

PRACTICAL EVALUATION OF INSECTICIDES
AND THEIR APPLICATION

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The scholarly production of veterinary acaroenomology has grown by 48 items over the past four years. These are scientific works and articles as well as communiques and reports concerning the applicability of preparations for control parasitic insects and mites in domestic animals.

The present paper deals with the effectiveness of preparations belonging mainly to the group organophosphorus compounds and carbamates. With the organophosphorus insecticides, such enolophosphates as Neguvon, oily Gzavon, Dermafos and bromophos ought to be ranked; while Pularyl and Karbatox (Karbosep in emulsion) with the carbamates; and Warbex, Hypocid, Alugan, Unitox, creoline and Folbex with the other groups.

In field researches, the following parasites were dealt with; insects: *Haematopirius eurysternus*, *H. suis*, *H. asini*, *Linognathus vituli*, *L. setosus*; *Bovicola bovis*, *B. ovis*, *B. caprae*, *Trichodectes canis*, as well as *Eomenacanthus straminaceus*, *Menopon gallinae*, *Lipeurus*, *Goniocotes*, *Stenocrotaphus*; *Melophagus ovinus*; *Ctenocephalides canis*, *Ceratophyllus avium*; *Hypoderma* sp.; mites: *Sarcoptes scabiei* var. *ovis*, *S. suis* and *S. equi*; *Psoroptes communis* var. *ovis*, *P. equi* and *P. cuniculi*; *Chorioptes symbiotes* var. *equi*; *Notoedres cuniculi* and *N. cati*; *Demodex canis* and *D. bovis* and *Dermanyssus gallinae*.

The researches concerning the applicability of enolophosphates [3-6, 34-42] were conducted within the framework of the major problem of "Development and Modernization of the Assortment of Pesticides of Home Production" dealt with the Institute of Organic Industry in Warsaw for the needs of agriculture, sanitary hygiene and veterinary service.

Detailed research was carried out with two preparations of Polish origin, code-named IPO-62 and IPO-63, invented at the Institute of Organic Industry in Warsaw. For comparison purposes, chlorfenvinphos (code-name Z-110) was used. All preparations were used in more than one form (emulsifying oil and alcohol preparations, technical or powders), and in various concentrations (2.5, 5, 25, 40 and 100%). Researches on the efficacy of enolophosphates were made in laboratory and field conditions.

Within the framework of laboratory research, the most effective concentrations for practical purposes were worked out and their toxicity on laboratory animals, cattle and chickens was estimated, depending on the way of application. The preparations IPO-62, IPO-63 and Z-110 turned out to be effective insecticides. Concentrations from 0.012 to 1% killed adult insects (*H. suis*, *M. ovinus*, mallophagans of chickens and cattle, *Cimex lectularius*) in time from a few seconds to 85 minutes. During the research, it was asserted that low percentage (0.05-0.1) water emulsions of these preparations should be the most effective in field applications.

The field researches covered the following parasitic insects: two species of cattle louse, dog and horse louse; *Mallophaga* of cattle, sheep, goats, dogs and chickens; *M. ovinus* and dog flea. For therapeutic purpose, in order to destroy the parasites, water emulsions of the preparations IPO-62, IPO-63 and Z-110 were used with nearly very good results, mainly in concentrations from 0.05 to 0.1%, and, rather less frequently, others (0.025 and 1%), or 2.5% powders. A single treatment consisted in either a bath together with washing off, or washing off only, or spraying or sprinkling of the whole body of the animal, or only of parts of the body most frequently infested by parasites.

Pularyl [45] turned out to be a particularly effective parasiticide on adult forms of *H. suis*, *B. bovis*, *Lipeurus*, *Goniocotes* and *Stenocrotaphus*, *Ctenocephalides canis* and *Dermanyssus gallinae*. The research was carried out on pigs, calves, pheasants and dogs and in henhouses. For treatment purposes, either about 0.13% solutions of Pularyl I and II, or 0.26% Pularyl II were used at a time. Powder (5.5%) was used on pigs, in doses of 200 mg of active substances per kg/body, while in dogs the doses ranged from 400 to 500 mg of active substance per kg/body weight.

The toxicity of Pularyl I was examined in pigs and mice. In addition, the influence of different concentrations (from 0.005 to 1.3%) of this preparation on *Lipeurus*, *Goniocotes* and *D. gallinae* was examined in laboratory conditions in vitro. The effectiveness of these three forms of Pularyl in adult parasites was estimated as very high (90-100%).

Pularyl gained a positive estimate in field observations [18]. For treatment of pediculosis and mallophagosis in cattle, dogs, chickens and pigeons, 1-2% water suspension was used. In cattle and fowl, the suspen-

sion was sprayed once, while in dogs it was applied three times by rubbing it into the sites affected by disease. Pularyl is based on carbaryl.

Karbatox (5% powder based on carbaryl) was used against *L. vituli* and *L. setosus*, *H. eurysternus* and *H. suis*; *M. ovinus*; *C. canis*; Mallophaga in sheep and chickens; *D. gallinae*. To destroy the parasites, 5% powder or water suspension of preparations of different concentrations (0.1; 0.3; 0.6; 0.9; 7.4; 2 and 6%) was used in a single application. For practical purposes, a 0.5-2% suspension is recommended.

Identical with Karbatox is Karbosep 75 — wettable powder allowed for application in sanitary hygiene. Classed third as for toxicity [1], it is more effective than Unitox (Lindan). It was tested in pediculosis and mallophagosis in cattle [15] in form of 1% water suspension in the quantity of one litre per animal. The cure was repeated after two weeks. In addition, it was tried out on a group of 100 one-month-old calves in the form of a 5% preparation. It is an effective and safe insecticide, innocuous a few days old and cows with highly advanced pregnancy.

The next preparation worth mentioning is Neguvon. It was the object of researches in pediculosis and mallophagosis in cattle as well as in pediculosis in swine [11, 12, 14, 25]. About 4 thousand cows, heifers and young bulls were sprayed twice or three times with a 0.2% solution of Neguvon or a 5% solution of creoline. In some sties the measures were sprayings with Neguvon and creoline cured 19,1% of the animals. About 2 thousand pigs and their lodgings were sprayed with a 0.2% solution of Neguvon or a 5% solution or creoline. In some sties the measures were repeated. Both preparations being highly parasiticidal, the solution of Neguvon was quicker working than the solution of creoline. Single applications (treatment and devastation of parasites in lodgings) should be considered insufficient.

Apart from that, Neguvon was used successfully in mallophagosis in pigeons and bulls and in pediculosis in bulls. The treatment of pigeons consisted in repeated immersions of the birds in a 0.5% solution, and, in the case of cattle, in dusting the areas affected by parasitic invasion with a 5% powder.

Worth mentioning is also Nexion (bromophos). Its usefulness [46] was tested in combatting in farm buildings. After a single spraying with 2% Nexion of even very dirty walls, ceilings etc., its insecticidal activeness may last up to several weeks.

The preparation Z-51 [32, 33] containing bromophos produced by the Institute of Organic Industry in Warsaw, had been tested before against migratory and sedentary larvae of botfly.

Enolophosphates, Neguvon and Alugan may also be of great importance to the therapy of diseases caused by mites (e. g. itch mites etc.).

Enolophosphates turned out to be highly parasitocidal to the following itch mites: *S. scabiei var. ovis*, *S. suis*, *S. equi*; *P. communis var. ovis*, *P. equi* and *P. cuniculi*; *N. cuniculi* and *N. cati*; and, apart from that, to such mites as *D. canis*, *D. gallinae*. The treatment of the itch in the animals, which had not been prepared prior to the application, consisted basically in smearing, at times only in washing the diseased and surrounding areas, with oil solutions of enolophosphates of concentrations of 0.1; 0.5; 1.0; 2.0; 3.0; and 5%, or with alcohol solutions of 2.5% concentration. Old cases of the itch, with considerable thickening of the epidermis, required stronger concentrations. The treatment by smearing ought to be performed 2-4 times at 2-4 days intervals.

On large animal breeding farms, in the therapy of the itch in swine [10, 13], for preparations were used with good results: 2% Neguvon, 2-5% Unitox, 0.2% Alugan and Biodylon-Biovet; the first three in water solutions. The treatment was carried out in two stages. On one day, all the animals were sprayed with warm soapy water in order to soften the crusts and so ensure quicker healing; at the same time, the diseased areas were scrubbed with a hard brush. The following day, the entire body of the animal was sprayed with water solutions of Neguvon, Alugan or Unitox. In addition, the medicament was rubbed into the diseased skin by means of a soft brush. Applications were repeated 2-4 times (at 7-10 days, intervals) until the healing was complete. The best results were achieved after treatment with Alugan, since after two applications all the pigs were cured. Similar results were obtained by using Neguvon and Unitox, but the former was applied three times, and the latter four times. The treatment failed, however, to make disappear the changes in the hearing duct. Animals with these symptoms were treated with Biodylon.

Enolophosphates, successfully used in demodecosis in dogs [8], failed to give positive results in cattle [40].

For treatment of dogs of different breeds and ages, mainly 8% oil solutions, and, less frequently, 5% alcohol solutions, most often of the preparations IPO-62 and IPO-63, were used. The treatment consisted in rubbing the medicament into the diseased areas of skin 3-4 times at 2-3 days' intervals. The 8% preparation was the most active in curing. The insecticide IPO-63 of the same concentration was less active, and the preparation Z-110 displayed no therapeutic properties. Alcoholic solutions of IPO-62 and IPO-63 were less active than the four 8% oil solutions of these insecticides, and, apart from that, they caused an excessive scaling of the epidermis.

On the other hand, the treatment of demodecosis in cattle is still an unsolved problem which requires further attempts. In spite of using many

preparations (IPO-62, IPO-63, Z-110, Unitox etc.) and various methods of therapy over a period of five months, no complete curing was achieved. New tumors, small and large, appeared continually on the skin, sometimes in places far from the originally diseased areas.

While discussing the insecticides having a killing effect on mites, it would be to mention the preparation Folbex, which is usefull in fighting the bee mite *Acarapis woodi* [26]. The preparation kills adult parasites, it does not, however, destroy the larval forms living in bees.

Neguvon and enolophosphates were also used in spring and autumn to get rid of the larvae of cattle grub. The first attempts to destroy the autumn migratory larvae of cattle grub were made in Poland, in 1952 (unpublished observation), within the framework of researches on application on allergenic tests to enable an early diagnosis of hypodermatosis [27]. In order to kill the parasites, *Stibium barium-tartaricum* was used. The results of the treatment was negative.

Further attempts to destroy the autumn cattle grub made in 1957 [7], by administering by mouth in young cattle the preparation Neguvon produced by the firm Bayer. Because of the high toxicity of this preparation, however, the researches were discontinued.

Years later, the attempts were resumed with Z-50, the first Polish organophosphorus preparation, i. e. Dermafos, worked out at the Institute of Organic Industry in Warsaw, in the years 1962-1966 [28, 29, 31].

Employed in the autumn of 1964 and in the following years, Dermafos displayed a high practical value, since it killed the larvae of cattle grub irrespective of the way in which it was applied, whether by a single administration by mouth, or by intramuscular injections, or again by rubbing it into the skin of the animal's back. The efficacy of the preparation depended not only on the quantity of active substance and the way of application, but probably also on its technology. Produced by the Institute of Organic Industry, the preparation was about 97% effective when rubbed into the skin, but the same preparation produced by other firms was only 68% effective [30]. Moreover, whether applied on the skin or per os, Dermafos showed a low degree of toxicity. Doses of 150-181% mg of active substance per kg/body weight of animal did not seem to because any side-effects.

Comparative studies on the efficacy of Neguvon, Hypocid and Dermafos in the treatment of cattle grub [43, 44], led to the finding that a single external application at the beginning of January was 100% effective with Neguvon, 36% with Hypocid and 67% with Dermafos. The cattle under treatment did not show sings of poisoning.

A safe medicament for external application is oily Gzavon. Principally, it contains imported and home production crystalloid Neguvon. Used in

November by Marański [24, 47], it proved 95% effective, and in spring its effectiveness amounted to 100%. Apart from being less toxic and very effective, Gzavon is a preparation ready for use; it is applied by the "pour on" method. The amount of active substance is only up to 2.5 mg per kg/body weight. Marański [20-23] was also concerned with the applicability of Neguvon, Dermafos and other non-organophosphorus preparations for fighting chiefly the spring stage of cattle grub.

Preparations of a great practical value for the therapy of cattle grub are enolophosphates [35, 38]. They can be applied both on the skin and by injection (e. g. preparation IPO-62). For the killing of the autumn botfly, higher doses (68-139 mg of active substance per kg/body weight) were used in single external application, and in the spring louse ones (18-57 mg). In intramuscular injections, a single dose of the preparation amounted to 1/3 of the external dose (21-37 mg of active substance per kg/body weight). Used by way of rubbing in, the preparation IPO-62 turned out to be the most effective in the treatment of the autumn hypodermatosis (99-100% effective), as compared with the preparation IPO-63 (92-96% effective), and Z-110 (95% effective). Estimated in spring, the effectiveness of the preparation IPO-62 after intramuscular injections amounted to 94%. Enolophosphates proved very effective in the curing of spring hypodermatosis.

Enolophosphates differ from the previously applied organophosphorus contact insecticides because their activeness is longer lasting [2]. IPO-62 and Z-110 have a lower vapour pressure, lower solubility in water and are less susceptible to hydrolysis. These properties have influence on the durability of their activeness. These insecticides remain active for 8-10 days towards Colorado beetle, for instance, while the activeness of Neguvon lasts for 1-2 days. The preparation IPO-62, used in animals in doses larger than those used in hypodermatosis in cattle, did not accumulate in their tissues [19]. The waiting period for the meat and fat in cattle and sheep is 7 days.

The purpose of massive researches was to find a preparation suitable for common use against hypodermatosis and to work out principal directions which later could become obligatory for the whole country [16, 17]. During the tests, four preparations were used: Dermafos, Neguvon, Bubulin and Warbex-Cyanamid. Dermafos and Neguvon were applied externally over the autumn-winter and spring periods by rubbing their water solutions into the skin either once or twice. Bubulin and Warbex, on the other hand, were administered by injection over the autumn-winter period, in doses recommended by the producer. The effectiveness of the autumn cure was checked by inspections at two-monthly intervals in the spring-summer period. In animals treated with Neguvon (100 mg active

substance per kg/body weight) no parasites were found, while in animals treated the same doses of Dermafos infestation was 67%.

Another advantage of Neguvon is that it is quickly excreted from the systems of the animals under treatment [9]. The meat and milk may be consumed in 24-48 hours after treatment. However, after treatment with Dermafos, the milk may be consumed for 14 days.

Bubulin turned out to be ineffective in the treatment of hypodermatosis.

As results of the autumnal measures, in order to destroy cattle grub, taken on a national scale, there was a significant decrease in infestation percentage. This was proved by the national inventory of the parasite, in 1973. Infestation by cattle grub in the particular zones ranged from 3.5 to 6.1%. Thus, hypodermatosis ceased to be one of the major invasion diseases in cattle. Undoubtedly, this has been a great achievement for the whole veterinary service.

Considering the usefulness of insecticides for fighting parasitic insects, it should be pointed that low percentage water concentrations of the enolophosphates, Neguvon, Dermafos, Pularyl Karbatox are suitable for practical use. Of particular value for practical purposes may be those enolophosphates which distinguish themselves by lower, as compared with other insecticides, quantities of active substance, as, for instance, 0.05% in the preparation IPO-62, which in field conditions kills adult insects, their eggs and even the larvae of ked. Some of the insecticides, e. g. IPO-62 and IPO-63, employed in sheep parallel with Unitox, turned out to be effective and less troublesome medicaments in the treatment of the burrowing itch.

In conclusion, a word may be said about the ways of treatment: all four methods, i. e. dusting, bathing together with washing only and spraying of the whole body of the animal, have passed the practical test. Dusting may be done all the year round. The other three ways are recommended for the summer, autumn and spring, provided the lodgings are warm and the water used for making the emulsions or solutions is always of the same temperature as the body temperature of the animals.

Some attention should be paid to the equipment necessary for spraying or dusting farms breeding animals on a large scale. Spray guns of the gardening type or rubber bulbs are not effective enough, and besides, they are rather awkward in use. Adequate equipment should, therefore, be worked out.

What ensues from the above presented discussion is the fact that new possibilities open before veterinary acarontomology for control ectoparasites and the cattle grub. What remains to be done is a quick starting of production of karbaryl, as well as of enolophosphates and Dermafos.

Karbaryl, particularly in its powder formulation which is easy to use and has a low degree of toxicity, ought to be regarded as very valuable in fighting mallophagosis on poultry farms. On the other hand, the insecticides which ought to be fully employed in fighting ectoparasites and the botfly are the preparations IPO-62 and IPO63, because of their strongly parasiticidal effects, the ease with which they penetrate through the diseased epidermis and the absence of toxic properties in the prescribed doses and methods of treatment, and also Dermafos.

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LITERATURA

1. Bakuniak, E., Kroczyński, J.: *Wiad. Parazytol.*, 18, 4-6: 613, 1972.
2. Bakuniak, E., Kroczyński, J.: Doniesienie na III Sympozjum Akarontomologiczne, Gdańsk 1975.
3. Buchalski, L.: *Medycyna Wet.*, 30, 1: 38, 1974.
4. Buchalski, L.: Materiały XI Zjazdu PTP, Poznań, 1973.
5. Buchalski, L.: Doniesienie na V Zjazd PTNW, Olsztyn 1974.
6. Buchalski, L.: Doniesienie na V Zjazd PTNW, Olsztyn 1974.
7. Chowaniec, W.: *Medycyna Wet.*, 14, 5: 273, 1958.
8. Janeczek, W., Koproński, J., Patyk, S.: *Medycyna Wet.*, 31, 12: 736, 1975.
9. Juszkiewicz, T., Stec, J.: *Medycyna Wet.*, 26, 2: 85, 1970.
10. Kamyszek, F.: *Trzoda chlewna*, 11: 9, 1973.
11. Kamyszek, F., Piotrowski, R.: *Wiad. Parazytol.*, 20, 6: 873, 1974.
12. Kamyszek, F., Piotrowski, R.: *Wiad. Parazytol.*, 21, 2: 271, 1975.
13. Kamyszek, F.: *Wiad. Parazytol.*, 21, 2: 282, 1975.
14. Kazimierczak, R.: Doniesienie na III Sympozjum Akarontomologiczne, Gdańsk 1975.
15. Kluczniok, O., Pietrzykowski, W.: *Medycyna Wet.*, 29, 12: 750, 1973.
16. Kołacz, J.: *Wiad. Parazytol.*, 21, 1: 137, 1975.
17. Kołacz, J.: *Medycyna Wet.*, 31, 5: 295, 1975.
18. Kopczewski, A.: Doniesienie na III Sympozjum Akarontomologiczne, Gdańsk 1975.
19. Kroczyński, J., Malinowski, H.: Doniesienie na III Sympozjum Akarontomologiczne, Gdańsk 1975.
20. Marański, C.: *Wiad. Parazytol.*, 4-6: 485, 1958.
21. Marański, C.: *Medycyna Wet.*, 17, 12: 715, 1961.
22. Marański, C.: Biul. III Zjazdu PTNW, Lublin, 194, 1966.
23. Marański, C.: *Wiad. Parazytol.*, 13, 6: 679, 1967.
24. Marański, C.: Materiały XI Zjazdu PTP, Poznań 1973.
25. Melnarowicz, T., Spindler, I.: Doniesienie na III Sympozjum Akarontomologiczne, Gdańsk 1975.

26. Niemczuk, R.: *Wiad. Parazytol.*, 20, 6: 881, 1974.
27. Patyk, S., Grzywiński, L.: *Pamiętnik III Zjazdu PTP*, Wrocław, 144, 1952/1953.
28. Patyk, S.: *Medycyna Wet.*, 22, 2: 91, 1966.
29. Patyk, S.: *Medycyna Wet.*, 23, 2: 78, 1967.
30. Patyk, S., Bąk, T., Czyrek, B.: *Medycyna Wet.*, 25, 4: 203, 1969.
31. Patyk, S.: *Medycyna Wet.*, 25, 5: 279, 1969.
32. Pałyk, S.: *Medycyna Wet.*, 25, 6: 352, 1969.
33. Patyk, S.: *Medycyna Wet.*, 26, 9: 540, 1970.
34. Patyk, S.: *Materiały XI Zjazdu PTP*, Poznań 1973.
35. Patyk, S., Buchalski, L.: *Instytut Przemysłu Organicznego*, 4, 235-257, 1972.
36. Patyk, S.: *Medycyna Wet.*, 29, 4: 200, 1973.
37. Patyk, S.: *Medycyna Wet.*, 30, 6: 337, 1974.
38. Patyk, S.: *Medycyna Wet.*, 30, 7: 398, 1974.
39. Patyk, S.: *Medycyna Wet.*, 30, 8: 465, 1974.
40. Patyk, S., Klimaszewski, W.: *Medycyna Wet.*, 30, 11: 682, 1974.
41. Patyk, S.: *Wiad. Parazytol.*, 21, 1: 81, 1975.
42. Patyk, S.: *Doniesienie na III Sympozjum Akarontomologiczne*, Gdańsk 1975.
43. Romaniuk, K.: *Materiały XI Zjazdu PTP*, Poznań 1973.
44. Romaniuk, K.: *Medycyna Wet.*, 29, 10: 598, 1973.
45. Romaniuk, K., Tarczyński, S.: *Wiad. Parazytol.*, 21, 1: 99, 1975.
46. Romaniuk, K.: *Doniesienie na III Sympozjum Akarontomologiczne*, Gdańsk 1975.
47. Synowiedzki, Z., Marański, C.: *Medycyna Wet.*, 30, 79, 1974.

PRAKTYCZNA OCENA INSEKTYCYDÓW I ICH STOSOWANIE

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W badaniach nad działaniem środków pasożyto-bójczych u zwierząt domowych posługiwano się w terenie preparatami fosforoorganicznymi (enolofosforanami, Neguvonem, Gzavonem, Dermafosem, bromofosem), karbaminianami (Pularylem, Karbatoxem, Karbosepem) oraz przynależnymi do innych grup preparatami (Warbexem, Hypocidem, Unitoxem, kreoliną, Folbexem), a w badaniach laboratoryjnych — enolofosforanami i Pularylem. Obiektem badań były owady: *Haematopinus eury-sternus*, *H. suis*, *H. asini*, *Linognathus vituli*, *L. setosus*; *Bovicola bovis*, *B. ovis*, *B. caprae*, *Trichodectes canis*, *Eomenacanthus stramineus*, *Lipeurus*, *Goniocotes*, *Stenocrotaphus*; *Melophagus ovinus*; *Ctenocephalides canis*, *Ceratophyllus avium*; *Hypoderma* sp. — oraz roztocza: *Sarcoptes scabiei* var. *ovis*, *S. suis* i *S. equi*; *Pso-roptes communis* var. *ovis*, *P. equi* i *P. cuniculi*; *Chorioptes symbiotes* var. *equi*; *Notoëdres cuniculi* i *N. cati*; *Demodex canis* i *D. bovis*; *Dermanyssus gallinae*.

Do zwalczania wszawic i wszolowic, wpleszczycy i ktenocefalidozy używano niskich stężeń (0.05-2%) przede wszystkim emulsji lub roztworów wodnych (0.05-0.1%) enolofosforanów, Neguvonu (0,2%), Pularylu (0.13-0.26%), Karbatoxu (0.5-2%), Karbosepu zawieszinowego (1%), rzadziej proszków, tj. enolofosforanów (2.5%), Neguvonu (5%), Pularylu (5,5%), Karbatoxu (5%). Ocena preparatów wypadła pozytywnie, przy czym nie stwierdzono ubocznego działania.

W zwalczaniu fazy jesiennej i wiosennej larw gza bydłęcego szczególnym działaniem pasożyto-bójczym odznaczały się Neguvon, enolofosforany (IPO-62, IPO-63) oraz Gzavon oleisty. Neguvon stosowany w okresie jesienno-zimowym i wiosennym zewnętrznie, przez jedno- lub dwukrotne wtarcie w skórę bydła, wykazał skuteczność leczenia w 100%. Preparat IPO-62 zastosowany jednorazowo jesienią naskórnice okazał się skuteczny w 99-100%, skuteczność IPO-63 i Gzavonu była niższa i wynosiła 92-96%. Enolofosforany i Gzavon niszczyły także larwy gza wiosną. Dodatkową zaletą Neguvonu i IPO-62 jest brak kumulacji w organizmie pacjenta oraz szybkie wydalanie. Mleko i mięso zwierząt traktowanych Neguvonem może być przeznaczone do konsumpcji po 24-48 godzinach od wykonania zabiegu, a okres karencji dla mięsa i tłuszczu po IPO-62 wynosi 7 dni.

W leczeniu świerzbu duże znaczenie praktyczne wykazały 1-5% enolofosforany (IPO-62, IPO-63), 2% Neguvon i 0.2% Alugan. Zabieg leczniczy należy wykonać kilkakrotnie (2-4 razy) z przerwami kilkudniowymi. Przy stosowaniu enolofosforanów, w przeciwieństwie do innych preparatów, nie zachodzi potrzeba przygotowania zwierząt do zabiegu.

W leczeniu nużycy psów najlepsze wyniki uzyskano po stosowaniu 8% roztworu olejowego preparatu IPO-62; 5% roztwór alkoholowy IPO-62 w porównaniu do poprzedniego wykazywał słabsze działanie powodując ponadto nadmierne łuszczenie naskórka. Leczenie nużycy bydła pozostało dalej zagadnieniem nierozwiązanym, wymagających dalszych prób.

Do zwalczania roztocza pszczelego nadaje się Folbex; nie niszczy on jednak postaci larwalnych, bytujących w pszczołach.

Wykonywanie zabiegów u zwierząt w warunkach chowu wielkostatadnego wymaga odpowiedniej aparatury. Zagadnieniem, które winno być szybko rozwiązane, jest produkcja karbarylu i enolofosforanów na skalę przemysłową.