

Development of the concept of "parasitic contamination"

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In the course of evolution Man constantly changes and deforms the environment. Antropogenic pressure is considered to be multifactorial and connected with environment contamination (= pollution) with organic and inorganic wastes, changes in climate, landscapes, hydrology, urbanization, population migrations, etc. Under antropogenic influences there is an "ecology shift" in populations of different species which manifests itself in change of ecotopes and cenoses, extinction of several species, changes of morphology, physiology, ethological peculiarities and adaptive norms of organisms. Constant impact on the environment affects the course of microevolutionary processes, increases the level of spontaneous mutation processes and disturbance of natural selection vectors.

There is no common generally accepted interpretation of the notion "environment" due to different approaches to estimate its constituent elements. Probably a common approach is impossible. The main thing is to reveal directions and intensity of human commercial activity disturbing the environmental equilibrium. Certain contradictions are observed in diverse human activity, i.e. as biological species from the environment consuming components necessary to maintain its vital activity thus deteriorating it, and, as *Homo sapiens*, it creates productive processes and social organisation with negative effect on nature. In a number of cases man's interference into the environment affects all spheres of life and has a character of global catastrophies.

In broad terms contamination implies any destructive, unfavorable changes of the environment and the condition of live organisms' existence (R a m a d e, 1978). D a n i l o v - D a n i l y a n *et al.* (1994) point out that environment problems require an elaboration of fundamentally new approaches to accomodate rapid socio-economic transformations taking place in the world and evoking total, often irreversible changes of natural conditions.

Environment contamination is linked with industrial, agricultural and household wastes. With regard to their nature, pollutants may be grouped into physical, chemical and biological types (R a m a d e, 1978).

Parasitic contamination is a part of biological contamination. It is one of the unfavorable factors with a negative affect on animals, man and plants.

Its emergence is inevitably followed by transformation and destabilization of the environment. Recognition of this fact is necessary to elaborate a general formulation of the problem, to devise quantitative and qualitative methods of its study, to define priority directions of research and their practical applications. As far as we know, the notion "parasitic contamination" has never been discussed in depth either by ecologists or parasitologists. It is not restricted to boundaries of traditional parasitology but lies within the range of ecological problems of the environment and its protection.

Introducing the notion of "parasitic contamination" we must be aware of the fact that, beginning with the earliest periods in biosphere development, parasitic organisms have constantly been present in nature (S k r y a b i n, 1923; S o p r u n o v, 1987 and others). Parasites are characterized by great species diversity and are able to colonize all groups of organisms, including man. Considering parasite taxonomy diversity, and different forms of parasite-host relations, an inference can be drawn that parasitism phenomenon effects many biology processes and biosphere evolution (R o i t m a n, 1991). Plants and animals are inhabited by parasite communities found to possess different ecological relations with the environment, thus forming complex parasitic systems. These systems have existed for long periods, they are structural and characterized by certain vectors and change rates, dependent on variable environment factors. Equilibrium of the systems is sharply disturbed under conditions of the environment destabilization.

While evaluating cause-and-effect relationships of changes in the parasitic situation, we must state that a

key feature of the processes is concurrent influence of different contamination types being mostly evident in urbanized ecosystems, in large cities especially. It is generally accepted that organic, physical and chemical contaminations serve as a basis for general environment contamination. At present there is a necessity to elaborate a conception of the notion "parasitic contamination".

The following postulates are laid down in the base of this concept:

1. Parasitic contamination is a situation having emerged under a human influence in which parameters of infection considerably exceed that in natural ecosystems.

2. Parasitic contamination significantly differs in that it affects animals and plants directly; it acts as a powerful factor of the environment destabilization.

3. Parasitic contamination is characterized by the following: destruction of historically established parasitic systems and emergence of novel ones; reduction of parasite species diversity simultaneous with introduction of parasite species not found earlier in the given biocenoses; alterations of parasite morpho-functional and population characteristics enhancing their virulence; destabilization of parasite adaptive norms and change of their ecology valency.

4. Parasitic contamination affects all biology components of the environment, this is seen most clearly in urbanized ecosystems (mainly in large cities) subjected to the powerful impact of ecology and socioeconomic factors.

Without doubt it is particularly important to study the phenomenon of parasitic contamination with regard to parasitoses dangerous to man, economically exploited animals and plants. In this case an elaboration of "object list" compiled according to "hazard rate" is appropriate.

As a rule parasitic contamination is concomitant with increase in parasite numbers (often of an explosive character) in their hosts and vectors ("parasitic expression"), partial change of the host parasite fauna ("parasitic succession") and parasite conquest of new territories and hosts ("parasitic expansion"). Very often these processes run parallel courses and are accompanied with parasitic "maximum saturation" of their hosts when immune system of the latter and climatic-landscape peculiarities permit it.

On the other hand, deterioration of human social conditions in urbanized ecosystems, especially in unstable periods of society development, leads to a significant rise of role of sociooriented parasite being transmitted through short chain, i.e. either from man to man or partial development in the environment (water, soil), and to intensive involvement of man (as a biology host) in those parasitic systems where not long ago its role was negligible. It often leads to mass multiplication of "unbalanced parasitic systems", to changes in epidemic (epizootic, epiphytotic) processes.

The parasitic contamination rate (quantity level) of territories and aquaterritories may be estimated with "contamination" of single parasitoses or with their sum ("summary contamination"). It may be estimated by separate constituents (for example, contamination of different environment objects with infective material, that of definitive, intermediate hosts, etc.). Such an index as "infection of final hosts" is considered to be the most informative one since it is a final result of parasitic contamination cumulating other intermediate indices.

It is quite natural that the contamination rate, as well as factors conditioning its emergence and dynamics on different territories, may vary considerably. In this case a different approach is needed to assess rate of contamination effect on humans, commercially important animals and plants and measures used as well to eliminate (minimize) after-effects of unfavorable parasitic situation.

In the case of quantitative evaluation of parasitic contamination and the forecast of extreme (crisis) situations with regard to dangerous parasitoses one must monitor changes of parasitic contamination level in combination with data on the amount and direction of other types of the environment contamination.

Let us illustrate these statements by providing examples of the progressive worsening of the parasitic situation in Moscow megapolis where, in recent years, the problem of parasitic contamination is especially acute due to unbalanced economic relations (see miscellany *Environment and Problems of Parasitic Contamination*, 1994). It was stated that the increase of parasitic contamination level had led to deterioration of epidemic, epizootic and phytosanitary situation in the megapolis. Parasitosis risk had sharply increased, and there were frequented outbreaks of human trichinellosis and *Trichinella* infection of pigs and wild boars; there was a steady growth of enterobiosis as well as parasitoses transmitted with foodstuffs and water (lambliosis, cryptosporidiosis). This was also the case with regard to acarus scabies and louse infections, more than the one-third of dogs and cats were infected with *Toxocara* that increased a risk of toxocarosis in children. Serious threat to the territory were wastes of cattle-breeding farms which were considered sources of causative agents of infectious and infective diseases of humans and animals and a reason for deterioration of drinking water. There was a growing number of *Anopheles*-inhabited reservoirs that increased risk of malaria in the megapolis; output of basement mosquitoes had significantly risen. Fasciolosis, moniezirosis, dictyocauloses were widespread in cattle and sheep and goats; khawioses, dactylogyrosis and chilodonellosis in pond fish of Moscow region. Chicken ticks and bed-bugs had proved to be a scourge in poultry farms reducing productivity by 40%.

Numbers of rats, mice, flies, fleas which served as transmitters of harmful virus and bacterial infections and

parasitic infections were still growing. Contamination of inland reservoirs had led to their overgrowth resulting in snail number increase - intermediate trematode hosts - and to outbreaks of human nonspecific cercarioses. A high background of parasitic contamination was found in Moscow Zoo. Urban vegetable store-houses incurred great losses due to virus, bacterial and fungal pathogens and nematodes.

The acute problem of parasitic contamination is engendered by sharp changes taking place recently in economic and socio-demographic spheres (i.e. break of economic ties, emergence of new forms of production and trade, contamination of urban landscapes and reservoirs with different wastes, lowering of sanitary-epidemiology and veterinary supply levels, etc.).

Unfavourable human impact on the environment leads to violation of the natural parasitic background where parasites and pathogens become one of the main factors of increased contamination of the environment.

In conclusion, the aim of the present report was to show that parasitic contamination, being one of the specific forms of biological contamination, exerts significant influence on stable development of mankind, i.e. mankind's existence under favorable conditions of the environment (V o r o n t s o v, 1995). Studies of parasitic

contamination must undoubtedly find its place in the general biosphere strategy for a stable development.

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