent effect of chemicals on the stable fly, *Stomoxys calcitrans* (L.). Pesticide Science. 16: 479-487.

Bartlett, A. C., and R. T. Staten. 1996. The sterile insect release method and other genetic control strategies. Radcliffe's IPM World Textbook. University of Minnesota. http://ipmworld.umn.edu.

Baudet, J. L. 1977. Les pieces buccles de *Stomoxys calcitrans* (L.) et. de *Lyperosia irritans* L. (Dipteres piqeurs) mophologie et fonctionnement. Bull. Soc. Sci. Nat. Ouest France. Tome 75: 21-29. (In French).

Beach, C. L., and A. B. Clark. 1904. Protecting cows from flies. Stoirs Agric. Exp. Stn. 32: 5-14.

Beersma, D. G. M., D. G. Stavanga, and J. W. Kuiper. 1977. Retinal lattice, visual field and binocularities in flies. J. Comp. Physiol. 119: 207-220.

Beerwinkle, K. R., I. L. Berry, and S. E. Kunz. 1978. Prediction models for mortality of immature stable flies caused by cold temperatures. Environ. Entomol. 7: 273-277.

Benigno, R. N. M., M. L. M. Garcia, and R. P. DeMello. 1989. Classificacao de femeas de *Stomoxys calictrans* (L.) (Diptera: Muscidae), de acordo com a idade fisiologica. Mem. Inst. Oswaldo Cruz. Rio De Janeiro 84: 69-73. (In Spanish).

Berberian, D.A. 1938. Successful transmission of cutaneous Leishmaniasis by the bites of *Stomoxys calcitrans*. Proc. Soc. Exp. Biol. Med. 38: 254-256.

Beresford, D. V., and J. F. Sutcliffe. 2006. Studies on the effectiveness of Coroplast sticky traps for sampling stable flies (Diptera: Muscidae), including a comparison to Alsynite. J. Econ. Entomol. 99: 1025-1035.

Beresford, D. V., and J. F. Sutcliffe. 2008. Stable fly (*Stomoxys calcitrans*: Diptera, Muscidae) trap response to changes in effective trap height caused by growing vegetation. J. Vector Ecol. 33: 40-45.

Tests were conducted to determine if stable flies responded to the height of sticky traps when flying, whether traps should be set a certain distance from the ground or from the top of the vegetation. Stable flies did not change their flight due to height of the traps. It was found that trap height should be constant with vegetation (20 cm above grass) and not ground level.

Beresford, D. V., and J. F. Sutcliffe. 2008. Male stable fly (*Stomoxys calcitrans*) response to $CO_2$ changes with age: evidence from wind tunnel experiments and field collections. J. Vector Ecol. 33: 247-254.

The attractiveness of $CO_2$ to male stable flies was tested in the laboratory using a wind tunnel and compared with field catches on Nzi traps. Results showed that the majority of male flies flying upwind toward the $CO_2$ were 2-3 days old, and most of the older males flew downwind, away from the $CO_2$. This suggests that stable flies are attracted to $CO_2$ only for the purpose of host location, since they need a blood meal to become sexually mature.

Beresford, D. V., and J. F. Sutcliffe. 2009. Sampling designs of insect time series data: are they all irregularly spaced? Oikos 118: 115-121.

Beresford, D. V., and J. F. Sutcliffe. 2009. Local infestation or long-distance migration? The seasonal recolonization of dairy farms by *Stomoxys calcitrans* (Diptera: Muscidae) in south central Ontario, Canada. J. Econ. Entomol. 102: 788-798.

Twenty-two dairies in south-central Ontario were monitored for stable flies to investigate their origins, either by long distance migration or local sources from overwintering. Models were divided into farms as refuges: (H1) all are refuges, (H2) some refuges, (H3) none are refuges, and (H4) long distance migration. Overwintering flies were found at 3 dairies at the southern part of the research area, adjacent to Lake Ontario. This suggested the H2 model that some dairies were refuges for overwintering, and some flies arrived by long distance migration.

Beresford, D. V., and J. F. Sutcliffe. 2010. Assessing pest control using changes in instantaneous rate of population increase: treated targets and stable fly populations case study. J. Dairy Sci. 93: 2517-2524.

Berkebile, D. R., and G. D. Thomas. 1992. Overwintering and dispersal of the stable fly, pp. 110-118. *In* G. D Thomas and S. R. Skoda (eds.), The stable fly: a pest of humans and domestic animals. Proc. Entomol. Soc. Am. Baltimore, MD.

Berkebile, D. R., G. D. Thomas, and J. B. Campbell. 1994. Overwintering of the stable fly (Diptera: Muscidae) in southeastern Nebraska. J. Econ. Entomol. 87: 1555-1563.

Several farms in southeastern Nebraska were monitored for stable flies over the winters of 1987, 1988 and 1989. Adult flies were found inside barns and caught on Alsynite traps. Breeding sites were sampled for immatures. The results of the study showed evidence that stable flies overwinter as developing immatures in silage, manure piles and grass clippings.

Berkebile, D. R., A. P. Weinhold, and D. B. Taylor. 2009. A new method for collecting clean stable fly (Diptera: Muscidae) pupae of known age. Southwest. Entomol. 34: 469-476.

The usual method of collecting stable fly pupae from larval rearing medium is by floatation, but with this method the age of each pupa is not known. The new method of collecting pupae consists of a shelf at the end of the larval rearing pan containing a sponge wrapped in a towel to retain moisture. The wandering larvae climb onto the shelf to pupariate, and the sponge keeps the area moist enough for the pupae. The pupae can be collected each day, and they are free of debris from the rearing media.

Berry, I. L. 1973. Improved system for measuring flying activity of insects by detecting static charges. J. Econ. Entomol. 6: 820-822.

Berry, I. L., and R.A. Hoffman. 1963. Use of step-on switches for control of automatic sprayers. J. Econ. Entomol. 56: 888-890.

Berry, I. L., and O. R. Kunze. 1970. Effects of 100F and 115F blackbody radiation on flight activity of stable flies. Trans. ASAE. 13: 328-331.

Berry, I. L., and S. E. Kunz. 1977. Mortality of adult stable flies. Environ. Entomol. 6: 569-574.

Berry, I. L., and S. E. Kunz. 1978. Oviposition of stable flies in response to temperature and humidity. Environ. Entomol. 7: 213-216.

Berry, I. L., and J. B. Campbell. 1985. Time and weather effects on daily feeding patterns of stable flies. (Diptera: Muscidae). Environ. Entomol. 14: 336-342.

Daily feeding patterns of stable flies were documented during the summer in 1981 and 1982, and the time and weather conditions were examined to investigate any correlations between these factors and feeding patterns. The most important weather factor was temperature, but relative humidity, radiation and wind also had some effect on stable fly feeding. In Nebraska, stable fly feeding follows a unimodal pattern, the maximum being during midday with less feeding at sunrise and sunset.

Berry, I. L., K. W. Foerster, and E. H. Ilcken. 1976. Prediction model for development time of stable flies. Trans. ASAE. 19: 123-127.

Berry, I. L., S. E. Kunz, and K. W. Foerster. 1977. A dynamic model of the physiological development of immature stable flies. Ann. Entomol. Soc. Am. 70: 173-176.

Berry, I. L., K. W. Foerster, and J. B. Campbell. 1978. Overwintering behavior of stable flies in manure mounds. Environ. Entomol. 7: 67-72.

Berry, I. L., J. A. Miller, and R. L. Harris. 1978. A chilling table for immobilizing insects. Ann. Entomol. Soc. Am. 71: 126-128.

The design and operation of a new chilling table for immobilizing insects is described. The tables recirculate air more efficiently than previous methods, reducing the condensation. The tables are used by ARS for immobilizing stable flies, horn flies and mosquitoes.

Berry, I. L., P. J. Scholl, and J. I. Shugart. 1981. A mark and recapture procedure for estimating population sizes of adult stable flies. Environ. Entomol. 10: 88-93.

Berry, I. L., D. A. Stage, and J. B. Campbell. 1983. Populations and economic impacts of stable flies on cattle. Trans. ASAE. 26: 873-877.

Berry, I. L., A. K. Nelson, and A. B. Broce. 1986. Effect of weather on capture of stable flies (Diptera: Muscidae) by Alsynite fiber glass traps. Environ. Entomol. 15: 706-709.

The effect of temperature, solar radiation, relative humidity and wind speed on the number of stable flies captured on alsynite traps was tested using one trap in Kansas and 4 in Nebraska. Number of flies caught on traps had no correlation with number of flies on the cattle. Temperature,

relative humidity and solar radiation had significant effects on number of flies captured, but wind speed had no effect.

Berry, I. L., D. A. Stage, J. B. Campbell, and C. B. Gilbertson. 1982. Populations and economic impacts of stable flies at cattle feedlots. *In* ASAE Pub. 3-82: 457-466.

Berry, I. L., K. W. Foerster, and E. H. Ilcken. 1976. Prediction model for development time of stable flies. Trans ASAE. 19: 123-127.

Betke, P., Schultka, H., and Ribbeck, R. 1986. *Stomoxys calcitrans* – Plage in einer Milchviehanlage. Angew. Parasitol. 27: 39-44.

Bidgood, H. M. 1980. Host location in *Stomoxys calcitrans* (L.) (The Stable Fly). Zoology and Comparative Physiology, University of Birmingham pp. 1-60.

Birkemoe, T., A. Soleng, and A. Aak. 2009. Biological control of *Musca domestica* and *Stomoxys calcitrans* by mass releases of the parasitoid *Spalangia cameroni* on two Norwegian pig farms. Biocontrol 54: 425-436.

Birkemoe, T., and A. Sverdrup-Thygeson. 2011. Stable fly (*Stomoxys calcitrans*) and house fly (Musca domestica) densities: A comparison of three monitoring methods on pig farms. J. Pest Sci. 84: 273-280.

Birkett, M. A., N. Agelopoulos, K. M. Jensen, J. B. Jespersen, J. A. Pickett, H. J. Prijs, G. Thomas, J. J. Trapman, L. J. Wadhams, and C. M. Woodcock. 2004. The role of volatile semiochemicals in mediating host location and selection by nuisance and disease-transmitting cattle flies. Med. Vet. Entomol. 18: 313-322.

A number of chemicals were tested for attractiveness or repellency to 5 species of cattle flies, including *Stomoxys calcitrans*. Methods used were gas chromatography-electrophysiology (GC-EAG), gas chromatography-mass spectrometry (GC-MS), electrophysiology (EAG), lab behavior and field studies. *S. calcitrans* responded to several chemicals of each type: amino acid derivatives, fatty acid derivatives, and isoprenoids or derivatives. Of the chemicals which elicited responses in all fly species, 1-octen-3-ol and 6-methyl-5-hepten-2-one were attractants and naphthalene, linalool and propyl butanoate were repellents.

Bishopp, F. C. 1913. The stable fly. USDA Farmers' Bull. #540. U.S. Govt. Printing Office. Washington, DC. 28 pp.

Bishopp, F. C. 1913. The stable fly (*Stomoxys calcitrans* L.) An important livestock pest. J. Econ. Entomol. 6: 112-127.

Bishopp, F. C. 1916. Flytraps and their operation. USDA Farmers' Bull. #734. U.S. Govt. Printing Office. Washington, DC. 14 pp.

Bishopp, F. C. 1920. The stable fly: how to prevent its annoyance and its losses to livestock. USDA Farmers' Bull. #1087. U.S. Govt. Printing Office. Washington, DC. 23 pp.

Bishopp, F. C. 1931. The stable fly: how to prevent its annoyance and its losses in livestock. USDA Farmers' Bulletin No. 1097 (rev). U.S. Govt. Printing Office. Washington, DC. 17 pp.

Bishopp, F. C. 1953. Stable flies: how to control them. USDA leaflet no. 338. U.S. Govt. Printing Office. Washington, DC. 8pp.

Bittencourt, A. J., and G. E. Moya-Borja. 2000. Flutuação sazonal de *Stomoxys calcitrans* em bovines e eqűinos no município de Espiríto Santo do Pinhal, São Paulo, Brasil. Rev. Univ. Rural 22: 101-106. (In Spanish).

Bittencourt, A. J., and B. G. De Castro. 2004. *Stomoxys calcitrans* parasitism associated with cattle diseases in Espirito Santo do Pinhal, Sao Paulo, Brazil. Ann. N.Y. Acad. Sci. 1026: 219-221.

Black, W. C., and E. S. Krafsur. 1985. Use of sticky traps to investigate seasonal trends in the spatial distribution of house flies and stable flies. (Diptera: Muscidae). J. Med. Entomol. 22: 550-557.

Blakemore, D., M. J. Lehane, and S. Williams. 1993. Cyclic AMP can promote the secretion of digestive enzymes in *Stomoxys calcitrans.* Insect Biochem. Mol. Biol. 23: 331-335.

Blakemore, D., S. Williams, and M. J. Lehane. 1995. Protein stimulation of trypsin secretion from the opaque zone cells of *Stomoxys calcitrans*. Comp. Biochem. Physiol. 110B: 301-307.

Blakeslee, E. B. 1944. DDT as a barn spray in stable fly control. J. Econ. Entomol. 37: 134-135.

The efficacy of DDT to control stable flies was tested in two horse stables along the Gulf Coast in NW Florida. Stables were sprayed every 10-12 days, and the DDT continued to kill flies for 12 days in one treatment and 13 days in another. The treatment had no effect on the outside of the barn. As a spray used directly on the horses, DDT gave 100% kill for one hour, partial protection for 2-4 hours, and had a toxic effect on stable flies for several days.

Blakeslee, E. B. 1945. DDT surface sprays for control of stable fly breeding in shore deposits of marine grass. J. Econ. Entomol. 38: 548-552.

The efficacy of using DDT emulsions for the control of stable flies breeding in marine grasses was tested in northwest Florida. This was to replace the current method of using creosote mixed with bay water, due to the economic cost of the current method. DDT was found to produce 99-100% control of stable flies in marine grasses.

Blume, R. R., R. H. Roberts, J. L. Eschle, and J. J. Matter. 1971. Tests of aerosols of deet for protection of livestock from biting flies. J. Econ. Entomol. 64: 1193-1196.

Blume, R. R., J. J. Matter, and J. L. Eschle. 1973. Biting flies (Diptera: Muscidae) on horses: laboratory evaluation of five insecticides for control. J. Med. Entomol. 10: 596-598.

Boeckh, J., H. Breer, M. Geier, F.-P. Hoever, B.-W. Krüger, G. Nentwig, and H. Sass. 1996. Acylated 1,3-Aminopropanols as repellents against bloodsucking arthropods. Pestic. Sci. 48: 359-373.

Boiko, G. P., and I. S. Nochvinov. 1978. Substantiation of the economic effectiveness of fly control measures in cattle breeding farms of the Zaporozhe district. Med. Parazitol.: Parazitol. Bolezn 48: 61-65. (In Russian with English summary).

Boire, S., D. E. Bay, and J. K. Olson. 1988. An evaluation of various types of manure and vegetative materials as larval breeding media for the stable fly. Southwest. Entomol. 13: 247-249.

Stable fly larvae were reared in different manures (cattle, horse, swine and chicken), bermudagrass hay and pine wood chips, alone and in combinations of manure and vegetation. The highest percent pupation occurred in horse manure, horse manure/hay mix, and the hay alone. The highest mean pupal weight occurred in horse manure. The chicken dung was the least effective manure for larval rearing, and no larvae survived on the wood chips alone.

Boisvenue, R. J., and J. A. Hair. 1985. Systemic activity of a benzimidazoline compound in cattle against ticks and biting flies. Vet. Parasitol. 17: 327-335.

Boisvenue, R. J., and G. O. P. O'Doherty. 1980. Systemic animal external parasiticidal activities of perfluoroalkylbenimidazoles and their aminoanilide precursor. Experientia 36: 189-190.

Bonduriansky, R., and R. J. Brooks. 1997. A technique for measuring and marking live flies. Can. Entomol. 129: 827-830.

A device for measuring and marking flies is described. The device restrains the fly with less risk of killing the fly by handling with fingers or forceps. It is used without anaesthetics, which also reduces fly mortality. The method was reported to have been used for 2 years, with 90% and 96% success rate, respectively.

Borja, G. E. M. 1981. Sexual sterility of *Stomoxys calcitrans* (L.) induced by females of *Dermatobia hominis* (Linnaeus Jr.) treated with theotepa. Rev. Brasil Biol. 41:117-120.

Born, D. E. 1954. Mold control in fly rearing media. J. Econ. Entomol. 47: 367.

The use of sand as the top layer in larval rearing media is reported to control the growth of mold. The sand adds volume to the media, and larvae remain beneath the sand layer. Their activity suppresses growth of mold beneath the sand. The larvae migrate into the sand layer to pupate. For stable flies, the sand must be moistened 1 day prior to pupating, otherwise they will pupate at the sand-media interface rather than in the sand layer. The sand also facilitates collection of the pupae by filtering.

Borovsky, D. 1985. Characterization of proteolytic enzymes of the midgut and excreta of the biting fly *Stomoxys calcitrans*. Arch. Insect Biochem. Physiol. 2: 145-159.

Borovsky, D. 1986. Isolation and *in vitro* synthesis of trypsin from the biting fly, *Stomoxys calcitrans.* Arch. Insect Biochem. Physiol. 3: 307-318.

Boulanger, N., R. J. Munks, J. V. Hamilton, F. Vovelle, R. Brun, M. J. Lehane, and P. Bulet. 2002. Epithelial innate immunity. A novel antimicrobial peptide with antiparasitic activity in the bloodsucking insect *Stomoxys calcitrans*. J. Bio. Chem. 277: 49921-49926.

An antimicrobial peptide is identified in the anterior midgut of the stable fly, *Stomoxys calcitrans,* which demonstrates antimicrobial activity against Gram-positive and Gram-negative bacteria, fungi and yeast. The AMP, designated “stomoxyn”, also has trypanolytic activity against the trypomastigote (bloodstream) form of *Trypanosoma brucei rhodesiense*, the parasite which causes African trypanosomiasis. Since *S. calcitrans* feeds on the same vertebrate hosts as *Glossina spp.*, the presence of this unique AMP may explain why *S. calcitrans* is not a cyclical vector of trypanosomiasis. Additionally, stomoxyn is adult specific, suggesting that it protects the stable fly from microbes entering the midgut with blood meals.

Bowles, D. E., and J. A. Swaby. 2006. Field guide to venomous and medically important invertebrates affecting military operations: identification, biology, symptoms, treatment. Version 2.0. USAF Institute for Operational Health, Brooks City-Base, TX.

Bowman, M. C., J. E. Wright, and M. Beroza. 1973. Determination of two juvenile hormone-active compounds and their stability in stable fly medium. J. Econ. Entomol. 66: 301-304.

Boyd, N. R., and B. W. Arthur. 1960. Biological degradation of O, O-diethyl O-naphthalimido phosphorothioate (Bayer 22408). J. Econ. Entomol. 53: 848-853.

Bradbury, W. C., and P. E. Morrison. 1975. A portable electric aspirator for collecting large insects. Can. Entomol. 107: 107-108.

Brady, J., and W. Shereni. 1988. Landing responses of the tsetse fly *Glossina morsitans* Westwood and the stable fly *Stomoxys calcitrans* (L.) (Diptera: Glossinidae & Muscidae) to black-and-white patterns: a laboratory study. Bull. Entomol. Res. 78: 301-311.

Brady, U. E., and B. W. Arthur. 1962. Absorption and metabolism of Ruelene by arthropods. J. Econ. Entomol. 55: 833-836.

Brain, C. K. 1912. *Stomoxys calcitrans* Linn. Ann. Entomol. Soc. Am. 5: 421-432.

Life history and breeding media of the stable fly are discussed. The external mouthparts, method of feeding, and digestive system are described.

Brain, C. K. 1913. *Stomoxys calcitrans* Linn., part II. Ann. Entomol. Soc. Am. 6: 197-202.

Brain, C. K. 1918. Storage of manure and fly suppression at Durban remount plant. J. Econ. Entomol. 11: 339-341.

A management system for the control of flies at the Durban Remount Depot was described. An average of 3300 animals, mostly horses, mules and donkeys, were maintained at the depot. The management practices consisted of removing all the manure daily and putting it into trenches. It was then covered with sand or earth. The stables were cleaned and treated with a contact spray after removal of the manure. The management practices proved effective for the control of flies.

Bram, R. A. 1992. Current and future status of research on stable flies, pp. 146-148. *In* G.D. Thomas and S.R. Skoda (eds.), The stable fly: a pest of humans and domestic animals. Proc. Entomol. Soc. Am. Baltimore, MD.

Bram, R. A. 1993. Current and future status of research on stable flies and house flies in the United States, pp. 94-97. *In* G.D. Thomas and S.R. Skoda (eds.), Rural flies in the urban environment. Proc. Of a Symposium, 1989 annual meeting of the ESA; N. Cent. Reg. Publ. No. 335. Agric. Research Div., Institute of Agric. And Natural Resources, Univ. of Nebraska Res. Bull. No. 317.

Brandner, G., W. J. Kloft, C. Schlager-Vollmer, E. Platten, and P. Neumann-Opitz. 1992. Preservation of HIV infectivity during uptake and regurgitation by the stable fly, *Stomoxys calcitrans* L. AIDS-Forschung 7: 253-256.

Braverman, Y., and K. Frish. 1980. Economic losses in dairy cattle caused by the stable fly (*Stomoxys calcitrans* L.) and sucking lice (Anoplura) Refu. Vet. 37: 51.

Brethes, J. 1918. La mosca brava. Anales del la Sociedad Rural Argentina. pp. 496-498. (In Spanish).

Bridges, A. C., and G. E. Spates. 1983. Larval medium for the stable fly, *Stomoxys calcitrans* (L.). Southwest. Entomol. 8: 6-10.

Bridges, A. C., J. W. Summerlin, and G. E. Spates. 1984. A new and more economical base medium for rearing larvae of the stable fly, horn fly, and house fly. Southwest. Entomol. 9: 388-390.

Broce, A. B. 1988. An improved Alsynite trap for stable flies, *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 25: 406-409.

Broce, A. B. 1993. Dispersal of house flies and stable flies, pp. 50-60. *In* G. D. Thomas and S. R. Skoda (eds.), Rural flies in the urban environment? Proc. of a Symposium, 1989 annual meeting of the ESA; N. Cent. Reg. Publ. No. 335. Agric. Research Div., Institute of Agric. And Natural Resources, Univ. of Nebraska Res. Bull. No. 317.

Broce, A. B., and M. S. Haas. 1999. Relation of cattle manure age to colonization by stable fly and house fly (Diptera: Muscidae). J. Kans. Entomol. Soc. 72: 60-72.

Broce, A. B., J. R. Schwenke, and K. E. Hampton. 1991. Landing patterns of stable flies (Diptera: Muscidae) on the Alsynite cylinder traps: effect of wind speed and direction. J. Med. Entomol. 28: 730-733.

Broce, A. B., J. Hogsette, and S. Paisley. 2005. Winter feeding sites of hay in round bales as major developmental sites of *Stomoxys calcitrans* (Diptera: Muscidae) in pastures in spring and summer. J. Econ. Entomol. 98: 2307-2312.

A study was conducted near Manhattan, KS to determine whether the wasted hay from large round bales served as breeding sites for stable flies. Three methods were used to make surveys. Core samples were taken from the sites where round bales had been placed throughout the winter; flies were caught on alsynite traps placed in pairs close to the feeding sites and far from the feeding sites; a mark-release-recapture survey was done. Results suggested that sites where round hay bales are placed during winter feeding make good breeding sites for stable flies.

Brody, A. L. 1936. The transmission of fowl-pox. Ithaca, New York. pp. 4.

Brown, J. 1974. The dog fly control program in west Florida. Rep. 45th Annu. Meet. Fla. Anti-Mosq. Control Assoc.: 33-34.

Brown, K. R. 1979. Comparative wing morphometrics of some calyptrate Diptera. J. Aust. Entomol. Soc. 18: 289-303.

Bruce, W. G., and C. Eagleson. 1938. A new method of feeding adult horn flies, *Haematobia irritan* L., and stable flies, *Stomoxys calcitrans* (L.). J. Kans. Entomol. Soc. 11: 144-145.

Describes a new cage designed for rearing and feeding adult horn flies and stable flies, including a method for maintaining the proper humidity for horn flies.

Bruce, W. G., and E. B. Blakeslee. 1946. DDT to control insect pests affecting livestock. J. Econ. Entomol. 39: 367-374.

Bruce, W. N., and G. C. Decker. 1947. Fly control and milk flow. J. Econ. Entomol. 40: 530-536.

Test herds of dairy cows treated with DDT or Rhothane maintained higher milk production than herds treated with a repellent spray. A correlation was found between stable fly and horn fly control and milk production. The greatest responses to treatments were found in the poorly managed herds that depended on pasture for feeding.

Bruce, W. N. and G. C. Decker. 1957. Experiments with several repellent formulations applied to cattle for the control of stable flies. J. Econ. Entomol. 50: 709-713.

Bruce, W. N., and G. C. Decker. 1958. The relationship of stable fly abundance to milk production in dairy cattle. J. Econ. Entomol. 51: 269-274.

Brues, C. T. 1913. The geographical distribution of the stable fly, *Stomoxys calcitrans*. J. Econ. Entomol. 6: 459-477.

Brues, C. T. 1913. The relation of the stable fly (*Stomoxys calcitrans*) to the transmission of infantile paralysis. J. Econ. Entomol. 6: 101-110.

Brues, C. T., and P. A. E. Sheppard. 1912. The possible etiological relation of certain biting insects to the spread of infantile paralysis. J. Econ. Entomol. 5: 305-324.

Brummer-Korvenkontio, M., P. Saikku, P. Korhonen, I. Ulmanen, T. Reunala, and J. Karvonen. 1973. Arboviruses in Finland. IV. Isolation and characterization of Inkoo Virus, a Finnish representative of the California group. Am. J. Tropical. Med. Hyg. 22: 404-413.

Brummer-Korvenkontio, M. 1974. Bunyamwera arbovirus supergroup in Finland. Societas Scientaiarum Fennica. 26: 1-52.

Bulet, P., and R. Stöcklin. 2005. Insect antimicrobial peptides: structures, properties and gene regulation. Protein and Peptide Letters 12: 3-11.

Bull, D. L., and R. W. Meola. 1994. Interactions of the insect growth regulator pyriproxyfen with immature and adult stages of the stable fly. Southwest. Entomol. 19: 257-263.

Burg, J. G., A. W. Roberts, N. M. Williams, D. G. Powell, and F. W. Knapp. 1990. Attempted transmission of *Ehrlichia risticii* (Rickettsiacaea) with *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 27: 874-877.

Burg, J. G., F. W. Knapp, and D. G. Powell. 1990. Seasonal abundance and spatial distribution patterns of three adult Muscoid (Diptera: Muscidae) species on equine premises. Environ. Entomol. 19: 901-904.

Populations of stable flies, horn flies and face flies were monitored on Kentucky horse farms from May-October of 1987 and 1988 to study seasonal abundance and distribution of the flies. Stable flies were most abundant from mid-June until late August during both years. A smaller population peak was observed in September 1987 but not in 1988. Distributions of stable flies were influenced by the horses congregating, mating swarms, and the proximity to ovipositional sites.

Burg, J. G., D. G. Powell, and F. W. Knapp. 1991. Arthropod faunal composition on Kentucky equine premises. J. Med. Entomol. 28: 658-662.

Burg, J. G., D. M. Neely, N. M. Williams, and F. W. Knapp. 1994. Retention and attempted mechanical transmission of *Ehrlichia risticii* by *Stomoxys calcitrans*. Med. Vet. Entomol. 8: 43-46.

Burnstock, G. 1996. Purinoceptors: ontogeny and phylogeny. Drug Dev. Res. 39: 204-242.

Buschman, L. L., and R. S. Patterson. 1981. Assembly, mating, and thermoregulating behavior of stable flies under field conditions. Environ. Entomol. 10: 16-21.

The behavior of stable flies was observed at some livestock facilities near Gainesville, FL. Flies gathered on light-colored objects near livestock. All ages and reproductive stages gathered, suggesting that the primary purpose was thermoregulation. Male flies were found to remain on the "waiting stations" and make short flights to patrol their territory. They were also observed to engage other flies in physical conflict. Mating also occurred near the "waiting stations".

Butler, J. F., W. J. Kloft, L. A. Dubose, and E. S. Kloft. 1977. Recontamination of food after feeding a $^{32}P$ food source to biting Muscidae. J. Med. Entomol. 13: 567-571.

Butler, J. F., R. Escher, and J. A. Hogsette. 1981. Natural parasite levels in house flies, stable flies, and horn flies in Florida, pp. 61-79. *In* Status of biological control of filth flies. Proceedings of a workshop, USDA/SEA, IFAS. University of Florida, Gainesville.

Buttram, J. R., and B. W. Arthur. 1961. Absorption and metabolism of Bayer 22408 by dairy cows and residues in the milk. J. Econ. Entomol. 54: 446-451.

Buxton, B. A., N. C. Hinkle, and R. D. Schultz. 1985. Role of insects in the transmission of bovine leukosis virus: potential for transmission by stable flies, horn flies, and tabanids. Am. J. Vet. Res. 46: 123-126.

Byford, R. L., M. E. Craig, and B. L. Crosby. 1992. A review of ectoparasites and their effect on cattle production. J. Anim. Sci. 70: 597-602.

A review of the effects of certain ectoparasites, primarily the horn fly, on the health and weight gain of cattle. Stable flies are not specifically discussed.

# C

Callan, E. MCC. 1945. A wasp preying on house flies and stable flies. Nature 155: 146.

Camp, H. B., and B. W. Arthur. 1967. Absorption and metabolism of Carbaryl by several insect species. J. Econ. Entomol. 60: 803-807.

Campau, E. J., G. J. Baker, and F. D. Morrison. 1953. Rearing stable fly for laboratory tests. J. Econ. Entomol. 46: 524.

A method for rearing a large number of stable flies is described. It is similar to the method described by Peet-Grady (1951) for rearing house flies. Flies are provided with bovine blood by soaking cellucotton in water, squeezing it dry, and pouring blood over the cotton. Oviposition occurs in the food dishes, eggs are removed and put in beakers. They are then put into the larval medium, where they stay below the surface and pupate near the edges of the cage. Pupae are placed in holding cages for emergence.

Campbell, J. B. 1985. Arthropod pests of confined beef, pp. 207-221. *In* R. E Williams, R. D. Hall, A. B. Broce and P. J. Scholl (eds.), Livestock entomology. John Wiley and Sons, New York.

Campbell, J. B. 1992. The economic significance of the stable fly, pp. 1-8. *In* G. D. Thomas and S. R. Skoda (eds.), The stable fly: a pest of humans and domestic animals. Proc. Entomol. Soc. Am. Baltimore, MD.

Campbell, J. B. 1992. Chemical control of the stable fly, pp. 142-145. *In* G. D. Thomas and S. R. Skoda (eds.), The stable fly: a pest of humans and domestic animals. Proc. Entomol. Soc. Am. Baltimore, MD.

Campbell, J. B. 1993. The economics of the fly problem, pp. 34-39. *In* G. D. Thomas and S. R. Skoda (eds.), Rural flies in the urban environment? Proc. of a Symposium, 1989 annual meeting of the ESA; N. Cent. Reg. Publ. No. 335. Agric. Research Div., Institute of Agric. And Natural Resources, Univ. of Nebraska Res. Bull. No. 317.

Campbell, J. B. 1997. Stable fly control on cattle. NebGuide pp. 1-5.

Campbell, J. B. 2002. A guide for the control of flies in Nebraska feedlots and dairies. MyCattle.com. University of Nebraska Cooperative Extension pub.

Campbell, J. B. 2006. Horse insect control guide. University of Nebraska-Lincoln Extension pub. G950.

A guide for the control of insects which affect horses. Mentions that stable flies can transmit a nematode parasite (*Habronema spp.*) to horses.

Campbell, J. B., and E. S. Raun. 1971. Aerial ULV and LV applications of insecticides for control of the stable fly and the horn fly. J. Econ. Entomol. 64: 1170-1173.

This study investigated the effectiveness of applying low volume (LV) and ultra low volume (ULV) insecticides to cattle by helicopter and fixed-wing aircraft for the control of stable flies and horn flies. Both feedlot cattle and range cattle were sprayed, and the average percent reduction in flies ranged from 40.4-85.8%, 16-24 hours after spraying. ULV applications of naled and dichlorvos by fixed-wing aircraft were found to be more effective than LV applications, and spraying was more effective when buildings and other obstructions were farther away from the cattle.

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Campbell, J. B., and J. F. Hermanussen. 1974. *Philonthus theveneti*: Life history and predatory habits against stable flies, house flies, and face flies under laboratory conditions. Environ. Entomol. 3: 365-358.

Campbell, J. B., and J. E. Wright. 1976. Field evaluations of insect growth regulators, insecticides, and a bacterial agent for stable fly control in feedlot breeding areas. J. Econ. Entomol. 69: 566-568.

Six insect growth regulators, 5 insecticides, and a bacterial agent were evaluated for the control of stable flies in Nebraska feedlots. Studies were conducted on small plots and large plots. All of the treatments were efficacious in controlling stable fly populations. Since the IGRs affect specific life stages, there was a lag phase before the reduction of stable fly numbers. The authors suggest that the addition of IGRs would be beneficial in a fly control program.

Campbell, J. B., and T. H. Doane. 1977. Weight gain response and efficacy of washing and various insecticide treatments for prevention of flies feeding on shear wounds of summer shorn lambs. J. Econ. Entomol. 70: 132-134.

Campbell, J. B., and C. D. McNeal. 1978. Implementation and evaluation of a pilot project for insect pest management in Nebraska feedlots. Univ. Nebr. Coop. Ext. Serv., North Platte Station. 40pp.

Campbell, J. B., and C. D. McNeal. 1979. A guide to Intergrated Pest Management at feedlots and dairies. Nebraska University College of Agriculture and Home Economics Extention Circular EC 80-1536: 1-21.

Campbell, J. B., and I. L. Berry. 1989. Economic threshold for stable flies on confined livestock. Misc. Publ. Entomol. Soc. Am. 74: 18-22.

Campbell, J. B., and G. D. Thomas. 1999. House fly and stable fly management in and near livestock facilities. Beef Cattle Handbook 3815: 1-4.

Campbell, J. B., R. G. White, J. E. Wright, and D. C. Clanton. 1976. Stable flies slow weight gains. Univ. Neb.-Lincoln Inst. Ag. Nat. Res. #EC 76-218.

Campbell, J. B., R. G. White, J. E. Wright, R. Crookshank, and D. C. Clanton. 1977. Effects of stable flies on weight gains and feed efficiency of calves on growing or finishing rations. J. Econ. Entomol. 70: 592-594.

Campbell, J. B., D. J. Boxler, D. M. Danielson, and M. A. Crenshaw. 1984. Effects of house and stable flies on weight gain and feed efficiency by feeder pigs. Southwest. Entomol. 9: 273-274.

Campbell, J. B., D. J. Boxler, and I. L. Berry. 1987. Efficacy of 17 insecticides applied at temperatures of 10C, 15.5C, 21C, 27C for control of overwintering stable fly larvae, *Stomoxys calitrans* (L.) (Diptera: Muscidae). J. Kans. Entomol. Soc. 60: 350-352.

Campbell, J. B., I. L. Berry, D. J. Boxler, R. L. Davis, D. C. Clanton, and G. H. Deutscher. 1987. Effects of stable flies (Diptera: Muscidae) on weight gain and feed efficiency of feedlot cattle. J. Econ. Entomol. 80: 117-119.

Campbell, J. B., M. A. Catangui, G. D. Thomas, D. J. Boxler, and R. Davis. 1993. Effects of stable flies (Diptera: Muscidae) and heat stress on weight gain and feed conversion of feeder cattle. J. Agric. Entomol. 10: 155-161.

Campbell, J. B., S. R. Skoda, D. R. Berkebile, and G. D. Thomas. 2001. Research on stable flies and house flies at Nebraska. Agr. Res. Div., Inst. Agr. Nat. Res., Univ. Nebr.-Lincoln, Bull. #RB-341, 22pp.

Campbell, J. B., S. R. Skoda, D. R. Berkebile, D. J. Boxler, G. D. Thomas, D. C. Adams, and R. Davis. 2001. Effects of stable flies (Diptera: Muscidae) on weight gain of grazing yearling cattle. J. Econ. Entomol. 94: 780-783.

A field experiment was conducted to determine the effect of stable flies on pastured yearling cattle as compared to feedlot cattle. Sprays and ear tags were used to eliminate horn flies and face flies as factors. An attempt was

made to maintain the economic threshold of 5 flies per front leg by releasing flies in the area, however the number varied. Results showed a 19% reduction in weight gain due to stable flies, or ~7% per fly.

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Capriles, J. M. 1971. A simple way to determine the presence of the stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae), on dairy farms in Puerto Rico. J. of Agric. Univ. Puerto Rico. 55: 259-260.

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Carn, V. M. 1996. The role of dipterous insects in the mechanical transmission of animal viruses. Br. Vet. J. 152: 377-393.

Carrera, M. 1944. Relacão de alguns dipteros capturados em Monte Alegre, Estado de São Paulo. Papeis Avulsos Dept. Zool. 6:37-50. (In Portuguese).

Case, A. A., and J. E. Ackert. 1939. Intermediate hosts of chicken tapeworms found in Kansas. Transactions of the Kansas Academy of Science 42: 437-442.

Castro, B. G., M. M. S. de Souza, and A. J. Bittencourt. 2007. Aerobic bacterial microbiota in *Stomoxys calcitrans*: preliminary studies in Brazil. Brazil. J. Vet. Parasitol. 16: 193-197.

Castro, B. G., M. M. S. Souza, A. H. Régua-Mangia, and A. J. Bittencourt. 2010. Enterobacterial microbiota on *Stomoxys calcitrans* external surface. Transboundary Emerging Dis. 57: 22-24.

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Catangui, M. A., J. B. Campbell, G. D. Thomas, and D. J. Boxler. 1993. Average daily gains of Brahman-crossbred and English X exotic feeder heifers

exposed to low, medium, and high levels of stable flies (Diptera: Muscidae). J. Econ. Entomol. 86: 1144-1150.

The affect of stable flies on Brahman-crossbred and English X Exotic heifers was compared using low, medium and high densities of released stable flies. The Brahman-crossbred heifers showed tolerance to stable flies only at 12-13 months of age. At 13-14 months of age, both breeds responded the same to stable flies. Average daily gains of the Brahman-crossbred heifers were lower than the English X Exotic when stable flies were not present.

Catangui, M. A., J. B. Campbell, G. D. Thomas, and D. J. Boxler. 1993. Calculating economic injury levels for stable flies (Diptera: Muscidae) on feeder heifers. J. Econ. Entomol. 90: 6-10.

A mathematical equation was developed using nonlinear regression to calculate the economic injury level for stable flies on feeder heifers. The data was based on 8 separate experiments conducted from 1974-1991. The equation results in a negative exponential curve, and can be used to calculate whether selected control measures are appropriate for the stable fly infestation level.

Catangui, M. A., J. B. Campbell, G. D. Thomas, and D. J. Boxler. 1995. Average daily gains of Brahman-crossbred and English X exotic feeder heifers during long-term exposure to stable flies (Diptera: Muscidae). J. Econ. Entomol. 88: 1349-1352.

Yearling Brahman cross and English X exotic cross heifers were exposed to a medium level of stable fly infestation (13-14 flies per minute on one front leg) daily for 112 days. Stable fly infestations reduced heifer weight gain from 1-84 days of treatment. From 85-112 days, when heifers were 15 months old, the fly infestations no longer reduced the weight gain. It was suggested that by this age the heifers had reached maturity and began to compensate from previous loss due to stable fly feeding. Breeds were not affected differently by stable fly feeding.

Chamberlain, W. F. 1979. A comparison of procedures for labeling stable flies with $^{32}P$ for behavior and ecological studies. Southwest. Entomol. 4: 150-155.

Chamberlain, W. F. 1988. On the insecticidal principle and timing of treatment of stable fly larvae with calcium cyanamide. Southwest. Entomol. 13: 235-241.

Chamberlain, W. F., and C. C. Barrett. 1964. A comparison of the amounts of Metepa required to sterilize the screwworm fly and the stable fly. J. Econ. Entomol. 57: 267-269.

Tests were performed to determine the amount of metepa required to sterilize screwworm flies and stable flies. Topical treatments and feeding treatments were used. Stable flies were much more susceptible than screwworm flies. In topical treatments, the male screwworm flies required 5.5 times more metapa than male stable flies, where female screwworm flies required 18 times more than female stable flies. In feeding treatments, male screwworm flies required 3.9 times more than male stable flies, and female screwworm flies required 6.2 times more than female stable flies. Differences in the weight of the two species were considered in the calculations.

Chamberlain, W. F., and E. W. Hamilton. 1964. Absorption, excretion, and metabolism of $P^{32}$-labeled Metepa by screwworm and stable flies. J. Econ. Entomol. 57: 800-803.

Screwworm flies require a much greater dose of metepa than stable flies to produce sterility. Rate of absorption, excretion, and detoxification of metepa was analyzed in screwworm flies and stable flies in an attempt to determine why this was the case. Multiplying the results of these three factors together gave a value that was comparable to the ratios of effective dose in stable flies and screwworms.

Chamberlain, W. F., and C. C. Barrett. 1968. Incorporation of tritiated thymidine into the ovarian DNA of stable flies: effects of treatment with apholate. Nature 218: 471-472.

Chamberlain, W. F. and D. E. Hopkins. 1980. Retention of larval dietary $^{32}$P in the malpighian tubules of adult *Stomoxys calcitrans*, *Haematobia irritans*, and *Cochliomyia macellaria*. Ann. Entomol. Soc. Am. 73: 310-314.

Chamberlain, W. F., and J. J. Matter. 1986. Control of stable flies (Diptera: Muscidae) with a unique nitrogen fertilizer, calcium cyanamide. J. Econ. Entomol. 79: 1573-1576.

Champlain, R. A., F. W. Fisk, and A. C. Dowdy. 1954. Some improvements in rearing stable flies. J. Econ. Entomol. 47: 940-941.

Some modifications of Campau's (1953) rearing method for stable flies are described. A sponge is provided for oviposition, and sand is added to the larval medium for easier removal of pupae. It was also found that using a UV lamp stimulated oviposition so it was utilized instead of natural light.

Champlain, R. A., and F. W. Fisk. 1956. The digestive enzymes of the stable fly, *Stomoxys calcitrans* (L.). Ohio J. Sci. 56: 52.

Charlwood, J. D., and J. Lopes. 1980. The age-structure and biting behaviour of *Stomoxys calcitrans* (L.) (Diptera: Muscidae) from Manaus, Brazil. Bull. Entomol. Res. 70: 549-555.

Charlwood, J. D., and S. Sama. 1996. The age structure, biting cycle and dispersal of *Stomoxys niger* Macquart (Diptera: Muscidae) from Ifakara, Tanzania. Afr. Entomol. 4: 274-277.

Chaudhri, R. P. 1965. Some insect tormentors of livestock. Indian Livestock 3: 3-5, 7, 43.

Chen, A. C. 1989. Changes in the hemolymph of the stable fly, *Stomoxys calcitrans*, after a blood meal. Arch. Insect Biochem. Physiol. 11: 147-158.

Chen, A. C., and R. M. Wagner. 1992. Hemolymph constituents of the stable fly, *Stomoxys calcitrans.* Comp. Biochem. Physiol., A: Mol. Integr. Physiol. 102:133-137.

Chen, A. C. and T. J. Kelly. 1993. Correlation of ecdysteroids with ovarian development and yolk protein synthesis in the adult stable fly, *Stomoxys calcitrans*. Comp. Biochem. Physiol. A: Comp. Physiol. 104: 485-490.

Chen, A. C., and P. G. Schleider. 1996. An analysis of excretion in the stable fly, *Stomoxys calcitrans*. Southwest. Entomol. 21: 43-48.

Chen, A. C. and T. J. Kelly. 1997. Cycling of ecdysteroid levels in adult female stable flies, Stomoxys calcitrans in relation to blood feeding. J. Insect Physiol. 43: 789-794.

Chen, A.C., R. T. Mayer, and J. R. DeLoach. 1982. Purification and characterization of chitinase from the stable fly, *Stomoxys calcitrans.* Arch. Biochem. Biophys. 216: 314-321.

Chen, A. C., H. R. Kim, R. J. Mayer, and J. O. Norman. 1987. Vitellogenesis in the stable fly *Stomoxys calictrans*. Comp. Biochem. Physiol. 88B: 897-903.

Chen, A. C., T. L. Pannabecker, and D. Taylor. 1997. Natriuretic and depolarizing effects of a stable fly (*Stomoxys calcitrans*) factor on malpighian tubules. J. Insect Physiol. 43: 991-998.

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Cheng, T. H., and J. P. Vanderberg. 1958. The treadle sprayer and the cable-type back rubber for control of biting flies on cattle in Pennsylvania. J. Econ. Entomol. 51: 149-156.

Cheng, T., and E. M. Kesler. 1961. A three-year study on effect of fly control on milk production by selected and randomized dairy herds. J. Econ. Entomol. 54: 751-757.

Cheng, T. H., D. E. H. Frear, and H. F. Enos, Jr. 1958. The use of treatments containing Methoxychlor against biting flies on cattle and the determination of Methoxychlor residues in milk. J. Econ. Entomol. 51: 618-623.

Cheng, T. H., D. E. H. Frear, and H. F. Enos. 1959. Effectiveness of aerosol formulations containing Methoxychlor and other insecticide-repellents against biting flies on cattle, and analyses of milk from treated animals. J. Econ. Entomol. 52: 866-868.

Cheng, T. H., D. E. H. Frear, and H. F. Enos, Jr. 1961. Fly control in dairy barns sprayed with Dimethoate and the determination of Dimethoate residues in milk. J. Econ. Entomol. 54: 740-742.

Two applications of dimethoate were applied to the walls and ceilings of 2 dairy barns and loafing sheds to tests its insecticidal effect against horn flies, house flies and stable flies. The applications were performed on June 10 and August 14, 1959. Dimethoate was found to be effective for up to 9 weeks against house flies and horn flies. Results for stable flies were inconclusive because the flies disappeared from the barns, including the control barn, shortly after the application. Residual effect from the first application seemed to enhance the effect of the second application. No dimethoate residue was found in milk from lactating cows.

Cheng, T. H., D. E. H. Frear, and H. F. Enos. 1962. The use of spray and aerosol formulations containing R-1207 and Dimethoate for fly control on cattle and the determination of Dimethoate residues in milk. J. Econ. Entomol. 55: 39-43.

Cheng, T. H., A. A. Hower, and R. K. Sprenkel. 1965. Oil-based and water-based Ciodrin sprays for fly control on dairy cattle. J. Econ. Entomol. 58: 910-913.

The efficacy of oil-based and water-based 2% Ciodrin sprays were tested on cattle for control of face flies, horn flies and stable flies. Cows were

sprayed as they walked through a doorway using a "push-button" sprayer. Oil-based Ciodrin had a greater toxic effect initially, but the water-based has a longer lasting residual effect. Although there was a reduction in the number of flies per cow, better results could have been obtained with stable flies if the legs had been sprayed instead of only the head, neck and back of the cows.

Chia, L. S. 1978. Studies on female reproductive physiology in the stable fly, *Stomoxys calcitrans* (L.). M.S. Thesis. University of Waterloo.

Chia, L. S., J. A. Baxter, and P. E. Morrison. 1982. Quantitative relationship between ingested blood and follicular growth in the stable fly, *Stomoxys calcitrans*. Can. J. Zool. 60: 1917-1921.

The effect of 1-5 blood meals on the growth of the ultimate and penultimate follicles during the first ovarian cycle in stable flies is examined. Follicular growth rate was the same for flies given a daily meal and those supplied with blood ad libitum. In blood fed females, the fat body increased after the first blood meal, then declined. In sugar fed females the weight of fat body and ovaries did not change. Stable flies were found to require 2 to 3 blood meals to build up the nutrient reserves needed for oogenesis. Five blood meals were required to produce the first batch of eggs. Follicle growth after blood meals followed an exponential curve.

Chia, L. S., A. Baxter and P. E. Morrison. 1984. Reduction in the nutritional requirements for oogenesis due to high concentrations of cholesterol in the larval diet of the stable fly, *Stomoxys calcitrans* (Diptera: Muscidae). Can. Entomol. 116: 801-804.

Chihota, C. M., L. F. Rennie, R. P. Kitching, and P. S. Mellor. 2003. Attempted mechanical transmission of lumpy skin desease virus by biting insects. Med. Vet. Entomol. 17: 294-300.

Christmas, P. E. 1970. Laboratory rearing of the biting fly *Stomoxys calcitrans* (Diptera: Muscidae). N. Z. Entomol. 4: 45-49.

The methods used to rear a colony of *Stomoxys calcitrans* to the 4$^{th}$ generation was described. The colony was started in New Zealand for the purpose of shipping a population to Kerrville, TX. Pupae of the 4$^{th}$ generation were shipped by air in vacuum flasks.

Chung, C. Y., R. W. Kasten, S. M. Paff, B. A. Vanltorn, M. Vayssier-Taussat, H. Boulouis, and B. B. Chomel. 2004. *Bartonella* spp. DNA associated with biting flies from California. Emerging Infectious Disease. 10: 1311-1313.

Chung, K. H., J. Ryu, S. H. Kwon, and M. S. Im. 1975. Study on stable fly eradication by sterile-male technique: (5) On the population density of the stable fly, *Stomoxys calcitrans* L. Korean J. Entomol. 5:13-16. (In Korean with English summary).

Cilek, J. E. 1999. Evaluation of various substances to increase adult *Stomoxys calcitrans* (Diptera: Muscidae) collections on Alsynite cylinder traps in North Florida. J. Med. Entomol. 36: 605-609.

Cilek, J. E. 2002. Attractiveness of beach ball decoys to adult *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 39: 127-129.

Inflated beach balls of different colors and coated with adhesive trapped more stable flies on Florida beaches than Alsynite traps.

Cilek, J. E. 2003. Attraction of colored plasticized corrugated boards to adult stable flies *Stomoxys calcitrans* (Diptera: Muscidae). Fla. Entomol. 86: 420-423.

Different colored plastic boards (blue, red, white, orange) were coated with adhesive and tested for trapping stable flies on Florida beaches. More flies were trapped on the blue boards than any other color, although blue was not significantly different from red. Flies tended to land on the leeward side of the boards. This experiment investigated the efficacy of traps to reduce the number of flies on the beaches.

Cilek, J. E. 2004. Stable fly, *Stomoxys calcitrans* (Diptera: Muscidae). *In* J. L. Capinera (ed.), Encyclopedia of entomology. Part 19 pp. 3536-3539. Springer.

A brief summary of stable fly behavior, economic importance, biology and control.

Cilek, J. E., and G. L. Greene. 1994. Stable fly (Diptera: Muscidae) insecticide resistance in Kansas cattle feedlots. J. Econ. Entomol. 87:275-279.

Resistance to the organophosphate insecticides dichlorvos, stirofos and the pyrethroid permethrin was tested in stable flies from 8 Kansas feedlots. Resistance was found to all of these chemicals, being highest for dichlorvos and lowest for permethrin. Six of the 8 populations were tested for resistance to methoxychlor, but no resistance was found.

Claborn, H. V., H. F. Beckman, and R. W. Wells. 1950. Excretion of DDT and TDE in milk from cows treated with these insecticides. J. Econ. Entomol. 43: 850-852.

Clements, B. W., Jr., and A. J. Rogers. 1967. Some factors affecting kill of the stable fly, *Stomoxys calcitrans* (L.), with insecticidal aerosols. Mosq. News 27: 274-277.

Clements, B. W., A. J. Rogers, W. E. Thomas, and W. N. Swenson. 1977. Tests of insecticides applied by ultra low volume ground equipment for the control of adult stable flies, *Stomoxys calcitrans* (L.). Mosq. News 37:43-45.

Cleveland, C. R. 1926. Repellent sprays for flies attacking dairy cattle. J. Econ. Entomol. 19: 529-536.

Clottens, F. L., G. M. Holman, G. M. Coast, N. T. Totty, T. K. Hayes, I. Kay, A. I Mallet, M. S. Wright, J. Chung, O. Truong, and D. L. Bull. 1994. Isolation and characterization of a diuretic peptide common to the house fly and stable fly. Peptides 15: 971-979.

Clymer, B. C. 1974. Control of flies around feedlots. Great Plains Agric. Counc. Publ. Fact Sheet GPE-7802.

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Clymer, B. C. 1993. Rural flies in the urban environment – a pest consultant's view, pp. 46-49. *In* G. D. Thomas and S. R. Skoda (eds.), Rural flies in the urban environment? Proc. of a Symposium, 1989 annual meeting of the ESA; N. Cent. Reg. Publ. No. 335. Agric. Research Div., Institute of Agric. And Natural Resources, Univ. of Nebraska Res. Bull. No. 317.

Coaker, T. H., and R. G. Passmore. 1958. *Stomoxys* sp. on cattle in Uganda. Nature 182: 4634-4635.

Cobb, M. 1999. What and how do maggots smell? Biol. Rev. 74: 425-459.

Cockburn, A. F., and S. E. Mitchell. 1989. Repetitive DNA interspersion patterns in diptera. Arch. Insect Biochem. Physiol. 10: 105-113.

Coffey, M. D. 1966. Studies on the association of flies (Diptera) with dung in Southeastern Washington. Ann. Entomol. Soc. Am. 59: 207-218.

A study was conducted to determine the types of flies occurring on several types and ages of dung in Southeastern Washington. Adults were collected with sweep nets, and samples of dung were collected from which larvae were reared. *Stomoxys calcitrans* was found only on cow and

chicken dung, in one location only (Pullman), from June-August. They were reported to be rare in the area.

Coghlan, A. 2002. Once bitten. New Scientist 173: 18.

Coker, R. E. 1926. Fauna of Penikese Island, 1923. Biol. Bull. 50: 17-37.

Collins, D. L. 1966. Recent advances in the control of some arthropods of public health and veterinary importance: biting flies. Bull. Entomol. Soc. Am. 12: 326-333.

Discusses advances in control of biting flies from 1964-1966, with a section on stable flies and tabanids. Research on New Jersey and Florida beaches concerning the control of these flies is cited. The use of the WHO tsetse fly kit was used to determine tolerance levels to some chemicals in stable flies. Resistance to dieldrin was found in the Panama City, FL strain of stable flies, and resistance to DDT in the Kerrville, TX strain.

Colwell, D. D., and M. Kavaliers. 1992. Evidence for activation of endogenous opioid systems in mice following short exposure to stable flies. Med. Vet. Entomol. 6: 159-164.

Colwell, D. D., M. Kavaliers, and T. J. Lysyk. 1997. Stable fly, *Stomoxys calcitrans*, mouthpart removal influences stress and anticipatory responses in mice. Med. Vet. Entomol. 11: 310-314.

The analgesic response of mice to biting flies was tested using intact stable flies, stable flies with mouthparts removed, and house flies. After being exposed to intact stable flies for 1h, fly-naïve mice exhibited an analgesic response when subsequently exposed to intact flies, but there was no analgesic response when exposed to altered stable flies or house flies. However, mice which had previously been exposed to intact stable flies exhibited an analgesic response when exposed to altered stable flies, but not house flies. This suggests that the analgesic response of mice is induced by the bite of a fly, and that just the presence of biting flies could have adverse effects on animals in an anticipatory manner.

Conway, J. A. 1972. Studies of status and control of the stable fly in intensive beef units in Britain. International Pest Control. 14: 11-16.

Cook, B. J. 1992. The oviduct musculature of the stable fly *Stomoxys calcitrans*: properties of its spontaneous motility and neural regulation. Arch. Insect Biochem. Physiol. 19: 119-132.

Cook, B. J., and S. Meola. 1983. Heart structure and beat in the stable fly, *Stomoxys calcitrans.* Physiol. Entomol. 8: 139-149.

Cook, B. J., and S. Meola. 1988. Heart structure and beat in the larvae of the stable fly, *Stomoxys calcitrans*. Southwest. Entomol. 13: 217-224.

Cook, B. J., and T. Peterson. 1989. Ovarian muscularis of the stable fly *Stomoxys calcitrans*: its structural, motile, and pharmacological properties. Arch. Insect Biochem. Physiol. 12: 15-30.

Cook, B. J., and R. M. Wagner. 1992. Some pharmacological properties of the oviduct muscularis of the stable fly *Stomoxys calcitrans*. Comp. Biochem. Physiol., C: Toxicol. Pharmacol. 102: 273-280.

Cook, B. J., and N. W. Pryor. 1995. Structural characterization of muscles and epithelial sheaths of the oviduct of *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 32: 328-337.

Female stable flies were dissected, and the muscles and epithelium of the oviducts were studied under an electron microscope. These structures were characterized at the cellular level. Occurance of a fragmented Z line in the muscle cells suggest the ability for super contraction in the stable fly ovarian muscles.

Cook, B. J., and N. W. Pryor. 1995. Structural properties of the female accessory gland in the stable fly, *Stomoxys calcitrans*. J. Entomol. Sci. 30: 362-373.

Cook, B. J., and N. W. Pryor. 1996. Structural characterization of peripheral nerve cells and nerve-muscle junctions of the oviduct of stable fly (Diptera: Muscidae). J. Med. Entomol. 33: 496-503.

The ultrastructures of peripheral nerve cells, branch nerves, and nerve-muscle junctions were examined in the oviduct of stable flies. Flies were dissected and observed by electron microscopy. The characteristics of the nervous system in that location were described.

Cook, B. J., and N. W. Pryor. 1997. Structural properties of the intrinsic muscles of the malpighian tubules of the female stable fly, *Stomoxys calcitrans* L. J. Entomol. Sci. 32: 138-147.

Cook, B. J., T. Peterson, and B. Staneart. 1990. Quantitative measurement of muscle contractions associated with the hindgut and oviduct of the stable fly (Diptera: Muscidae). J. Entomol. Sci. 25: 99-105.

Cook, B. J., R. M. Wagner, and T. L. Peterson. 1991. The hindgut muscularis of the stable fly, *Stomoxys calcitrans*: some of its structural motile and pharmacological properties. J. Insect. Physiol. 37: 635-645.

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During the warm summer and autumn months flies attack many dogs of different breeds kept outdoors throughout Hungary. These ectoparasites, as they feed, cause damage usually at the edges, tips and/or bases of the ears. The flies' bites result in severe irritation to the skin, causing dermatitis. The skin is covered by bloody crusts and scabs. The painful bite of flies usually causes restlessness, head shaking and scratching the ears, leading to further irritation and bleeding. Based on the species identification of flies caught on four infested dogs the specimens of the common stable fly, *Stomoxys calcitrans* (Diptera: Muscidae) occurred. The authors summarize the biology of the blood-sucking fly species,

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A new morphological character is described to differentiate between the stable fly species *Stomoxys calcitrans* and *S. niger*. It was found that the maxillary palpi are longer in *S. niger*, regardless of sex, and the character is visible in the field using a magnifying glass. Populations of both species were studied at different elevations on La Reunion Island, and populations in West Africa were surveyed to confirm the consistency of the character.

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Eight microsatellite markers were isolated from *Stomoxys calcitrans* from La Reunion Island. Number of alleles per locus ranged for 4-15. Several heterozygote deficiencies were detected. Four of the microsatellite loci were successfully isolated from *S. niger*.

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Laboratory experiments were conducted to compare the survival and developmental rate of the immature stages (eggs, larvae, pupae) of *Stomoxys calcitrans* and *S. niger niger* at five different temperatures (15, 20, 25, 30 and 35ºC). *S. calcitrans* had a significantly higher survival rate than *S. niger* at 20ºC. At 15ºC, there was high mortality for *S. calcitrans* larvae and *S. niger* eggs. The pupae of both species had high mortality at

35ºC. Results suggest that the tropical *S. niger* is better adapted to lower temperatures than *S. calcitrans*.

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The efficiency of 2 Alsynite sticky traps (Williams trap and Broce trap) and 2 phtalogen blue cloth traps (Vavouva and Nzi) were tested on 2 farms on La Reunion Island. Total fly catches were higher on the sticky traps but they were less specific to *Stomoxys* spp. On farm 1 the Vavouva trap proved more efficient for catching *Stomoxys*, but on farm 2 the Williams traps was more efficient. Considering that the cloth traps can hold more flies and are easier to use than the Williams trap, the results supported the use of the Vavouva trap as part of a stable fly control program.

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*Stomoxys calcitrans* and *S. n. niger* were sampled on La Reunion Island, on 7 farms along an altitude gradient (100m-1600m above sea level) to examine the effects of temperature on fly abundance. There was no relationship found between maximum or mean abundance and temperature, but minimum numbers during winter were higher at the lower altitudes. A greater difference was found between fly abundance and husbandry methods of the farms.

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given access to both types of dung. In both experiments the flies preferred horse dung. When given access, they oviposited in the horse dung but avoided the cow dung, only ovipositing in the vicinity. Flies were also tested in a wind tunnel, where they also preferred horse dung. In electroantennogram tests, the chemostimuli were similar in both attractants, however more $CO_2$ was emitted from horse dung.

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McGregor, W. S., and J. M. Dreiss. 1955. Rearing stable flies in the laboratory. J. Econ. Entomol. 48: 327-328.

The rearing method for stable flies at the Kerrville, TX. laboratory is described. It is simpler than methods described earilier, and consists of mixing 1 part CSMA with 5 parts wood shavings. Eggs are placed in a 7 x 9" jar and maintained at 80°F. Larvae feed on the medium, and pupate under the dry layer that forms. If the medium becomes too moist, a small amount of rolled oats can be added. Pupae can be left undisturbed, and adults removed as they emerge. Adults are placed in another cage and fed citrated beef blood. Oviposition sites are provided which consist of a ball of damp cotton covered with black cloth. A 5% ammonia solution is applied to stimulate oviposition.

McGregor, W. S., and R. C. Bushland. 1956. Research on the use of systemic insecticides for the control of livestock pests. J. Econ. Entomol. 49: 86-88.

McGregor, W. S., and R. C. Bushland. 1957. Tests with Dow ET-57 against two species of cattle grubs. J. Econ. Entomol. 50: 246-249.

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McOrist, S., R. Blunt, and C. J. Gebhart. 2011. Pig-associated *Lawsonia intracellularis* in various on-farm dipterous fly stages. J. Swine Health Prod. 19: 277-283.

McPheron, L. J., and A. B. Broce. 1995. Influence of environmental factors on the wandering phase and pupariation in stable fly, *Stomoxys calcitrans*, larvae. Physiol. Entomol. 20: 337-342.

Lab experiments were performed to test the mean length of the wandering phase of stable fly larvae, mean time to 50% pupariation and rate of pupariation at 3 different moisture levels and different light levels. The effect of larval density was also tested. Stable flies pupariated fastest and had the greatest survival rate at the moderate moisture level of 67% (compared with 17% or 84%). Temperature had an effect on rate of pupariation: mean time to 50% pupariation decreased with increased temperature. Density had no effect on mean time to 50% pupariation, or on rate of pupariation.

McPheron, L. J., and A. B. Broce. 1996. Environmental components of pupariation-site selection by the stable fly (Diptera: Muscidae). Environ. Entomol. 25: 665-671.

Experiments were conducted to determine the effect of different moisture levels, temperature, light, osmolality and pH on pupariation site selection of stable fly larvae. Larvae chose the highest moisture level (71%), but survival was highest at medium levels. They chose a temperature range of 24-28ºC and survival was highest at 26ºC. More pupae were found at the highest pH (9.3) but survival was highest at 7.2 and lowest at 9.3. They chose the lowest osmolality (111 mmol/kg) and survival was highest at the higher levels (254 and 403 mmol/kg). Most larvae pupariated in the dark and tended to aggregate.

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Mehlhorn, H., G. Schmahl, and J. Schmidt. 2005. Extracts of the seeds of the plant *Vitex agnus castus* proven to be highly efficacious as a repellent against ticks, fleas, mosquitoes and biting flies. Parasitol. Res. 95: 363-365.

Meifert, D. W., R. S. Patterson, T. Whitfield, G. C. LaBrecque, and D. E. Weidhaas. 1978. Unique attractant-toxicant system to control stable fly populations. J. Econ. Entomol. 71: 290-292.

The efficacy of fiberglass panels treated with permethrin was tested as a control for stable flies in the laboratory and in the field. The fiberglass panels act as an attractant to the flies, and once in contact with the permethrin they die within 24 hours. When permethrin was applied to traps at .5g/$m^2$, 98-100% of the flies died within 24 hours for the first 3 weeks, and 90% in the $4^{th}$ week. When the concentration was increased to 2.5g/$m^2$, over 99% of the stable flies in the test area were killed over a 6-week period. The authors calculated that using 1 trap for every 5 domestic animals would decrease the stable fly population by 30%.

Mellor, J. E. M. 1919. Observations on the habits of certain flies, especially of those breeding in manure. Ann. Appl. Biol. 6: 53-88.

Mellor, P. S., R. P. Kitching, and P. J. Wilkinson. 1987. Mechanical transmission of capripox virus and African swine fever virus by *Stomoxys calcitrans*. Res. Vet. Sci. 43: 109-112.

Melvin, R. 1931. Notes on the biology of the stable fly *Stomoxys calcitrans* Linn. Ann. Entomol. Soc. Am. 24: 436-438.

A large number of *Stomoxys calcitrans* were reared in the laboratory to monitor life history parameters under constant temperature and humidity. Egg incubation period, larval and pupal periods were monitored at 25°C and 30°C. Two different rearing media were used at each temperature for larvae and pupae. Length of the pupal period was monitored under different relative humidity.

Melvin, R. 1932. Physiological studies on the effect of flies and fly spray on cattle. J. Econ. Entomol. 25: 1151-1164.

Melvin, R. 1934. Incubation period of eggs of certain Muscoid flies at different constant temperatures. Ann. Entomol. Soc. Am. 27: 406-410.

The incubation period of 9 species of muscoid flies were compared at temperatures ranging from 59°F-109°F, in 5-degree intervals. Both high and low temperatures were found to slow egg hatch. Eggs of *Stomoxys calcitrans* hatched between 79-94°F.

Menusan, H. 1946. Flies attacking cattle. Dairymens Price Reporter. 28: 3.

Meola, R.W., R. L. Harris, S. M. Meola, and D. D. Oehler. 1977. Dietary-induced secretion of sex pheromone and development of sexual behavior in the stable fly. Environ. Entomol. 6: 895-897.

Meola, S. M. 1982. Morphology of the region of the ejaculatory duct producing the male accessory gland material in the stable fly, *Stomoxys calcitrans* L. (Diptera: Muscidae). Int. J. Ins. Morphol. Embryol. 11: 69-77.

Meola, S. M., and R. T. Mayer. 1980. Inhibition of cellular proliferation of imaginal epidermal cells by diflubenzuron in pupae of the stable fly. Science 207: 985-987.

Meola, S. M., and B. J. Cook. 1986. Neuroendocrine plexus in the pericardial septum of the stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae). Int. J. Morphol. Embryol. 15: 269-281.

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Meola, S. M., M. S. Wright, G. M. Holman, and J. M. Thompson. 1991. Localization of leucomyosuppressin-like peptides in the central nervous system of the stable fly with immunocyctochemistry. J. Med. Entomol. 28: 712-718.

Meola, S. M., M. S. Wright, R. Nichols, and M. W. Pendleton. 1996. Localization of myosuppressinlike peptides in the hypocerebral ganglion of two blood-feeding flies: horn fly and stable fly (Diptera: Muscidae). J. Med. Entomol. 33: 473-481.

Two peptides, dromyossuppressin (DMS) and leucomyosuppressin (LMS) suppress the spontaneous contractions of visceral muscle in insects. These peptides were previously isolated from *Stomoxys calcitrans*, and in this study they were isolated from *Hematobia irritans*. Neurons reactive to LMS were located in both species.

Meola, S. M., M. W. Pendleton, P. A. Langley, and S. L. Lovering. 1999. Ultrastructural localization of unique neurosecretory granules in the *corpora cardiaca* of the stable fly, *Stomoxys calcitrans*, and the tsetse fly, *Glossina morsitans*. J. Morphol. 240: 155-168.

The corpora cardiaca of the stable fly and tsetse fly were studied, and unique elementary neurosecretory granules (ENG) in the intrinsic neurosecretory cells (INC) were described. Those of *Stomoxys calcitrans* contain square or rectangular granules, whereas *Glossina morsitans* has spindle-shaped ENG. The shapes are unique to these dipterans.

Metcalf, C. L., and W. E. Sanderson. 1931. Black flies, mosquitoes, and punkies of the Adirondacks. New York State Museum 5: 9-38.

Meyer, H. J., and H. Bolton. 2007. S1030: flies impacting livestock, poultry and food safety. Outline of project S1031, USDA, Cooperative State, Research, Education and Extension Service.

Meyer, J. A. 1993. The influence of poultry operations on the urban fly problem in the Western United States, pp. 7-16. *In* G. D. Thomas and S. R. Skoda (eds.), Rural flies in the urban environment? Proc. of a Symposium, 1989 annual meeting of the ESA; N. Cent. Reg. Publ. No. 335. Agric. Research Div., Institute of Agric. And Natural Resources, Univ. of Nebraska Res. Bull. No. 317.

Meyer, J. A., and T. A. Shultz. 1990. Stable fly and house fly breeding sites on dairies. Calif. Agric. 44: 28-29.

A survey was conducted to compare management practices between dairies in southern and central California, with the purpose of determining which contained more breeding sites for house flies and stable flies. It was concluded that different management practices influenced fly breeding.

Meyer, J. A., and J. S. Hunter, III. 1991. Residual activity of microencapsulated permethrin against stable flies on lactating dairy cows. Med. Vet. Entomol. 5: 359-362.

The residual properties of microencapsulated permethrin with an emulsifiable concentrate solution were compared on the shoulder and leg hair of lactating dairy cows. Microencapsulated permethrin was found to remain on the hair much longer than the concentrate. It remained on the shoulders of the cows longer than on the legs due to daily washing of the legs. The use of permethrin against stable flies on dairy cows is questioned since stable flies attack mainly the legs, and the permethrin is washed off the legs relatively fast. This also raises the possibility of stable flies acquiring resistance to permethrin due to the low dose on the legs of the cows.

Meyer, J. A., and J. J. Petersen. 1982. Samping stable fly and house fly pupal parasites on beef feedlots and dairies in Eastern Nebraska. Southwest. Entomol. 7: 119-124.

Meyer, J. A., and J. J. Peterson. 1983. Characterization and seasonal distribution of breeding sites of stable flies (Diptera: Muscidae) on eastern Nebraska feedlots and dairies. J. Econ. Entomol. 76: 103-108.

Weekly searches for stable fly and house fly breeding sites were made at 3 small feedlots, 1 large feedlot and one dairy. One-time searches were made at an additional 25 feedlots, all in eastern Nebraska. Breeding sites

were classified into 16 categories, and the distribution of fly breeding in these areas was studied. Spilled feed was the major breeding site on large feedlots; drainage ditches, fencelines and empty lots were the main source on small feedlots; and stored manure and straw bedding were the main breeding site at dairies.

Meyer, J. A., B. A. Mullens, T. L. Cyr, and C. Stokes. 1990. Commercial and naturally occuring fly parasitoids (Hymenoptera: Pteromalidae) as biological control agents of stable flies and house flies (Diptera: Muscidae) on California dairies. J. Econ. Entomol. 83: 799-806.

Pteromalid parasitoids were released on 2 California dairies and their affect on stable fly and house fly populations was evaluated. Results showed that the releases had no significant effect on fly populations, perhaps because of the number of other dairies in the vicinity and the ability of flies to disperse.

Meyer, J. A., T. A. Shultz, C. Collar, and B. A. Mullens. 1991. Relative abundance of stable fly and house fly (Diptera: Muscidae) pupal parasites (Hymenoptera: Pteromalidae, Coleoptera: Staphylinidae) on confinement dairies in California. Environ. Entomol. 20: 915-921.

Mihok, S. 2002. The development of a multipurpose trap (the Nzi) for tsetse and other biting flies. Bull. Entomol. Res. 92: 385-403.

Mihok, S., and P. H. Clausen. 1996. Feeding habits of *Stomoxys* spp. stable flies in a Kenyan forest. Med. Vet. Entomol. 10: 392-394.

Mihok, S., and D. A. Carlson. 2007. Performance of painted plywood and cloth Nzi traps relative to Manitoba and Greenhead traps for Tabanids and stable flies. J. Econ. Entomol. 100: 613-618.

The efficacy of painted plywood Nzi traps was compared with that of the phthalogen blue cloth Nzi traps for capturing stable flies and Tabanids. Traps were baited with 1-octen-3-ol. It was found that plywood traps painted with a matte blue paint performed as well as the cloth traps. However, traps with shiny paint did not perform as well.

Mihok, S., E. K. Kang'ethe, and G. K. Kamau. 1995. Trials of traps and attractants for *Stomoxys* spp. (Diptera: Muscidae). J. Med. Entomol. 32: 283-289.

Mihok, S., O. Maramba, E. Munyoki, and K. Saleh. 1996. Phenology of Stomoxyinae in a Kenyan forest. Med. Vet. Entomol. 10: 305-316.

Mihok, S., D. A. Carlson, E. S. Krafsur, and L. D. Foil. 2006. Performance of the Nzi and other traps for biting flies in North America. Bull. Entomol. Res. 96: 387-397.

Mihok, S., D. A. Carlson, and N. Ndegwa. 2007. Tsetse and other biting fly responses to Nzi traps baited with octenol, phenols and acetone. Med. Vet. Entomol. 21: 70-84.

Miller, A., and R. L. Harris. 1970. A collector for studing the emergence pattern of flies. J. Econ. Entomol. 63: 1682-1683.

Miller, J. A., and W. F. Chamberlain. 1989. Azadirachtin as a larvicide against the horn fly, stable fly, and house fly (Diptera: Muscidae). J. Econ. Entomol. 82: 1375-1378.

Miller, J. A., J. L. Eschle, and I. L. Berry. 1969. Patterns of flight activity in livestock insects. 1. Preliminary testing of a system for recording flight activity of the stable fly. Ann. Entomol. Soc. Am. 62: 1046-1050.

An “aktograph”, a device used to detect the flight activity of stable flies was described. An experiment was conducted using the aktograph to monitor flight activity of stable flies that were recently engorged on blood. Flight activity was monitored under total light and total darkness. There was more activity in light conditions, and males were more active than females.

Miller, J. A., S. E. Kunz, D. D. Oehler, and R. W. Miller. 1981. Larvicidal activity of Merck MK-933, an avermectin, against the horn fly, stable fly, face fly, and house fly. J. Econ. Entomol. 74: 608-611.

Miller, J. A., K. Lohmeyer, J. George, J. Pruett, J. M. Pound, and P. Olafson. 2006. Sustainable pest management systems for blood-feeding flies affecting livestock. USDA-ARS annual report.

Miller, L. D., D. R. Downing, and N. O. Morgan. 1974. Transmission of hog cholera virus by flies: recovery of virus from flies following exposure to infective blood. U.S. Anim. Health Assoc. 7: 324-330.

Miller, R.W. 1992. The stable fly as a pest of dairy cattle, pp. 12-20. *In* G. D. Thomas and S. R. Skoda (eds.), The stable fly: a pest of humans and domestic animals. Proc. Entomol. Soc. Am. Baltimore, MD.

Miller, R.W. 1993. The influence of dairy operations on the urban fly problem, pp. 25-33. *In* G. D. Thomas and S. R. Skoda (eds.), Rural flies in the urban environment? Proc. of a Symposium, 1989 annual meeting of the

ESA; N. Cent. Reg. Publ. No. 335. Agric. Research Div., Institute of Agric. And Natural Resources, Univ. of Nebraska Res. Bull. No. 317.

Miller, R. W. 1994. Inhibition of house flies and stable flies (Diptera: Muscidae) in field-spread dairy bedding from cattle treated with diflubenzuron boluses. J. Econ. Entomol. 87: 402-404.

Five heifers were kept in a stall with straw bedding and diflubenzuron boluses were administered to each one. After 3 weeks the bedding was removed and spread out. Another group of untreated heifers and their bedding was used as a control. The spread out bedding was sampled for house flies and stable flies. It was found that fewer flies emerged from the treated bedding.

Miller, R. W., and L. G. Pickens. 1975. Feed additives for control of flies on dairy farms. J. Med. Entomol. 12: 141-142.

Miller, R. W., L. G. Pickens, N. O. Morgan, R. W. Thimijan, and R. L. Wilson. 1973. Effect of stable flies on feed intake and milk production of dairy cows. J. Econ. Entomol. 66: 711-713.

Miller, R. W., D. A. Rutz, L. G. Pickens, and C. J. Geden. 1993. Evaluation of traps and the parasitoid *Muscidifurax raptor* Girault and Sanders to manage house flies (Diptera, Muscidae) and stable flies (Diptera, Muscidae) on dairy farms. J. Agr. Entomol. 10: 9-19.

Miller, R. W., L. G. Pickens, and W. E. Potts. 1993. Comparison of traps and an integrated program to manage house flies and stable flies on dairy farms. J. Agric. Entomol. 10: 189-196.

Miller, R. W., E. T. Schmidtmann, R. D. Wauchope, C. M. Clegg, A. E. Herner, and H. Weber. 1996. Urine delivery of cyromazine for suppressing house and stable flies (Diptera: Muscidae) in outdoor dairy calf hutches. J. Econ. Entomol. 89: 689-694.

Miller, T. A., and R. E. Treece. 1968. A device for obtaining flies of known age. Ann. Entomol. Soc. Am. 61: 548.

Miloushov, Y. 1978. Species composition and numbers of common house and stable (Synanthropic) flies on stock breeding farms. Vet. Science. 15: 39-44.

Mitchell, E. R., W. W. Copeland, and F. C. Tingle. 1974. Parasites of filth-breeding dipteral in poultry houses in north central Florida. Fla. Entomol. 57: 383-384.

Mitzmain, M. B. 1913. *Stomoxys calcitrans* Linn. A note giving a summary of its life history. Public Health Reports (1896-1970) 28: 345-346.

A brief summary of the life history of *Stomoxys calcitrans*.

Mitzmain, M. B. 1913. The bionomics of *Stomoxys calcitrans* Linnaeus: a preliminary account. Philippine J. Sci. 8: 29-48.

Mitzmain, M. B. 1914. Experimental insect transmission of anthrax. Public Health Reports (1896-1970) 29: 75-77.

Discusses several experiments involving the transmission of anthrax by stable flies and tabanids, including some with negative results. Anthrax was successfully transmitted by the flies when their feeding on infected animals was interrupted, and they were transferred to a susceptible host to complete their blood meal. Anthrax was found in the feces of stable flies and tabanids 24 hours after feeding on an infected animal.

Moffatt, M.R. and M.J. Lehane. 1990. Trypsin is stored as an inactive zymogen in the midgut of *Stomoxys calcitrans*. Insect Biochem. 20: 719-723.

Moffatt, M. R., D. Blakemore, and M. J. Lehane. 1995. Studies on the synthesis and secretion of trypsin in the midgut of *Stomoxys calcitrans*. Comp. Biochem. Physiol. 110B: 291-300.

Monty, J. 1972. A review of the stable fly problem in Mauritius. Revue Agricole Et Sucriere. 51 :13-29.

Moobola, S. M., and E. W. Cupp. 1978. Ovarian development in the stable fly, *Stomoxys calcitrans*, in relation to diet and juvenile hormone control. Physiol. Entomol. 3: 317-321.

Corpora allata are removed to examine the effect of juvenile hormone on ovarian development. Cell lysis occurred in flies with no CA and a diet of sugar only, but not in blood fed flies. Follicles did not grow in any flies in the absence of juvenile hormone, but when the CA was implanted back into surgically altered flies, the ovaries began to develop, and when given blood meals they produced yolk.

Moon, R. D., I. L. Berry, and J. J. Petersen. 1982. Reproduction of *Spalangia cameroni* Perkins (Hymenoptera: Pteromalidae) on Stable fly (Diptera: Muscidae) in the laboratory. J. Kans. Entomol. Soc. 55: 77-85.

Moon, R. D., L. D. Jacobson, and S. G. Cornelius. 1987. Stable flies (Diptera: Muscidae) and productivity of confined nursery pigs. J. Econ. Entomol. 80: 1025-1027.

The effect of stable flies on piglets was studied using 4 sets of 5 pigs each. Two sets were exposed to over 1000 stable flies and 2 sets were free from flies. Amount of feed consumed and weight gain of the piglets was calculated. Stable flies did not significantly affect the average daily gain of piglets at a rate of 7 flies per animal.

Moore, J. 1993. Parasites and the behavior of biting flies. J. Parasitol. 79: 1-16.

Moore, S., A. H. Toczydlowski, and H. L. Sweetman. 1951. Fly control experiments in Massachusetts in 1950. J. Econ. Entomol. 44: 731-733.

Moorhouse, D. E. 1972. Cutaneous lesions on cattle caused by stable fly. Aust. Vet. J. 48: 644.

Moraes, A. P. R., V. R. E. P. Bittencourt, and A. J. Bittencourt. 2010. Pathogenicity of *Beauveria bassiana* on immature stages of *Stomoxys calcitrans*. Ciéncia Rural, Santa Maria 40: 1802-1807. (In Portugese).

Moraes, A. P. R., I. da C. Angelo, E. K. K. Fernandes, V. R. E. P. Bittencourt and A. J. Bittencourt. 2008. Virulence of *Metarhizium anisopliae* to eggs and immature stages of *Stomoxys calcitrans*. Ann. N. Y. Acad. Sci. 1149: 384-387.

Morgan, C. E., G. D. Thomas, and R. D. Hall. 1983. Annotated bibliography of the stable fly, *Stomoxys calcitrans* (L.), including references on other species belonging to the genus *Stomoxys*. North Central Regional Res. Publication No. 291. University of Missouri Agricultural Experiment Station Research Bulletin 1049, Columbia.

Morgan, D. W. T., and H. D. Bailie. 1980. A field trial to determine the effect of fly control using permethrin on milk yields in dairy cattle in the U. K. Vet. Rec. 106: 121-123.

Morgan, N. O., and H. J. Retzer. 1974. Modified double nozzle micronized dust gun for delivering insecticides. J. Econ. Entomol. 67: 563-564.

Morgan, N. O., and L. D. Miller. 1976. Muscidae (Diptera): experimental vectors of hog cholera virus. J. Med. Entomol. 12: 657-660.

Morgan, N. O., L. G. Pickens, and R. W. Thimijan. 1970. House flies and stable flies captured by two types of traps. J. Econ. Entomol. 63: 672-673.

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The use of alternative bedding substrates was tested in calf hutches for the suppression of house fly and stable fly larvae. Straw bedding is absorbent, and can absorb 2 to 3 times its weight in water, supplying maggots with a moist media in which to grow. Ground corn cob is nonabsorbent, and was found to suppress maggot growth by >90%. Feeding cyromazine to calves in their milk also suppressed maggot occurance by 79%. It was concluded that outdoor calf hutches were a good breeding site for muscoid flies when straw bedding was used, but the use of alternative substrates or cytomazine significantly reduced maggot production.

Schneider, F., J. G. Houseman, and P. E. Morrison. 1987. Activity cycle and the regulation of digestive proteases in the posterior midgut of *Stomoxys calcitrans* (L.) (Diptera: Muscidae). Insect Biochem. 17: 859-862.

Schofield, S. 1998. Responses to electrified targets and daily activity of *Stomoxys* spp. (Diptera: Muscidae) in Zimbabwe. Bull. Entomol. Res. 88: 627-632.

Schofield, S., and J. Brady. 1996. Circadian activity pattern in the stable fly, *Stomoxys calcitrans*. Physiol. Entomol. 21: 159-163.

Activity patterns of stable flies were tested at LD 12:12, total darkness (DD) and total light (LL). Patterns were the same for LD and DD, showing a unimodal pattern of diurnal activity. However, in field conditions both unimodal and bimodal patterns are followed. The evidence in this experiment did not support earilier work that reported hunger to have an effect on circadian patterns.

Schofield, S., and J. Brady. 1997. Effects of carbon dioxide, acetone and 1-octen-3-ol on the flight responses of the stable fly, *Stomoxys calcitrans*, in a wind tunnel. Physiol. Entomol. 22: 380-386.

Wind tunnel experiments were conducted using $CO_2$, acetone and 1-octen-3-ol as attractants for stable flies. Fly behavior was recorded using a video camera. $CO_2$ produced progressively higher responses at increasing concentrations. The other two chemicals produced a decrease in response at the highest concentrations.

Schofield, S., and S. J. Torr. 2002. A comparison of the feeding behaviour of tsetse and stable flies. Med. Vet. Entomol. 16: 177-185.

Compares the response of *Stomoxys* spp. and *Glossina* spp. to host defensive behavior and other flies while taking a blood meal. *Stomoxys* were found to take more risks, remaining on the host longer in spite of defensive behavior. *Glossina* were more responsive to host behavior and tended to leave the host more quickly. It was suggested that these results could relate to the life cycle of the flies. Stomoxys could take more risks in order to acquire the blood meals needed for reproduction, due to their higher fecundity and shorter life span.

Schofield, S., A. Cork, and J. Brady. 1995. Electroantennogram responses of the stable fly, *Stomoxys calcitrans*, to components of host odour. Physiol. Entomol. 20: 273-280.

Schofield, S., C. Witty, and J. Brady. 1997. Effects of carbon dioxide, acetone and 1-octen-3-ol on the activity of the stable fly, *Stomoxys calcitrans*. Physiol. Entomol. 22: 256-260.

Activation (flight activity) of stable flies and time spent on a target was tested using carbon dioxide, acetone and octenol. $CO_2$ and acetone elicited an increase in activation and the flies stayed longer on the “host”.

However, high concentrations of octenol caused a decrease in activation and also decreased the time on the "host". The authors suggest that the responses to octenol are dynamic, and may be affected by concentration and flux.

Scholl, P. J. 1980. A technique for physiologically age-grading female stable flies, *Stomoxys calcitrans* (L.). Nebr. Agric. Exp. Stn. Res. Bull. #298: 28 pp.

Scholl, P. J. 1984. Comparison of physiological development of marked-recaptured populations and laboratory cohorts of stable flies, *Stomoxys calcitrans* (L.). Southwest. Entomol. 9: 382-387.

Scholl, P. J. 1986. Field population studies of *Stomoxys calcitrans* (L.) in eastern Nebraska. Southwest. Entomol. 11: 155-160.

Field studies of stable fly populations were studied during the summers of 1980 and 1981 in Cuming County, Nebraska. Flies were captured on Williams traps weekly and counted. Females were dissected to determine reproductive stage. Survival rate of females was higher than previously reported. More males dispersed from their origin than females. Population changes seemed to correlate with weather changes.

Scholl, P. J., and J. J. Petersen. 1985. Biting flies, pp. 49-63. *In* R. E. Williams, R. D. Hall, A. B. Broce, and P. J. Scholl (eds.). Livestock entomology. John Wiley, New York. 335 pp.

Scholl, P. J., J. J. Petersen, D. A. Stage, and J. A. Meyer. 1981. Open silage as an overwintering site for immature stable flies in eastern Nebraska. Southwest. Entomol. 6: 253-258.

Scholl, P. J., S. R. Lowry, and G. G. Rabe. 1985. Modified William's sticky traps used to measure activity of adult stable flies, *Stomoxys calcitrans* (L.) in eastern Nebraska. Southwest. Entomol. 10: 32-38.

Schoof, H. F. 1964. Laboratory culture of *Musca*, *Fannia*, and *Stomoxys*. Bull. Wld. Hlth. Org. 31: 539-544.

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Schoof, H. F., G. A. Mail, and E. P. Savage. 1954. Fly production sources in urban communities. J. Econ. Entomol. 47: 245-253.

Schowalter, T. D., and M. J. Klowden. 1979. Blood meal size of the stable fly, *Stomoxys calcitrans* measured by the HiCN method. Mosq. News 39: 110-112.

Schreck, C. E., K. Posey, and H. K. Gouck. 1975. Evaluation of the electrocutor grid trap baited with carbon dioxide against the stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae). J. Med. Entomol. 12: 338-340.

Schreck, C. E., D. E. Weidhaas, N. Smith, and K. H. Posey. 1977. Chemical treatment of wide-mesh net clothing for personal protection against blood-feeding arthropods. Mosq. News 37: 455-462.

Schreck, C. E., N. Smith, D. Weidhaas, K. Posey, and D. Smith. 1978. Repellents vs. toxicants as clothing treatments for protection from mosquitoes and other biting fies. J. Econ. Entomol. 71: 919-922.

Schreck, C. E., T. P. McGovern, and N. Smith. 1978. Repellency of selected esters and amides of four alicyclic acids against the stable fly, *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 14: 589-591.

Schreck, C. E., K. Posey, and D. Smith. 1978. Durability of Permethrin as a potential clothing treatment to protect against blood-feeding arthropods. J. Econ. Entomol. 71: 397-400.

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Nematode larvae of the family Habronematidae were found in lung tissue of 3 horses on a farm in Al Dhaid (UAE). Larvae were found in 147 of 561 male and 64 of 739 female *Musca domestica* sampled on the farm. All of the 15 *Stomoxys calcitrans* tested were negative for Habronematidae larvae.

Schwardt, H. H. 1932. Bloodsucking flies (exclusive of Culicidae) in relation to human welfare. Ann. Entomol. Soc. Am. 25: 603-611.

Schwarz, M., J. E. Wright, R. E. Redfern, and G. D. Mills, Jr. 1974. Compounds related to juvenile hormone. Activity of arylterpenoid compounds in four insect species. J. Econ. Entomol. 67: 177-180.

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Schwinghammer, K. A., F. W. Knapp, J. A. Boling, and K. K. Schillo. 1986. Physiological and nutritional response of beef steers to infestations of the stable fly (Diptera: Muscidae). J. Econ. Entomol. 70: 1294-1298.

Schwinghammer, K. A., F. W. Knapp, and J. A. Boling. 1987. Physiological and nutritional response of beef steers to combine infestations of horn fly and stable fly (Diptera: Muscidae). J. Econ. Entomol. 80: 120-125.

Scoles, G. A., A. B. Broce, T. J. Lysyk, and G. H. Palmer. 2005. Relative efficiency of biological transmission of *Anaplasma marginale* (Rickettsiales: Anaplasmataceae) by *Dermacentor andersoni* (Acari: Ixodidae) compared with mechanical transmission by *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 42: 668-675.

Seawright, J. A., B. K. Birky, and B. J. Smittle. 1986. Use of a genetic technique for separating the sexes of the stable fly (Diptera: Muscidae). J. Econ. Entomol. 79: 1413-1417.

Segal, B. 1933. Why not Bourgault's trap for horse-flies? J. Econ. Entomol. 26: 301-302.

Sehgal, B. S., and P. Kumar. 1966. A study on the seasonal fluctuations in fly populations in two villages near Lucknow. Ind. J. Med. Res. 54: 1175-1181.

Semakula, L. M. 1971. Factors affecting flight of the stable fly, *Stomoxys calcitrans* (L.) and the house fly, *Musca domestica* (L.). MS Thesis, Kansas State University.

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Service, M. W. 1986. Lecture notes on medical entomology. Blackwell Scientific Publications. pp. 138-154.

Seunaga, O. 1965. A rearing method of stable fly and quantity of blood taken up by a fly. Endem. Dis. Bull. Nagasaki. 1: 296-301. (In Japanese). Rev. Appl. Entomol. (1968) 56: 196. Abstract 709.

Seymour, R. C., and J. B. Campbell. 1993. Predators and parasitoids of house flies and stable flies (Diptera, Muscidae) in cattle confinements in West Central Nebraska. Environ. Entomol. 22: 212-219.

A survey was conducted during the summers of 1983 and 1984 to determine the species of pupal parasitoids and arthropod predators of house flies and stable flies. The survey was conducted on 2 dairies and 3 feedlots near North Platte, NE. Both natural and artificial breeding sites were used for the flies. Results showed that the major parasitoids attacking the flies were *Muscidifurax zaraptor* and *Spalangia nigroaenea* for the house fly and *Aleochara lacertian* and *S. nigroaenea* for stable flies. Staphilinids were the primary predators.

Shannon, H. J. 1926. A preliminary report on the seasonal migration of insects. J. N.Y. Entomol. Soc. 34: 199-205.

Shaw, A. O., and F. W. Atkeson. 1943. Effect of spraying cows with repellent type sprays as measured by milk production. J. Dairy Sci. 26: 179-187.

Shaw, A. O., R. C. Smith, F. W. Atkeson, H. C. Fryer, A. R. Borgmann, and F. J. Holmes. 1943. Tests of fly repellents of known ingredients and of selected commercial sprays of dairy cattle. J. Econ. Entomol. 36: 23-32.

Shiga, S. 2003. Anatomy and functions of brain neurosecretory cells in Diptera. Micro. Res. Tech. 62: 114-131.

Shipley, A. E. 1915. Stomoxys, the stable fly. Br. Med. J. 2: 216-218.

Simkover, H. G. 1964. 2-Imidazolidinone as an insect growth inhibitor and chemosterilant. J. Econ. Entomol. 57: 574-579.

Simmons, S. W. 1944. Observations on the biology of the stable fly in Florida. J. Econ. Entomol. 37: 680-686.

Studies were conducted on the biology and life history of stable flies, using both lab-reared and wild flies. Observations were made on the minimum and maximum duration of each life stage, as well as behavioral factors. Behavioral factors studied included biting rates at specified hours, with humans as hosts; breeding incidence in bay-grass media of different ages; overwintering.

Simmons, S. W., and W. E. Dove. 1941. Breeding places of the stable fly or "dog fly" *Stomoxys calcitrans* (L.) in northwestern Florida. J. Econ. Entomol. 34: 457-462.

Stable flies were found to be breeding in two major substrates in Northwest Florida. Contrary to the findings of King and Lenert (1936), the authors found stable flies breeding in the bay grasses *Halodule wrightii* and *Thalassia testudinum* washed up along the shores. They were

found in the grasses washed up by storms, far enough above the tide mark to not be submerged each day. The other major breeding site was found to be piles of peanut litter left after harvesting of peanuts. It was estimated that over 100,000 piles of peanut litter were distributed over the 1,000,000 acres of peanuts harvested in the region, and most were breeding sites of stable flies.

Simmons, S. W., and W. E. Dove. 1942a. Waste celery as a breeding medium for the stable fly or "dog fly" with suggestions for control. J. Econ. Entomol. 35: 709-715.

Waste celery is found to be a major site of stable fly breeding, in addition to bay grasses and peanut litter, in Northwest Florida. Celery waste is dumped in piles after harvest and begins to ferment, creating a good medium for larval growth. In addition, it was found that plowing the waste celery under after harvest was not effective in controlling late instar larvae and pupae. Instead it supplied them with a great rearing medium from which the adults could easily emerge. Some suggestions for insecticidal control are discussed.

Simmons, S. W., and W. E. Dove. 1942b. Creosote oil with water for control of the stable fly, or "dog fly", in drifts of marine grasses. J. Econ. Entomol. 35: 589-592.

The efficacy of using creosote mixed with bay water for the control of stable flies on beach grasses was conducted in northwest Florida. The experiment tested the mixture against the previously used method of creosote mixed with diesel oil. Creosote mixed with water performed as well as creosote mixed with diesel oil as an insecticide against stable flies, with a projected savings of $15,000 for treating the bay from Pensacola to Apalachicola.

Simmons, S. W., and M. Wright. 1944. The use of DDT in the treatment of manure for fly control. J. Econ. Entomol. 37: 135.

Simmons, S. W., and W. E. Dove. 1945. Experimental use of gas condensate for the prevention of fly breeding. J. Econ. Entomol. 38: 23-25.

Singh, P., and P. D. Gupta. 1973. Raffinose in *Stomoxys calcitrans* Linn. (Diptera: Cyclorrhapha: Muscidae). Cell. Mol. Life Sci. 29: 732-733.

Sinshaw, A., G. Abebe, M. Desquisnes, and W. Yoni. 2006. Biting flies and *Trypanosoma vivax* infection in three highland districts bordering lake Tana, Ethiopia. Vet. Parasitol. 142: 35-46.

Siverly, R. E., and H. F. Schoof. 1955a. Utilization of various production media by Muscoid flies in a metropolitan area. I. Adaptability of different flies for infestation of prevalent media. Ann. Entomol. Soc. Am. 48: 258-262.

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Skoda, S. R., and G. D. Thomas. 1992. The stable fly as a pest of humans, pp. 21-24. *In* G. D. Thomas and S. R. Skoda (eds.), The stable fly: a pest of humans and domestic animals. Proc. Entomol. Soc. Am. Baltimore, MD.

Skoda, S. R., and G. D. Thomas 1992. Sampling of adult and immature stable flies, pp. 72-86. *In* G. D. Thomas and S. R. Skoda (eds.), The stable fly: a pest of humans and domestic animals. Proc. Entomol. Soc. Am. Baltimore, MD.

Skoda, S. R., and G. D. Thomas. 1993. Breeding sites of stable flies and house flies, pp. 61-69. *In* G. D. Thomas and S. R. Skoda (eds.), Rural flies in the urban environment? Proc. of a Symposium, 1989 annual meeting of the ESA; N. Cent. Reg. Publ. No. 335. Agric. Research Div., Institute of Agric. And Natural Resources, Univ. of Nebraska Res. Bull. No. 317.

Skoda, S. R., G. D. Thomas, and J. B. Campbell. 1991. Developmental sites and relative abundance of immature stages of the stable fly (Diptera: Muscidae) in beef cattle feedlot pens in Eastern Nebraska. J. Econ. Entomol. 84: 191-197.

Three categories of feedlots in Nebraska were monitored for immature stable fly populations from 1986-1988. The categories were: minimum management (type A), intermediate management (type B) and intense management (type C). Feedlots were divided into 5 areas for collection of larvae: feed apron, mound, side fences, back fence and general lot. In the 1986 study, the majority (85%) of stable fly immatures were collected from the feed apron and mound areas. In 1987, feedlot types A and B had the highest number of immature, and the highest percent were collected at the feed apron and mound. Feedlot type C produced very few flies. During both years, the population peaked early in the season, and there was a strong correlation between number of immature and number of adults 2 weeks later. 1988 produced different results, with adult populations increasing gradually during the season at all lot types, and there were negative correlations between the numbers of immature and adults. The authors suggest that the 1988 results could be due to drought conditions during that season, with stable flies utilizing alternative breeding sites. They conclude that during years of normal rainfall, the feed apron is the primary breeding site for stable flies, and that an estimate

of the adult population could be made by sampling the breeding areas for immatures.

Skoda, S. R., G. D. Thomas, and J. B. Campbell. 1996. Comparison of core sampling and pupal traps for monitoring immature stable flies and house flies (Diptera: Muscidae) in beef feedlot pens. J. Econ. Entomol. 89: 428-434.

Two sampling methods for immature house flies and stable flies (core sampling and pupal traps) were tested at two cattle feedlots in 1986 and 1987. Samples were taken at 5 locations on each feedlot: the mound, feed apron, back fence, side fences and general lot. Core samples were more consistent but few pupae of either species were collected. Pupal traps captured a greater number of immatures but were more variable. Both methods supported earlier research which found that the feed aprons were the best developmental site for immature stable flies and house flies.

Skov, O., D. F. Williams, and R. S. Patterson. 1978. A release cage for the mass distribution of flies and other insects. Mosq. News 38: 284-286.

Skovgård, H. 2004. Sustained releases of the pupal parasitoid *Spalangia cameroni* (Hymenoptera: Pteromalidae) for the control of house flies *Musca domestica* and stable flies *Stomoxys calcitrans* (Diptera: Muscidae) on dairy farms in Denmark. Biol. Control 30: 288-297.

Skovgård, H. 2006. Search efficiency of *Spalangia cameroni* and *Mucidifurax raptor* on *Musca domestica* pupae in dairy cattle farms in Denmark. BioControl 51: 49-64.

Skovgård, H., and J. B. Jespersen. 1999. Activity and relative abundance of hymenopterous parasitoids that attack puparia of *Musca domestica* and *Stomoxys calcitrans* (Diptera: Muscidae) on confined pig and cattle farms in Denmark. Bull. Entomol. Res. 89: 263-269.

Skovgård, H., and T. Steenberg. 2002. Activity of pupal parasitoids of the stable fly *Stomoxys calcitrans* and prevalence of entomopathogenic fungi in the stable fly and house fly in Denmark. BioControl 47: 45-60.

Skovgård, H., and G. Nachman. 2004. Biological control of house flies *Musca domestica* and stable flies *Stomoxys calcitrans* (Diptera: Muscidae) by means of inundative releases of *Spalangia cameroni* (Hymenoptera: Pteromalidae). Bull. Entomol. Res. 94: 555-567.

The efficacy *Spalangia cameroni* as biological control of flies was tested on 3 farms in 1999 and 2000. The parasitoids had a significant effect on house fly numbers, but not stable flies. It was suggested that stable fly

larvae may burrow deeper into the substrate than house fly larvae, making them more difficult for parasitoids to reach. The parasitoids may also have had a preference for house flies due to being lab reared on that species.

Slansky, F., and J. G. Rodriguez. 1987. Nutritional ecology of insects, mites, spiders, and related invertabrates. Wiley-Interscience Publications pp. 741-765.

Smith, C. W., and E. J. Hansens. 1975. The effect of temperature and humidity on the amount of blood ingested by the stable fly, *Stomoxys calcitrans* L. (Diptera: Muscidae). N.Y. Entomol. Soc. 83: 235-240.

Stable flies were kept at 23, 32 or 38ºC and 7, 43, 75 or 97% relative humidity to test the effect of temperature and humidity on the amount of blood ingested. No significant differences were found in amount of blood ingested, but there were significant differences in the percentage of flies that fed at the different temperature/humidity combinations. A higher percentage of flies fed at high temperature/low humidity, and the lowest percent of flies fed at low temperature/high humidity combinations.

Smith, H. G., and L. J. Krysl. 1989. Grub, House, Stable, Horn, and Face Fly Control for Dairy Cattle. U.N.R., Nevada Cooperative Extension. Fact Sheet 89-08.

Smith, J. B. 1896. An essay on the development of mouthparts of certain insects. Trans. Am. Philosophical Soc. 19: 175-198.

Smith, J. P. 1981. Blood sucking flies of food producing animals in the United States. Part I: Family Tabanidae and *Stomoxys calcitrans*. Southwest Vet. 34: 115-117.

Smith, J. P., R. D. Hall, and G. D. Thomas. 1983. Natural enemies of the stable fly, *Stomoxys Calictrans* (L.) and their impact in Missouri. J. Kans. Entomol. Soc. 56: 454-455.

Smith, J. P., R. D. Hall, and G. D. Thomas. 1985. Field studies on mortality of the immature stages of the stable fly (Diptera: Muscidae). Environ. Entomol. 14: 881-890.

Field studies were conducted for 3 years (1980-1982) to determine the factors causing mortality of immature stable flies. Life tables were produced from the results, and the majority of immature deaths were due to “unknown causes”. Predation was the second most important factor.

Smith, J. P., R. D. Hall, and G. D. Thomas. 1987. Arthropods predators and competitors of the stable fly *Stomoxys calcitrans* (L.) (Diptera: Muscidae) in Central Missouri. J Kans. Entomol. Soc. 60: 562-567.

Sentinel stable fly breeding sites were set up on four farms in Missouri to identify predators and competitors of immature stable flies. The most common predators recovered were staphylinids and macrochelid mites. Competitors included one species of Dermaptera, 2 species of Hemiptera, 8 coleopteran families and 5 dipteran families.

Smith, J. P., R. D. Hall, and G. D. Thomas. 1987. Field paratism of the stable fly (Diptera: Muscidae). Ann. Entomol. Soc. Am. 80: 391-397.

Smith, J. P., R. D. Hall, and G. D. Thomas. 1989. A review of natural mortality and enemies of the stable fly (Diptera: Muscidae) in Missouri. Fla. Entomol. 72: 351-360.

Smith, L., and D. A. Rutz. 1991. Relationship of microhabitat to incidence of house fly (Diptera: Muscidae) immatures and their parasitoids at dairy farms in central New York. Environ. Entomol. 20: 669-674.

Smith, L., and D. A. Rutz. 1991. Seasonal and relative abundance of Hymenopterous parasitoids attacking house fly pupae at dairy farms in central New York. Environ. Entomol. 20: 661-668.

Smith, T. A. 1969. The maturation of fly larvae following removal from the larval medium. Cal. Vector News 16: 73-82.

Smittle, B. J., G. C. LaBreque, D. F. Williams, and R. S. Patterson. 1978. Container for irradiation of stable flies for a mass-release program. J. Econ. Entomol. 71: 335-336.

Smittle, B. J., J. A. Seawright, and N. L. Willis. 1984. Mating competitiveness of irradiated male stable flies, *Stomoxys calcitrans* (Diptera: Muscidae), from a genetic sexing strain. J. Med. Entomol. 21: 179-182.

The mating competitiveness of males of a genetic sexing strain (with a sex-linked resistance factor to dieldrin) was compared with a normal strain. Males were irradiated with 2500R cesium-137, and results were obtained by mating males with dieldrin-susceptible females. During the course of the experiment, a test was performed using carmine eye females to confirm female monogamy. It was concluded that the use of SIT could be enhanced by using dieldrin-resistant males.

Smittle, B. J., J. A. Seawright, and B. K. Birky. 1986. Use of a commercial color sorter to separate sexes of stable fly (Diptera: Muscidea) pupae from a genetic sexing strain. J. Econ. Entomol. 79: 877-878.

A machine is described that sorts stable fly pupae by color, separating black pupae from brown. Pupae progress down a hopper, pass through a trough and onto rollers, where they fall into a scanner which compares their color to a preset standard color. Black pupae are directed through a different valve than brown pupae. Using this machine, pupae of the genetic strain [T(1;3)2] could be separated by sexes, as in this strain the male pupae are brown and female pupae are black. Since the machine can sort up to 1200 pupae/min., it would be an efficient method to use in a sterile male release program.

Somme, L. 1958. The number of stable flies in Norwegian barns, and their resistance to DDT. J. Econ. Entomol. 51: 599-601.

Somme, L. 1959. On the numbers of stable flies and house flies on Norwegian farms. Saertykk av Norsk Entomologist Tidsskrift. 91: 7-15.

Somme, L. 1959. Control of stable flies by Dipterex on Norwegian farms. Saertrykk av korsk Entomologisk Tidsskrift, Bd, XI, H. 1-2: 16-19.

Somme, L. 1961. On the overwintering of house flies (*Musca domestica* L.) and stable flies (*Stomoxys calcitrans* (L.)) in Norway. Norsk. Entomol. Tidsskr. 11: 191-223.

Somme, L. 1962. Notes on resistance to chlorinated hydrocarbon insecticides in the stable fly, *Stomoxys calcitrans* (L.) (Diptera). Nors. Entomol. Tidskr. 12: 11-16.

Sonnet, P. E. 1979. Synthesis of the male stable fly polyene (z,z)-1,7,13-pentacosatriene and its geometrical isomers. J. Chem. Ecology. 5: 415-421.

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Sonnet, P. E., E. C. Uebel, W. R. Lusby, M. Schwarz, and R. W. Miller. 1979. Sex pheromone of the stable fly. J. Chem. Ecol. 5: 353-361.

Spates, G. 1979. Fecundity of the stable fly: effect of soybean trypsin inhibitor and phospholipase A inhibitor on the fecundity. Ann. Entomol. Soc. Am. 72: 847-849.

Spates, G. E. 1981. Proteolytic and hemolytic activity in the midgut of the stable fly *Stomoxys calcitrans* (L.). Partial purification of the haemolysin. Insect Biochem. 11: 143-147.

Spates, G. E. 1983. Midgut proteolytic and hemolytic activities, and feeding habits of young adult stable flies *Stomoxys calcitrans* (L.). Southwest. Entomol. 8: 178-185.

Spates, G. E., and J. E. Wright. 1975. Effect of a juvenile hormone analogue on phosphatase activity in pupae of the stable fly, *Stomoxys calcitrans*. J. Insect Physiol. 21: 1789-1792.

Spates, G. E., and J. E. Wright. 1980. Residues of diflubenzuron applied topically to adult stable flies. J. Econ. Entomol. 73: 595-598.

Spates, G. E., and J. R. DeLoach. 1980. Hemolysin of the stable fly, *Stomoxys calcitrans*. Comp. Biochem. Physiol. 67B: 121-125.

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without being punctured. Ten intra-puparial stages were described: pupariation, prepupa, larval-pupal apolysis, cryptocephalic pupa, larval-pupal ecdysis, phanerocephalic pupa, pupal-adult apolysis, early pharate adult, red-edyd pharate adult, and late pharate adult. It was determined that horn flies diapause in the red-eyed pharate or late pharate adult stage.

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Vitela, M. I., C. Cruz-Vazquez, J. J. Solano, and A. Orihuela. 2007. A note on the associations between the prevalence of stable flies (*Stomoxys calcitrans*) and the behavior of dairy cows under semi-arid conditions. J. Anim. Vet. Adv. 6: 1284-1290.

Twenty-one Holstein dairy cows were monitored for their reactions to stable fly activity on a private dairy in Aguascalientes, Mexico, during July and August. The climate in the region was semi-arid, with an average rainfall of 74mm. Cows were monitored for fly-dislodging activities such as ear twitching, head-tossing, leg stamping, muscle twitching and tail switching. Cows were reported to perform the activities at the highest rate when fly counts were over 20 flies per front leg. Tail switching was the most frequent activity.

Voegtline, A. C., G. W. Ozburn, and G. D. Gill. 1965. The relation of weather to biting activity of *Stomoxys calcitrans* (Linneaus) along Lake Superior. Papers Mich. Acad. Sci., Art Lett. 10: 107-114.

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Waldbillig, R. C. 1968. Color vision of the female stable fly, *Stomoxys calcitrans*. Ann. Entomol. Soc. Am. 61: 789-791.

The attractiveness of different wavelengths of light to female stable flies was tested. Stable flies were most attracted to wavelengths between 340-500 mμ, ultraviolet to blue-green. They were more attracted to white light than infrared, but in the absence of white light, they were attracted to the

infrared. This result was contradictory to other research which suggested that stable flies were blind to red light. The authors suggest that the attractiveness of blue light to stable flies could explain their accumulation at large bodies of water.

Wales, A. D., J. J. Carrique-Mas, M. Rankin, B. Bell, B. B. Thind, and R. H. Davies. 2010. Review of the carriage of zoonotic bacteria by arthropods, with special reference to *Salmonella* in mites, flies and litter beetles. Zoonoses Public Health 57: 299-314.

Wall, R. 2007. Ectoparasites: future challenges in a changing world. Vet. Parasitol. 148: 62-74.

Walsh, J. D. 1964. A survey of fly production in cattle feedlots in the San Joaquin Valley. California Vector View. 11: 33-39.

Wang, X., J. M. C. Ribeiro, A. B. Broce, M. J. Wilkerson, and M. R. Kanost. 2009. An insight into the transcriptome and proteome of the salivary gland of the stable fly, *Stomoxys calcitrans*. Insect Biochem. Mol. Biol. 39: 607-614.

Wang, Y. E., and G. D. Gill. 1970. Effect of temperature and relative humidity on mortality of adult stable flies. J. Econ. Entomol. 63: 1666-1668.

The purpose of this experiment was to determine if stable fly mortality increased at temperature and relative humidity conditions that were comparable with their movement toward large bodies of water, such as Lake Superior. Test conditions were 36 hour exposure to 3 different RH at 5 degree intervals. Mortality was high at 20% RH at all temperatures. Mortality increased significantly at 85°F, but was least at 80% RH. The results were consistent with conditions in which flies move toward bodies of water.

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Warnes, M. L., and L. H. Finlayson. 1985. Responses of the stable fly, *Stomoxys calcitrans* (L.) (Diptera: Muscidae), to carbon dioxide and host odours. II. Orientation. Bull. Entomol. Res. 75: 717-727.

Warnes, M. L., and L. H. Finlayson. 1986. Electroantennogram response of the stable fly, *Stomoxys calcitrans*, to carbon dioxide and other odours. Physiol. Entomol. 11: 469-473.

Warnes, M. L., and L. H. Finlayson. 1987. Effects of host behaviour on host preference in *Stomoxys calcitrans*. Med. Vet. Entomol. 1: 53-57.

Watson, D. W., and J. J. Petersen. 1991. Infectivity of *Serratia marcescens* (Eubacteriales: Enterobacteriaceae) in *Stomoxys calcitrans* (Diptera: Muscidae). J. Med. Entomol. 28: 190-192.

*Serratia marcescens* were cultured from house flies caught at Nebraska feedlots and dairies. Laboratory experiments were conducted to determine the infectivity of *S. marcescens* to stable flies, to compare the wild isolate with cultures maintained at the UNL School of Biological Sciences, and to determine if stable flies could be infected through their food source. Although stable flies became infected with this bacteria, they were only facultatively pathogenic and therefore would not be an important means of stable fly control.

Watson, D. W., J. K. Waldron, and D. A. Rutz. 1994. Integrated management of flies in and around dairy and livestock barns. Cornell Cooperative Extension.

Watson, D. W., C. J. Geden, S. J. Long, and D. A. Rutz. 1995. Efficacy of *Beauveria bassiana* for controlling the house fly and stable fly (Diptera: Muscidae). Biol. Control 5: 405-411.

Watson, D. W., D. A. Rutz, and S. J. Long. 1996. *Beauveria bassiana* and sawdust bedding for the management of the house fly, *Musca domestica* (Diptera: Muscidae) in calf hutches. Biol. Control 7: 221-227.

Wayson, N. E. 1914. Plague and plague-like disease: a report on their transmission by *Stomoxys calcitrans* and *Musca domestica*. Public Health Reports (1896-1970) 29: 3390-3393.

Weber, A. F., R. D. Moon, S. K. Sorensen, D. W. Bates, J. C. Meiske, C. A. Brown, N. L. Rohland, E. C. Hooker, and W. O. Strand. 1988. Evaluation of the stable fly (*Stomoxys calcitrans*) as a vector of enzootic bovine leukosis. Am. J. Vet. Res. 49: 1543-1549.

Webster, K. A., M. Rankin, N. Goddard, D. W. Tarry, and G. C. Coles. 1992. Immunological and feeding studies on antigens derived from the biting fly, *Stomoxys calcitrans*. Vet. Parasitol. 44: 143-150.

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Weinzierl, R. A., and C. J. Jones. 1998. Releases of *Spalangia nigroaena* and *Muscidifurax zaraptor* (Hymenoptera: Pteromalidae) increase rates of parasitism and total mortality of stable fly and house fly (Diptera: Muscidae) pupae in Illinois cattle feedlots. J. Econ. Entomol. 91: 1114-1121.

During 1991-1993, pupal parasitoids were released weekly at small independent feedlots. Puparia were collected, and mortality was calculated by parasitoid species, unknown causes and duds (puparia in which no adult flies or parasitoids emerged). *Spalangia nigroaena* had a slight (9%) effect on stable fly mortality, and *Muscidifurax zaraptor* caused 1.1% mortality in house flies. Results seemed dependent on climatic variations.

Welch, E. V. 1939. Insects found on aircraft at Miami, Fla. in 1938. Public Health Reports (1896-1970) 54: 561-566.

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Wellington, W. G. 1945b. Conditions governing the distribution of insects in the free atmosphere. Part IV: Distributive processes of economic significance. Can. Entomol. 77: 67-74.

Wellington, W. G. 1983. Biometeorology of dispersal. Bull. Entomol. Soc. Am. 29: 24-29.

Wells, R. W. 1931. Some observations on electrified screens and traps. J. Econ. Entomol. 24: 1242-1247.

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Wharton, R. H., and K. R. Norris. 1980. Control of parasitic arthropods. Vet. Parasitol. 6: 135-164.

Whitaker, J. O., P. Clem, and J. R. Munsee. 1991. Trophic structure of the community in the guano of the evening bat *Nycticceius humeralis* in Indiana. Am. Midl. Nat. 126: 392-398.

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White, S. A. 1971. The effect of ionizing radiation on the stable fly *Stomoxys calcitrans* L. Ph.D. Dissertation, University of Florida.

White, W. H., S. M. Bauer, X. Zhao, J. A. Gutierrez, and C. K. Smith II. 2005. Comparison of *in vitro* and *in vivo* ectoparasiticide activity of experimental benzimidazole-carbamate with permethrin and amitraz. J. Med. Entomol. 42: 207-211.

Whitehead,W. E., and F. O. Morrison. 1947. Oh those flies. MacDonald College J. 7: 8.

Whitfield, T. L., G. C. LaBreque, R. S. Patterson, and D. W. Meifert. 1978. Effect of gamma irradiation on sterility and longevity of stable flies. J. Econ. Entomol. 7: 608-609.

Wieman, G. A., J. A. Deshazer, and J. B. Campbell. 1988. Performance and behavior responses of the beef cattle to stable flies in warm environments. Livestock environment III : proceedings of the Third International Livestock Environment Symposium, April 25-27, 1988, Toronto, Ontario, Canada.- St. Joseph, Mich. (USA): ASAE p. 315-321.

Wieman, G. A., J. B. Campbell, J. A. Deshazer, and I. L. Berry. 1992. Effects of stable flies (Diptera: Muscidae) and heat stress on weight gain and feed efficiency of feeder cattle. J. Econ. Entomol. 85: 1835-1842.

The purpose of this study was to separate the direct effects (biting) and indirect effects (bunching) of stable flies on feeder cattle. Four treatments were applied, with 10 cattle in each group. Treatments were: no flies, no bunching; flies, no bunching; no flies, bunching; flies and bunching. The effect of bunching was achieved by placing the groups of cattle into smaller pens. Direct effects (biting) were found to cause 28.5% of the reduction in weight gain, while bunching (and the resulting heat stress) was responsible for 71.5%.

Wille, J. 1925. A survey of the insects of agricultural importance in Rio Grande do Sul, Brazil. Z. Angew. Entomol. 11: 415-426. (In Portuguese).

Williams, D. F. 1973. Sticky traps for sampling populations of *Stomoxys calcitrans*. J. Econ. Entomol. 66: 1279-1280.

Williams, D. F., and A. J. Rogers. 1976a. Stable flies infested with the mite *Macrocheles muscaedomestica*. Fla. Entomol. 59: 328-228.

During collection of stable flies from sticky traps in northwest Florida, flies were observed to be infested with mites, which were later identified as *Macrocheles muscaedomestica.* Mites were found predominantly on abdominal segments 2 and 3, but also on the head and thorax. This was the only species of mite found on the flies. Percentage of flies infested with mites was higher on dairies (5.6%) than on the beaches (1.7%).

Williams, D. F., and A. J. Rogers. 1976b. Vertical and lateral distribution of stable flies in northwestern Florida. J. Med. Entomol. 13: 95-98.

A survey was taken of stable fly numbers in a vertical distribution using sticky traps attached to fire and Navy observation towers. A lateral survey was taken by placing sticky traps 4 ft above the ground in a power line right-of-way, some at the center in the open and others in adjacent wooded areas. The most flies were captured below 4 ft from the ground, and preferred the open areas to wooded areas.

Williams, D. F., O. Skov, and R. S. Patterson. 1977. Two traps for collecting live stable flies, *Stomoxys calcitrans*, in the field. Mosq. News 37: 404-406.

Williams, D. F., G. C. LaBrecque, and R.S. Patterson. 1977. Effect of gamma rays and/or fluorescent pigments on sterility and survival of the stable fly. Fla. Entomol. 60: 197-300.

Williams, D. F., R. S. Patterson, and G. C. LaBrecque. 1979. Marking large numbers of stable flies *Stomoxys calcitrans* (L.) for a sterile release program. Mosq. News 39: 146-148.

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Williams, R. E. 1985. Arthropod pests of swine, pp. 239-251. *In* R. E. Williams, R. D. Hall, A. B. Broce and P. J. Scholl (eds.), Livestock entomology. John Wiley and Sons, New York.

Willis, N. L., B. J. Smittle, and J. A. Seawright. 1980. A genetic sexing system for *Stomoxys calcitrans* (L.). Proc. Ann. Fla. Anti-Mosq. Assoc. Meet. 51: 52-54.

Willis, N. L., J. A. Seawright, C. Nickel, and D. J. Joslyn. 1981. Reciprocal translocations and partial correlation of chromosomes in the stable fly. J. Hered. 72: 104-106.

In this study, male stable flies were irradiated with $Cs^{137}$ to cause reciprocal translocations in chromosomes, then crossed with females with certain combinations of two mutant forms: carmine eye (ca) and rolled down wing (rd). Using a "pseudolinkage" breeding scheme, the authors determined that the mutations were not sex-linked, sex determination is located on chromosome 1, carmine eye (ca) on chromosome 2, and rolled down wing (rd) on chromosome 4.

Willis, N. L., L. R. Hilburn, and J. A. Seawright. 1983. Black pupa, a recessive mutant on chromosome 3 of the stable fly, *Stomoxys calcitrans* (L.). The J. Hered. 74: 114-115.

Reciprocal translocations were used to determine the location of a 3rd mutant phenotype in the stable fly, black pupa (bp), which occurs only in the pupal stage. No color changes are present in larvae or adults with this phenotype. After crossing irradiated males with bp females and backcrossing, the F2 generation was examined. A correlation between chromosomes 1 and 3 was found by examination of male testes. Since it was found previously that sex determination is on chromosome 1, this suggests that the black pupa mutant gene is on chromosome 3. The authors suggest that new genes can be mapped by their linkage to one of the three mutants, carmine eye (ca), rolled down wing (rd) and black pupa (bp), since these genes are on different chromosomes.

Williston, S. W. 1889. A new cattle pest. Am. Nat. 23: 584-590.

Williston, S. W. 1908. North American Diptera. 3rd ed. James T. Hathaway, New Haven 405 pp.

Wilson, J. W. 1932. Coleoptera and Diptera collected from a New Jersey sheep pasture. J. New York Entomol. Soc. 40: 77-93.

Wingo, C. W. 1954. House fly control with diazinon. J. Econ. Entomol. 47: 632-635.

Winters, S. R. 1939. Effect of flies on milk production. South. Agric. 69: 12.

Wolf, W. W., R. A. Killough, and J. G. Hartsock. 1967. Small equipment for immobilizing flies with cool air. J. Econ. Entomol. 60: 303-304.

Wood, A.R., and M.J. Lehane. 1991. Relative contributions of apocrine and eccrine secretion to digestive enzyme release from midgut cells of *Stomoxys calcitrans* (Insecta: Diptera). J. Insect Physiol. 37: 161-166.

Wright, J. E. 1970. Hormones for control of livestock arthropods. Development of an assay to select candidate compounds with juvenile hormone activity in the stable fly. J. Econ. Entomol. 63: 878-883.

Wright developed an assay to test the juvenile hormone activity of several compounds when applied topically or in the diet of stable flies at all life stages. The prepupal stage was found to be the most susceptible to juvenile hormone, and the synthetic juvenile hormone SJH II produced the strongest results. Most of the compounds tested were ovicidal when applied topically. When applied to prepupae the juvenile hormone compounds produced a pupal-adult intermediate: head and thorax were developed and had setae, but the abdomen was not fully developed and no adult genitalia developed. It is suggested that juvenile hormone could be a possible control method for stable flies.

Wright, J. E. 1972. Hormones for control of livestock arthropods. Effectiveness of three juvenile hormone analogues for control of stable flies. J. Econ. Entomol. 65: 1361-1364.

Wright, J. E. 1973. Evaluation of juvenile hormone analogues for the control of stable fly. Folia Entomol. Mex. 25-26: 123.

Wright, J. E. 1974. Insect growth regulators: juvenile hormone analogs for control of the stable fly in marine plants in Florida. Mosq. News 34: 160-162.

Wright, J. E. 1974. Insect growth regulators: laboratory and field evaluations of Thompson-Hayward TH-6040 against the house fly and the stable fly. J. Econ. Entomol. 67: 746-747.

An insect growth regulator, TH-6040, was tested on stable flies and house flies in the laboratory, in a cattle feedlot, and in a wastewater treatment plant. In the laboratory, 1 µL of different concentrations was applied to white pupae. In the field, the compound was applied to the breeding medium. TH-6040 was not effective when applied topically to pupae. It was highly effective when ingested by larvae, causing morphological deformations and thinning of the cuticle.

Wright, J. E. 1975. Insect growth regulators: development of house flies in feces of bovines fed TH-6040 in mineral blocks and reduction in field populations by surface treatments with TH-6040 or a mixture of stirophos and dichlorvos at larval breeding areas. J. Econ. Entomol. 68: 322-324.

Wright, J. E., and J. N. Kaplanis. 1970. Ecdysones and ecdysone-analogues: effects on fecundity of the stable fly, *Stomoxys calcitrans*. Ann. Entomol. Soc. Amer. 63: 622-623.

Wright, J. E., and G. E. Spates. 1971. Biological evaluation of juvenile hormone compounds against pupae of the stable fly. Ag. Food Chem. 19: 289-290.

Wright, J. E. and G. E. Spates. 1972. A new approach in integrated control: insect juvenile hormone plus a Hymenopteran parasite against the stable fly. Science 178: 1292-1293.

Wright, J. E., and G. E. Spates. 1972. Laboratory evaluation of compounds to determine juvenile hormone activity against the stable fly. J. Econ. Entomol. 65: 1346-1349.

Twenty-nine compounds were tested on different life stages of the stable fly to determine if they had juvenile hormone activity against this insect. The compounds tested were 11 juvenile hormone analogues, 9 potential chemosterilants, and 9 plant extracts, which had demonstrated juvenile hormone activity in other insect species. In this experiment, only the juvenile hormone analogues were effective against stable flies. These compounds had considerable effect on larval, pupal, and adult stages but little effect on eggs. Application of the JH analogues to larvae and pupae caused larviform pupae or pupal-adult intermediates.

Wright, J. E., and M. Schwarz. 1972. Juvenilizing activity of compounds related to the juvenile hormone against pupae of the stable fly. J. Econ. Entomol. 65: 1644-1647.

Wright, J. E., and P. E. Sonnet. 1973. Juvenile hormone activity of citronellylamine and citronellol derivatives against pupae of the stable fly and the house fly (Diptera: Muscidae). J. Med. Entomol. 10: 477-480.

Wright, J. E., and D. Rushing. 1973. Glycogen in pupal and adult stable flies as affected by a juvenile hormone analogue. Ann. Entomol Soc. Am. 66: 274-276.

Wright, J. E., and G. E. Spates. 1975. Penetration and persistence of an insect growth regulator in the pupa of the stable fly, *Stomoxys calcitrans*. J. Insect. Physiol. 21: 801-805.

Wright, J. E., and R. L. Harris. 1976. Ovicidal activity of Thompson-Hayward TH 6040 in the stable fly and horn fly after surface contact by adults. J. Econ. Entomol. 69: 728-730.

The insect growth regulator TH-6040 was tested for ovicidal activity in stable flies and horn flies. In laboratory tests, stable flies were put into cylinders in which the walls were treated with TH-6040. Horn flies were treated topically. In the second test, flies were released in a stall with a steer which was sprayed with TH-6040. Ovicidal activity of TH-6040 was high even when one sex was treated, then mated with untreated flies.

Wright, J. E., and R. L. Jones. 1976. Insect growth regulators: methoprene and Stauffer R-20458 in pupae of the stable fly from treated breeding medium. Environ. Contam. Toxicol. 5: 525-529.

Wright, J. E., and G. E. Spates. 1976. Reproductive inhibition activity of the insect growth regulator TH 6040 against the stable fly and the house fly: effects on hatchability. J. Econ. Entomol. 69: 365-368.

The effect of TH-6040 on egg hatch was tested on the stable fly and the house fly. In the first test, the substrate was dusted with the compound, so that eclosing adults had to emerge through the powder. In the second test, TH-6040 was applied directly to the insects. TH-6040 was very effective on preventing egg hatch in the stable fly. It was also transferred from treated to untreated flies. However, TH-6040 was not as effective on house flies.

Wright, J. E., and H. E. Smalley. 1977. Biological activity of insect juvenile hormone analogues against the stable fly and toxicity studies in domestic animals. Arch. Environ. Contam. Toxicol. 5: 191-197.

Sixty-two terpenoid compounds, each with a different functional group, were applied to stable fly larvae at 10µg/pupa (1 µL of a 1% solution in acetone) to determine if chemical structure was related to juvenilization. Compound activity was determined by the presence of a pupal-adult intermediate in the puparium 8 days after treatment. Six of the compounds were found to be very effective on stable fly pupae. Four compounds of interest, which were similar to cecropia juvenile hormone, were found to be more effective when used on *Tenebrio molitor,* but were less effective than cecropia JH on the stable fly pupae.

Wright. J. E., and M. C. Bowman. 1973. Determination of the juvenile hormone-active compound Altosid® and its stability in stable fly medium. J. Econ. Entomol. 66: 707-709.

A method for determining the concentration of a juvenile hormone analogue, Altosid, in stable fly rearing medium is described. Altosid was extracted from the rearing medium using benzene-methanol. 100% recovery of the compound was reported 22 days after treatment. The persistence of Altosid would be sufficient to cause morphogenic effects in stable fly pupae, suggesting that it would be an effective control of this insect.

Wright, J. E., W. F. Chamberlain, and C. C. Barrett. 1971. Ovarian maturation in stable flies: inhibition by 20-hydroxy-ecdyson. Science 172: 1247-1248.

Wright, J. E., H. R. Crookshank, and D. D. Rushing. 1973. Glycogen phosphorylase activity in pharate adults of the stable fly and the effects of a juvenile hormone analogue. J. Insect Physiol. 19: 1575-1578.

Wright, J. E., J. B. Campbell, and P. Hester. 1973. Hormones for control of livestock arthropods: evaluation of two juvenile hormone analogues applied to breeding materials in small plot tests in Nebraska and Florida for control of the stable fly. Environ. Entomol. 2: 69-72.

Wright, J. E., T. P. McGovern, R. Sarmiento, and M. Beroza. 1974. Juvenile hormone activity of substituted aryl 3,7-dimethyl-6-octenyl ethers in the stable fly and house fly. J. Insect. Physiol. 20: 423-427.

Wright. J. E., J. B. Campbell, and D. D. Oehler. 1974. Insect growth regulators: large plot field tests against the stable fly in cattle feedlots. J. Econ. Entomol. 67: 459-460.

The effectiveness of an insect growth regulator, Stauffer R-20458, was tested in a cattle feedlot in Keith County, NE. Insect growth regulators primarily affect the pupal stage of stable flies, preventing adult eclosion. Plots were sprayed with a 1% concentration of the IGR at $1L/m^2$. Sprayed areas were covered with screens to catch eclosing adults. Reduction in stable fly adults in the treated area was 74-95.6%. The IGR did not affect house flies in the area. The product was found to persist in the soil after 22 days. It was also tested in crusty soil, and there was only a 32% reduction in flies. The authors concluded that Stauffer R-20458 is more effective if used in moist substrate.

Wright, J. E., D. D. Oehler, and J. H. Johnson. 1975. Control of house fly and stable fly breeding in rhinoceros dung with an insect growth regulator used as a feed additive. J. Wildlife Dis. 11: 522-524.

The effectiveness of the insect growth regulator Thompson-Hayward 6040 was tested in rhinoceros dung against house flies and stable flies. Nineteen rhinoceroses were fed the IGR for 60 days, and the dung was

collected daily. The dung was then seeded with house fly and stable fly eggs. TH 6040 was 100% effective at inhibiting adult emergence both at 1mg/kg and .1 mg/kg. The rhinoceroses showed no adverse effects from the IGR.

Wright, J. E., G. E. Spates, and M. Schwarz. 1976. Insect growth regulator AI3-36206. Biological activity against *Stomoxys calcitrans* and *Musca domestica* and its environmental stability. J. Econ. Entomol. 69: 79-82.

Wright. J. E., J. B. Campbell, D. D. Oehler, and J. Schugart. 1977. Stable fly: control with diflubenzuron applied to adult resting surfaces in cattle feedlots. Southwest. Entomol. 2: 155-158.

Wright, J. E, G. E. Spates, and S. E. Kunz. 1978. Diflubenzuron: ovicidal activity against adult stable flies exposed to treated surfaces or to treated animals. Southwest. Entomol. 3: 5-13.

Wright, M. 1945. Dragonflies predaceous on the stable fly: *Stomoxys calcitrans* (L.). Fla. Entomol. 28: 11-13.

Wright, M. 1945. Dragonflies predaceous on the stable fly: *Stomoxys calcitrans* (L.) (Continued). Fla. Entomol. 28: 31-32.

Wright, R. E. 1985. Arthropod pests of beef cattle on pasture or range land, pp.191-206. *In* R. E. Williams, R. D. Hall, A. B. Broce, and P. J. Scholl (eds.), Livestock entomology. John Wiley and Sons, Inc., New York, N. Y.

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Yeoman, G. H., and B. C. Warren. 1970. Repellents for *Stomoxys calcitrans* (L.), the stable fly: techniques and a comparative laboratory assessment of butyl methylcinchoninate. Bull. Entomol. Res. 59: 563-577.

Yeruhan, I., and Y. Braverman. 1995. Skin lesions in dogs, horses, and calves caused by the stable fly *Stomoxys calcitrans* (L.) (Diptera: Muscidae). Rev. Med. Vet. Pays. Trop. 4: 347-349.

Young, S.Y., III, and R. S. Berger. 1969. Absorption and metabolism of fenthion in blood-sucking arthropods. J. Econ. Entomol. 62: 727-728.

Yuval, B. 2006. Mating systems of blood-feeding flies. Annu. Rev. Entomol. 51: 413-440.

Zacks, D. N., and E. R. Loew. 1989. Why is Alsynite fiber glass sheet attractive to stable flies? Optical and behavioral studies. Exp. Biol. 48: 215-222.

Zdarek, J., and J. Pospisil. 1965. Orientation of *Stomoxys calcitrans* L. towards warmth during ontogenesis in relations to various food conditions. Acta. Ent. Bohemoslov. 62: 421-427.

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