

FREQUENCY OF KNOCKDOWN RESISTANCE MUTATIONS IN BODY LICE (PHTHIRAPTERA: PEDICULIDAE) FROM RUSSIA

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Abstract One of the global problems of today is the insecticide resistance of the human louse *Pediculus humanus* L. to pyrethroids. The continuous application of pyrethroids (mostly, permethrin) resulted in the formation of local lice populations resistant to this group of insecticides. In the 2013-2015 body lice *P.h.humanus* were collected in various regions of Russia (European Russia, Ural, Siberia), both in big cities (Moscow, St. Petersburg, Novosibirsk, Perm), and in small towns (Kursk, Tambov). Body lice were studied by real-time PCR to detect the *kdr* mutations (T917I and L920F) in the para-orthologous voltage-sensitive sodium channel gene, which are associated with permethrin resistance. The resistant haplotype was found in all of the body lice samples. The frequency of the resistant allele varied from 0.432 to 0.89 which indicates the different level of permethrin resistance. The resistance monitoring was carried out in Moscow in the 2008-2015. The frequency of the resistant allele was 0.488 in 2008; whilst a considerable part of the species was represented by susceptible homozygous (37. 5%) and heterozygous by *kdr* allele (27. 5%) individuals. The frequency of *kdr* allele which increased sharply in 2009 (0.763) has been gradually growing hereafter, and reached its maximum (0.879) in 2014. 80% of the insects were the homozygous resistant individuals at the time; the rate of susceptible homozygous individuals didn't exceed 3%. From 2011 onwards no colonies of exclusively permethrin-susceptible (SS) lice have been found. Our research resulted in the substitution of permethrin by fenthion in 2014 for the treatment of homeless people's clothes infected by lice, and for the liquidation of their head lice in the decontamination centers. This probably caused the decrease of the lice infestation rate among homeless people in 2014-2015, as compared to 2009-2013 (15% vs 30%). The other reasons of the improvement could also be the active efforts of charitable organizations in Moscow, and the increase of homeless people's awareness which allowed them to change clothing, infested by lice in particular, for the new one more often.

