

Komarova Galina A. Syndrome To be Alive on the Dead River

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The primary data for the study were obtained by the author during her anthropological studies in the region of the river Musliumovo in the Republic of Tatarstan. The largest ethnic group in the region is the Tatars, who are called "Majars". The author has been studying the region since 1990. The third generation of the population there are already suffering from high radiation levels. Various types of diseases (cancer, leukemia, etc.) and religious (Muslims and Orthodox Christians) are victims of this disaster. The author studied ethnic aspects of the behavior of human beings suffering from this. In particular, she studied the behavior of individuals who are suffering from this. The author studied the behavior of individuals who are suffering from this. The author studied the behavior of individuals who are suffering from this.

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Musliumovo Syndrome: To be Alive on the Dead River

Galina A. Komarova*

モスリュモヴォ・シンδροーム
——死せる川に生きる——

ガリーナ・A・コマロヴァ

The primary data for the paper were collected by the author during her anthropological studies in the Techa River Valley, in the Southern Ural region. The largest Soviet plant producing plutonium for military use, called "Mayak", had used the river to dump atomic waste. As a result, the third generation of the local inhabitants are already suffering from high radiation levels. Various ethnic (Tatars, Bashkirs, and Russians) and religious (Muslims and Orthodox Christians) groups are victims of this disaster. The author studied ethnic aspects of the behavior of human beings suffering ecocide, in particular, changes in their subsistence in order to survive. Individual subsistence behavior, including gardening and stock-keeping, means of nourishment, personal hygiene, precautions taken and self-treatment, were analyzed.

ここで報告をする主なデータは、(現在のロシア連邦)南ウラル地域のテチャ川渓谷で人類学的調査を実施し、収集したものである。軍事用のプルトニウムを生産するソビエト最大の工場「マヤク」は、核廃棄物をテチャ川に捨ててきた。その結果、地元住人の第三世代は高い放射能を浴び続け、すでに被害を受けつつある。多様な民族(タタール人、バシキール人、ロシア人)および宗教集団(イスラム教徒、正教徒)は、この災害の犠牲者である。筆者は、エコサイドという条件下での人間の行為の民族的な諸相、特にサバイバルの一

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手段としての生活様式の諸変化を研究した。そして、菜園や家畜飼育、適切な食物の選択、食物の処理と料理、食物産物の放射能洗浄、衛生・予防手段と自己治療など、個人の諸行為を分析してきた。

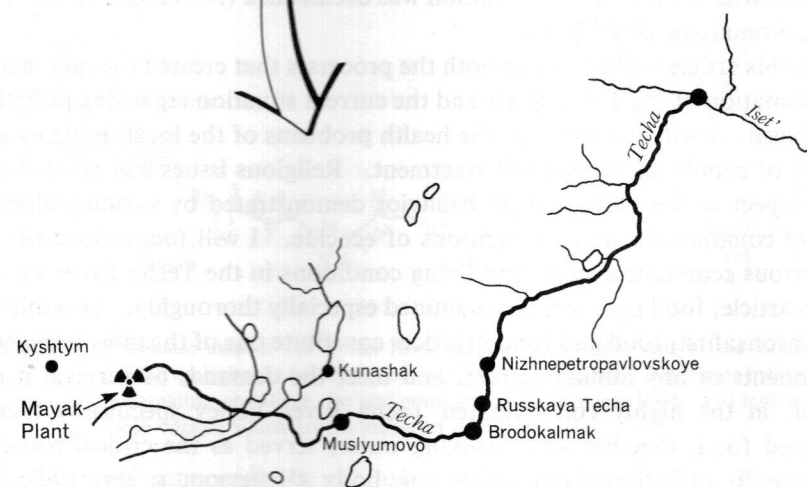
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1 Introduction

“Mayak”, the largest Soviet plant for producing plutonium for military use, was built in the South Urals region (Map), and its atomic waste was dumped in the nearby Techa River from 1949 to 1956.¹⁾ As a result, three generations of Techa River Valley inhabitants have been affected by radioactive contamination of their environment for several decades. It is well known that the population of the Bikini atoll and Columbia River natives (Jurgy 1992; Dalton et al. 1999) (*Japan Times*, March 2, 2001), who were resettled after similar disastrous events, modified their way of life greatly and lost their traditional food practices. By contrast, many Techa River Valley inhabitants continued living in their native villages and had to adapt to their unhealthy new environment. The fates of these three groups were different, but all of them, also like people of Hiroshima, Nagasaki, Nevada, and Pasa, shared at least one point in common—all of them paid a high cost for nuclear weapons experiments (Jurgy 1992; Стил 1993; Takayama 2000).

Only in the very early 1990s did the Techa River Valley inhabitants get access to previously classified information about the environmental disaster (Komarova 1997a). Nowadays they have a fairly clear idea who was guilty, but they are still uncertain about what to do, how to survive in the midst of radioactive contamination, and how to conduct their lives in order to avoid the terrible diseases that are brought to them by the highly contaminated river.

It is clear to everybody who is aware of the present situation that the local people should be resettled in uncontaminated regions and provided with comfortable dwellings, health care, and welfare. At the same time, maintenance of their traditional life-style should be promoted. Yet, the former state responsible for the disaster has collapsed, and the new Russia is too busy with other



Map Southern Urals region including the Techa River Valley

problems (Komarova and Garb 2001).

Until very recently, it was impossible even to discuss problems of human survival under radioactive contamination openly, because the issue was classified. Russian anthropologists never carried out studies of how various ethnic groups coped with such harsh conditions, or how they modified their food practices in order to survive. Russian medical doctors did conduct studies of the effects of ethnic differences on health of the Techa River Valley residents (Kосенко 1992; Kossenکو et al. 1997) but without any analysis of the causes of those differences. At the same time, their studies revealed that radiation taken into the body in the form of ingested materials from the environment (internal radiation) was crucial there. Between 1992 and 1998, I carried out nine field

studies in the highly contaminated Techa River area. My studies focused on the life-styles of various ethnic groups (Russians, Tatars, and Bashkirs) still living in the area. Bearing in mind the factor of radiation entering the body through ingestion, I was especially interested to learn how cultural traditions and innovations in subsistence behavior affected human health in conditions of intense radioactive contamination, and how one could use this knowledge beneficially to help local inhabitants to survive such conditions. My idea was to carry out a comparative analysis of folk knowledge and experience (TEK), on the one hand, and the scientific approach to the same problems (SEK), on the other hand. To achieve this goal, I discussed all these problems with specialists—physicians, nutritionists, biophysicists and other scientists. Besides, I carried on two sociological surveys (in 1993 and 1998) in order to reveal what in particular was changing in terms of the humans' relationship with the local environment, their subsistence behavior and their perception of the situation after the relevant information was declassified (Комарова 1994, 1995, 1999a; Komarova 1997, 2000).

In this article I will describe both the processes that created the radioactive contamination of the Techa River and the current situation regarding radiation in its basin. I will also examine the health problems of the local residents and the use of prophylactics and self-treatment. Religious issues will be analyzed with respect to the differences in behavior demonstrated by various religious (ethnic) communities under conditions of ecocide. I will focus especially on the various economic aspects and living conditions in the Techa River Valley. In this article, food practices are examined especially thoroughly. I do this for two reasons: first, food and food practices constitute one of the most important components of any human culture, and meet the demands of survival itself; second, in the highly contaminated Techa River Valley specifically locally produced food, together with drinking water, served as the critical route of exposure to radiation from inside the body (Чечеткин и др. 1993: 54; Резонанс 1991: 6).

2 An Overview of the Techa River Disaster

The Techa River is a tributary of the Iset' River and is a part of a huge river system (more than 6,000 km in length) covering all of Western Siberia, up to the Arctic Ocean. The river flood-lands are 5 km in width in its upper course, and up to 3 km at its mouth. By the late 1940s, there were 38 villages in the Techa River Valley, with a total population of 28,100 people (Figure 1). The Tatars and Bashkirs lived on the upper course of the river, whereas mainly Russians occupied the lower course. Traditionally all of them used the river as the only source of water (Комарова 1994, 1996b; Komarova 1997).

Specialists had hoped the wastewater would be carried into the ocean,

#	Village	Pop.	#	Village	Pop.	#	Village	Pop.
1	Metlino	1242	14	Karpino	195	27	Verkhnyaya Techa	979
2	Techa-Brod	75	15	Zamanikha	338	28	Skilyagino	492
3	Novoye Asanovo	157	16	Vetroduika	163	29	Bugaev	1074
4	Staroye Asanovo	637	17	Brodokalmak	4102	30	Dubasovo	703
5	Nazarovo	98	18	Osolodka	362	31	Bisserovo	465
6	Maloye Taskino	147	19	Panovo	129	32	Shutikhinskoye	1109
7	Gerasimovka	357	20	Cherepanovo	222	33	Progress	205
8	Nadyrov Most	240	21	Russkaya Techa	1472	34	Pershinskoye	1143
9	Nadyrovo	184	22	Baklanovo	480	35	Klyuchevskoye	1309
10	Ibragimovo	184	23	Nizhnepetrovskoye	919	36	Markovo	139
11	Isaev	434	24	Beloyarka 2	386	37	Ganino	82
12	Muslyumovo	3977	25	Lobanovo	626	38	Zatechenskoye	1135
13	Kurmanovo	1046	26	Anchugovo	1093			

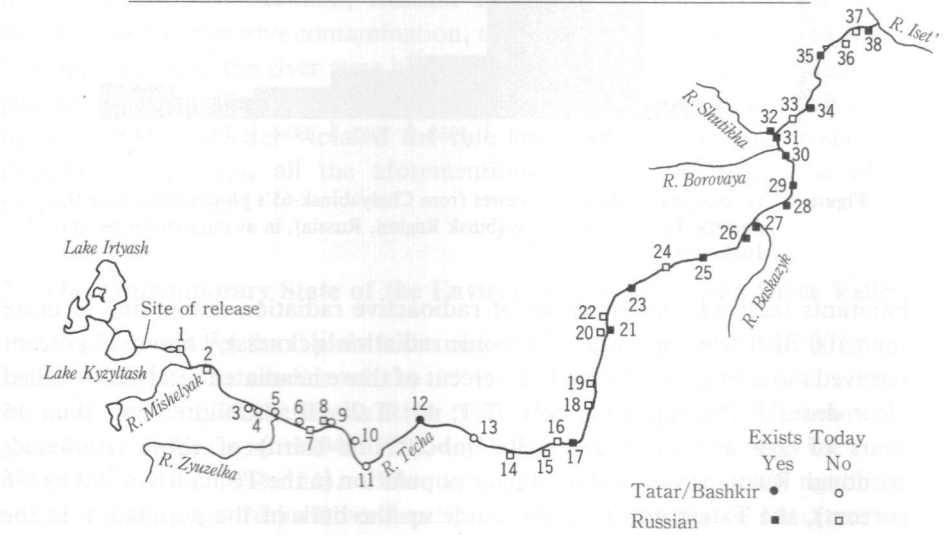


Figure 1 Schematic map of the Techa River (approximate scale) and of the villages located on its banks before the radioactive contamination. The figure includes information on village size and ethnicity in the very late 1940s, and indicates those villages which are no longer in existence.

where it would supposedly be diluted to a safe concentration. This was a miscalculation: the radionuclides remained in the silt, accumulated in water plants, and penetrated into underground water tables. The Techa River, which has a very slow current (only 0.3 km/hour), changed for the local people from a river of life to a terrible source of contamination, as they used the river water and the river valley as basis of their subsistence activity (Komarova 1997a, 1997b). Between 1949 and 1956, 76 million cubic meters of waste water, with a cumulative activity of 2,750,000 curie (Figure 2), were disposed of through the whole river system (AVHPIC PM, д. 1548: 6).

According to scientific studies of the Techa River Valley population, it was unique in that people were affected not only by exposure to external sources of radiation, like the Japanese Atomic bomb survivors, but, as the major effect, by exposure to sources inside their bodies, through ingestion of river water and local food (Kossenko et al. 1997). Over 8 percent of the Techa River in-

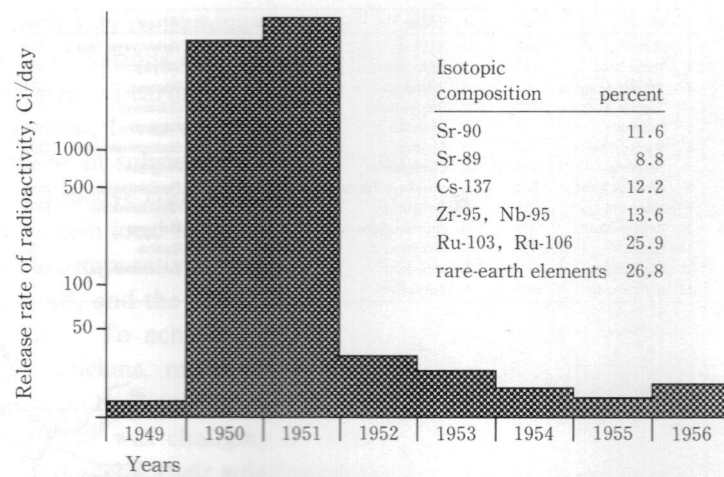


Figure 2 Discharge of radioactive wastes from Chelyabinsk-65's plutonium production into the Techa River (Chelyabinsk Region, Russia), in average curies per day, 1949-1956.

habitants received effective doses of radioactive radiation amounting to more than 100 BER (the threshold of chronic radiation sickness),²⁾ about 12 percent received more than 50 BER and 73 percent of those irradiated received so-called "low doses"³⁾ (Материалы 1991. Т.1: 11; Т.2: 50). Children less than 15 years of age accounted for 9,302 (about one third) of those irradiated. Although Russians were the dominant population in the Techa River Valley (76 percent), the Tatars and Bashkirs made up the bulk of the population in the



Figure 3 The village of Musliumovo today

most greatly affected villages in the upper courses of the river (82 percent) (Проблемы 1997: 10).

In 1953–1961, about a quarter of the overall river valley population (7,500 people from the 22 villages) were resettled outside of the contaminated region. Thus, the upper part of the river valley became depopulated. Yet, one of the largest villages named Musliumovo (Figure 3), situated at the middle part of the valley, was not removed by contrast to some other settlements situated down the river much further of the sources of irradiation. The same was the fate of the villages of Brodokalmak, Russian Techa and Nizhnepetropavlovskoye: despite a high radioactive contamination, these villages were not removed at all. The approaches to the river were blocked by the fence of the barbed wire and guarded by the police in order to make the river resources inaccessible for people. Yet, the latter violated the rule and exploited the river resources illegally. Nowadays, all the aforementioned villages form a zone of a radioactive disaster.

3 The Contemporary State of the Environment in the Techa River Valley

The Techa River flood plain is the main source of external exposure for the local residents. As studies of the 1990s demonstrated, the exposure rate (gamma emission) in the Techa River Valley amounted to 500 mR/hour⁴ in general (Кравцова и др. 1994a: 128), and even 820 mR/hour close to the river itself (Solovieva 1994: 11). The activity levels of the main artificial radionuclides in the Techa River flood plain within the village of Musliumovo are currently: 137 Cs–254.7 curie; 90 Sr–370.9 curie; 239 Pt, 240 Pt–0.3 curie (Чечеткин и др. 1993: 52).

At the same time, the Techa residents are affected by internal exposure. At least three routes are known by which radionuclides penetrate through trophic (nutritional) chains to the human population: 1) from contaminated river soil—to grass—to waterfowl—to food—to the human body; 2) from contaminated river soil—to grass—to cattle—to milk—to the human body; 3) from contaminated river soil—to grass—to domestic livestock—to meat—to the human body (Figure 4). Then, there is one more route, namely inhalation: the movement of both livestock and transport within the Techa River flood plain raises dust that is transferred by the wind all across the rural areas. Moreover, the riverbed is frequently crossed by livestock, various means of transport, and humans, and as a result the contaminated waste is carried by them across an extended range.

In order to measure the level of intensity of the exploitation of the Techa River flood plain for subsistence purposes, 582 homesteads were studied in 1992–1993. Their levels of radioactive contamination were measured, and their households' inhabitants were interviewed (Чечеткин и др. 1993: 6). In

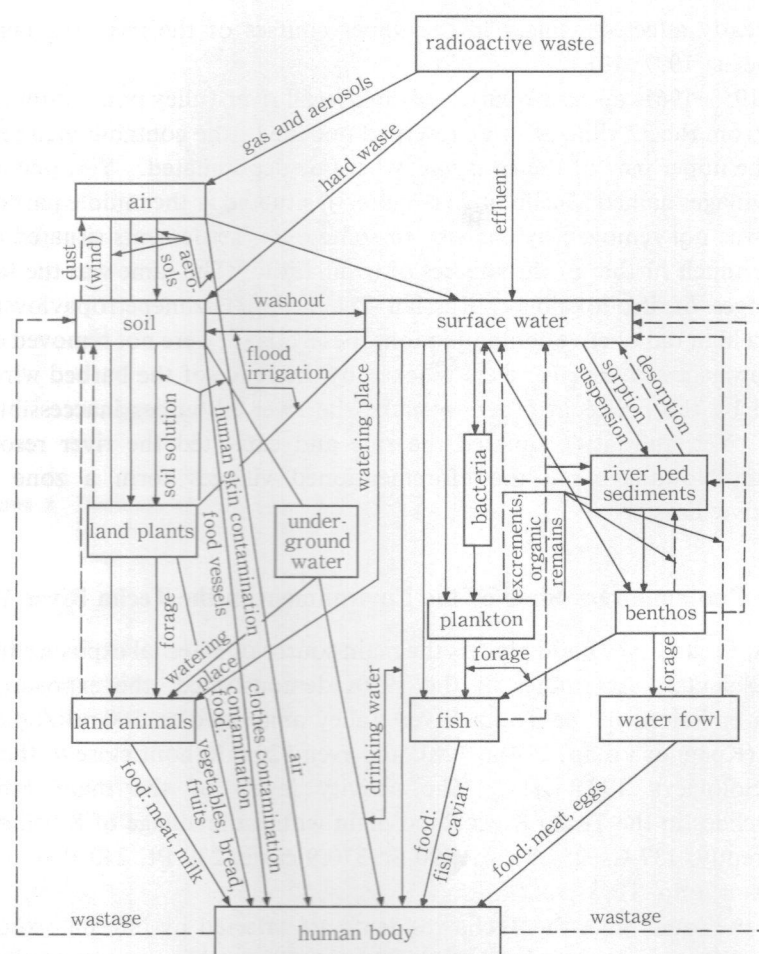


Figure 4 The migration of radioactive elements into the human body (after A. N. Marey, adapted by the author)

121 cases (more than 20 percent), they acknowledged that they used the Techa River flood plain as a pasture and for storing fodder. As a result, most of the homesteads in question were highly contaminated. Quite unexpectedly, another 50 homesteads proved to be contaminated as well, even though their inhabitants avoided using the Techa River flood plain for the aforementioned purposes. This means that there are many different ways by which the radionuclides are spread, and the local inhabitants are still highly vulnerable to the effect of radioactivity.

In order to calculate the doses of radiation received by people who frequently both used the water of the Techa River and accessed its flood plain, a special study was carried out (Кравцова 19946). Human activity was recorded in the Musliumovo village throughout all daytime hours, over three seven-day



Figure 5 The Techa River floodplain

periods in July, August and September 1993. It was established that children 5 to 12 years of age spent about a half an hour a day at the river: they walked there, took baths, played, and tended ducks and geese. Teenagers 13 to 16 years old spent about 1.5 hours a day there, in order to bathe, fish, wash horses, and store grass for domestic waterfowl (Figure 5). Mature people, who accounted for the largest group studied, spent several hours on the Techa River flood plain. Among these, herders made up the most vulnerable group: they spent up to eleven hours a day there. Beyond the scope of the study were those who visited the flood plain beyond the village borders where it was used even more intensively. These people were affected by radioactivity to the extent that they received doses of radiation that were many times higher than the acceptable level. Thus, the studies in question had demonstrated that, although they have been informed of the presence of dangerous contamination, about 15 percent of the residents still used both the river water and the flood plain extensively. As a result, these people had exposed themselves to high levels of external-source radiation (Figure 6).

It was impossible to carry out a similar study in 1998, but, according to my survey, the Techa River flood plain was used even more intensively in the mid- and late-1990s. The people themselves gave the following reasons for that: "First, all control on the part of the local authorities over the river valley ceased; second, economic poverty caused the people to intensify the practices of fishing, grazing livestock, and storing fodder." The disastrous ecological situation in the Techa River Valley echoes far beyond its borders, first, as people (especially, the Tatars and Bashkirs) maintain their kinship relationships



Figure 6 Techa River Valley residents: Tatars, Russians, Bashkirs

strongly and thus supply their urban relatives with foodstuffs from the Techa River area, and second, during the most recent years, Techa River Valley inhabitants sell contaminated products (meat, milk, vegetables, fish) far beyond the contaminated areas.

4 The Musliumovo Syndrome

To my question "When did you first hear of the impact of the Mayak disaster on health?" over 90 percent of the residents replied, "In 1989–1990." But the prevailing secrecy had not prevented them of being affected by radiation long before that. Those whose life was entirely linked to the river were suffering most of all. It is no accident that Techa residents used to say, "I've got river disease", which meant numbness of body parts, aching joints, continuous headaches, nose bleeds, weakness, and so forth. In recent times, people have taken to calling their river "Atomka" which means "Atomic river" (Комарова 1994; Komarova 19996).

According to the geneticist N. A. Solovieva (Соловьева 1993, 1994; Solovieva 1994), who has been carrying out cytogenetic studies among the local residents, 25 percent of the latter exhibited genetic cell deformation (decen-trics, decentric rings). Some of children have chromosome patterns that are inherited from neither the father nor the mother, which suggest mutational changes. Children suffer from diseases that were only characteristic of adults in the past (Русанова и др. 1994: 108); most of those diseases are of a genetic nature (Figure 7). In particular, there is a high level of mental deficiency



Figure 7 A local resident in the local hospital with his sick son

among children, including oligophrenia (АУНПЦ РМ, д. 168: 65–66) and Down's Syndrome (АУНПЦ РМ, д. 169: 69–70). A high level of radiation sickness is revealed among the local residents as well (Galimova 1993). According to a medical survey in 1994, only 7 percent of the overall regional population were relatively healthy people (Шилко и Зеленцова 1994). All the specific health problems of the local inhabitants were grouped together and called "Musliumovo Syndrome" by Solovieva and certain other scientists. The symptoms of Musliumovo Syndrome are fairly similar to both Chernobyl' Syndrome and the Cainar's Syndrome (Соловьёва 1994: 11).

5 The Ethnic and Religious Composition of the Techa River Valley Population

Nowadays, there are 11,360 people living in the Techa River Valley, including 3,595 children and 7,765 adults. Females account for 59 percent of the population. There are about 3,000 households in the region. The Tatars and Bashkirs together make up slightly more than half of the population (51.3 percent), the Tatars 45 percent and the Bashkirs 6.3 percent. The Russians account for 46.0 percent of the local residents. The rest of the population are Gypsies (0.6 percent), Ukrainians, Belorussians, Germans, Estonians, Kazakhs, Mordvinians, Chuvash, Nenets, Azeris, Chechens and others (Комарова 1995).

In this article I do not analyze the important and complex issue of ethnic identity changes in various ethnic communities in conditions of ecocide. Yet, it is worth noting the attempts of various nationalist leaders (Tatar, Bashkir and Russian ones) to interpret the ecological catastrophe in the Techa River

Valley as ecological racism aimed at his or her particular ethnic group. For example, Tatar nationalist activists make many efforts to "... awaken feeling of national humiliation among the Tatars living in the radioactive contaminated zone" (Komarova. Interviewing F. Bairamova in 1995). They point out that the Tatars and Bashkirs made up the bulk of the population in the Upper Techa River Valley, and use this as evidence of "Tatar genocide in Russia" (Закиров 1993; Таховиев и Ахмеев 1993). The leaders of the Bashkir nationalist movement believe that "the Bashkirs served the guinea pigs for Soviet nuclear tests" (Komarova. Interviewing F. Kobzhasarova in 1993). The Russian nationalists also maintained that the "Russians suffered most of all from the 'Mayak' activity" (Komarova. Interviewing N. Kalachev in 1993).

Yet, the results of my field studies (Комарова 1995; Komarova 1997) demonstrate that all the local residents irrespective of ethnic identity, employment, social position, sex and age (and including the staff of the plutonium producing plant. For that, see Komarova's interviewing M. Gladyshev in 1995) suffered from the ecological disaster. There is no question of the genocide of any distinct segment of the local population. In the Techa River region, one would not find ecological racism, which manifested itself against the Yakima Nation on the Columbia River, in the State of Washington, who suffered because of the plutonium-producing plant in Hanford (an American analogue of the 'Mayak' plant) (Jaimes 1994: 47). The sad story of the Techa River Valley tragedy might be defined as ecocide aimed at life itself. Meanwhile, as in similar circumstances elsewhere (Parajuli 1996), one observes that there is an ethnicization of the ecological disaster, which causes ethnic and religious mobilization.

According to my surveys, the role of religion apparently increased in the lives of the local inhabitants between 1993 and 1998. In 1993, 59.1 percent of the population manifested religious attitudes. This number had grown up to 80.7 percent by 1998. The Muslims (Figure 8) make up the bulk of the believers (76.2 percent), and Christians account for 14.6 percent (Комарова 1998a, 1998b; 1999a). As N. Tornau put it, "Islam demands that faithful Muslims follow such behavioral norms as washing before *namaz* (daily prayer. G. K.), fivefold *namaz*, donations to the mosque as well as alms for the poor (*zakat*), fasting (*uraz*), and *hajj* (Muslim pilgrimage. G. K.)" (Торнау 1990: 57). Faithful Muslims have to respect Qur'anic dogmas and follow Shari'a prescriptions, which regulate their daily lives. Yet, those who strictly follow all these norms make up a minority among the Techa River Valley Muslims. Most of the local Muslims visit mosque irregularly. They participate in Muslim festivals but avoid following strictly all the religious prescriptions. They mostly appreciate so-called "popular Islam", which simplifies Muslim rituals and norms and makes them easier (Аширов 1972). For example, it suffices to perform only one *namaz* a day, to fast for only three days instead of for a few



Figure 8 A family of Muslim believers

weeks, etc. As a local *imam* in Cheliabinsk told me, "Today the mullahs have to make people familiar with the critical prescriptions of Islam, which are as follows. First, one should be faithful to Allah. Second, one has to perform *namaz*, observe *uraz*, not drink vodka and avoid eating pork. Third, there is a requirement to protect one's soul from all evil and always be honest" (Komarova, Interviewing A. Yusupov in 1997).

6 Traditional Subsistence

The traditional occupations of the Southern Urals first settlers, the Bashkirs, were semi-nomadic pastoralism combined with hunting, fishing and apiculture. Later on, that was supplemented by agriculture borrowed from migrants from inner Russia, namely Russians, Ukrainians and Tatars who had moved up to the Southern Urals since the late 16th century. The Tatars combined livestock raising with cereal agriculture, while the Russians also practiced vegetable gardening and fruit-growing. Long interactions between all these populations resulted in intensive borrowings from each other: the Tatars and Bashkirs increased their farming activities combining them with their former livestock-raising, and the Russians borrowed some aspects of livestock-raising, fishing, apiculture, and the intensive usage of forest food-products (Komarova 1996a; Komarova 1997).

After the 1920s, all of them were made into collective farmers. They were engaged in arable land and livestock farming, and soon there emerged tractor-

and car-drivers, electricians, agricultural experts, builders, and other professionals who carried out these jobs irrespective of the ethnic subsistence traditions. However, the villagers have still preserved certain specific cultural features in their private household economies.

Until the turn of the 1980s, there were many enterprises and economic organizations in the region in question, especially in Musliumovo, that employed people from all the neighboring villages. Yet, nowadays there is a high level of unemployment there, and even those who are employed find the payment of their salary is delayed more often than not. That is why the "Chernobyl' privileges" are very important to the great bulk of the local inhabitants. This means that some of the latter (about one third of the local population) who did not fail to receive official documents confirming their status as victims of a disaster are paid compensations for their suffering due to radioactive contamination.

7 Domestic Life

The majority of the local inhabitants (83 percent) live in private houses. Fourteen percent occupy apartments in two- or three-storied buildings. The remaining 3 percent rent rooms in private houses. Although there are no homeless people in the region, many people complain of their poor living conditions. Indeed, many dwellings lack running water, centralized heating and a supply of gas. Most of the dwellings are heated by ovens. Firewood, turf and charcoal are used as fuel. Fortunately, all the houses are provided with electricity. Yet, only 7 percent of houses have running water. Thus, the inhabitants of over 87 percent of dwellings use wells or water fountains for their water supply, while another 6 percent use fairly occasional sources of water supply, mostly movable cisterns.

The bulk of the dwellings are wooden houses. Houses were built of the pine logs in former times, and any appropriate raw material is used nowadays. In order to keep the dwellings warm, they caulk the walls with the moss from the local swamps. Yet, moss accumulates more radionuclides than any other plant form. Another method of a house building is also popular in the region: a wooden frame is made first which is then filled in with slag and cement. Raw materials from the Techa River flood plain are used to make grout, for foundations, for wall coatings and for other aspects of construction. These materials are commonly used especially for the outbuildings situated next to the main dwellings. As a result, the houses and outbuildings themselves serve as sources of radiation.

According to official data, 1,350 families from the Techa River Valley still need to be resettled. In the early 1990s, a resettlement project was provided generous financial support by the central authorities. At their village meetings,



Figure 9 Migrants from the Techa River
Their new house is situated 1.5 km away from the river.

the majority of the Techa residents voted to be resettled out of the dangerous zone. Yet, after a few houses had been built for them, the bulk of the resettlement money disappeared.

After Russian legislation, "The law regarding the welfare of those who have suffered from both the accident of 1957 at the Mayak plant and the contaminated waters of the Techa River", was passed in 1993, Techa residents became its hostages. Indeed, those who had moved out of the contaminated zone were immediately denied any welfare or other privileges. In the present-day harsh Russian social environment, these privileges are the only source of income for most of the Techa residents. Moreover, whereas 160 new houses were built for them between 1992 and 1997, half of them were built at a distance of only 1–2 km of the riverbank (Figure 9). As a result, even after resettlement, people were still within the effects of radiation. The irony is that these people appreciated this change, for after resettlement they not only improved their living conditions but also received welfare. It is no accident that only 12 percent of my informants were willing to move out of the danger zone in 1998. And more than two thirds of the informants hoped to receive financial compensation for their conditions of ill health.

8 Contemporary Subsistence Behavior

The natural environment in the Techa River Valley makes a traditional food-producing economy by no means an easy task. The warm period lasts for no more than 100–110 days a year. The fields are covered with snow for about

160 days, usually to a depth of about 0.30–0.40 meter. In July the mean temperature is plus 18.4°C, and in January it is minus 15.7°C. Sometimes, but very rarely, the temperature falls to minus 40–45°C. Generally, farming, gardening and animal husbandry are not very effective occupations. They provide enough to stay alive, but they do not result in any surplus that might be used to some profit. Yet, in the 1990s the local residents invested a lot of energy in the development of their domestic subsistence economics that have proved to be their only reliable source of foodstuffs. As a result, land became a scarce and highly desirable resource in the region. My survey of 1998 revealed that people who still lived in the Techa River Valley were using the plots of land in other villages whose inhabitants had been resettled out of the region earlier.

Actually, every homestead has its own plot of land (from 600 to 2,000 sq. m) that is used for gardening. Traditionally local people ranged their houses along the river course: the dwellings were built on the higher ground, 50 to 100 meters away from the river, and the gardens descended down toward the water. Recently, people have begun to build new dwellings further away from the river, but they keep using their former gardens and irrigating them with Techa River water.

The majority of the Tatars and Bashkirs grow cabbage, carrots, onions, garlic, beets, and sometimes tomatoes and cucumbers. The list of vegetables grown in the gardens of the ethnic Russians is much richer. It is worth noting that there are a few aged Russian women (so-called rural intellectuals, i.e. schoolteachers, agronomists, physicians, former state officials, and the like) who are very innovative in their subsistence behavior. Recently, they have been experimenting with a broad list of agricultural plant species to find those, which, in their view, are better for human health in the harsh local environment. They do their best to share their knowledge with their neighbors, but, unfortunately, they have only a few followers. Meanwhile, according to the 1998 survey, the importance of gardening had increased greatly during the last few years among all the local inhabitants irrespective of ethnic identity. The local people look down on careless gardeners, and especially condemn them if they are Russians. They say, “The Bashkirs and Tatars are less accustomed to gardening, but a poorly cared garden brings shame on the Russians.”

Potatoes are still a favorite vegetable for raising in the local gardens. They are less demanding crop, and yield good harvests in the Techa River Valley. The local inhabitants say that nowadays potatoes grow even better than they used to. The usual harvests are one to ten, and the most experienced gardeners were able to get as much as one to fifteen in 1997. A tuber can weigh as much as 0.5 to 1.0 kg, but people are less satisfied with the potatoes' quality. They say that the tubers get rotten more easily in storage, and have cavities inside. But nobody complains about their taste, although they say that the flavor of

other vegetables has gotten worse: carrots are bitter, fresh cucumbers and tomatoes have lost their flavor. That is why nowadays people usually preserve them rather than eat them fresh.

Different local vegetable species have different abilities to absorb radionuclides. The legumes especially soak up 90-Sr. The ability of various species to absorb 137-Cs is as follows (from most to least): cabbage, potatoes, beets, sorrel, salad greens, radishes, onions, garlic, carrots, cucumbers, and tomatoes. The first listed (cabbage, potatoes, etc.) absorb 10–15 times as much radionuclides as the latter (cucumbers, tomatoes).

The absorption of radionuclides by crop also depends on the type of soil and its acidity, the amount of organic material, the level of precipitation, and other factors. For example, crops grown in black earth contain 50–100 times less radionuclides than those grown in acid soils. When harvesting, careful gardeners also thoroughly clean the earth off the plants in order to avoid contamination.

In order to reduce the level of soil acidity, the local inhabitants add slaked lime to soil. This helps reduce the radioactive contamination of potatoes and other vegetables 5–10 times, and that of fruits and berries 4–5 times. Use of fertilizers, including organic types, also prevents radionuclides from being absorbed by the plants. However, the local fertilizers (manure, turf, ashes, humus, and the like) are themselves already contaminated. In order to avoid contamination, one should not use plant material from contaminated plots as fertilizer. Yet, this is just what the local people commonly do. In the fall, after harvest is over, they collect what is left at the plots (leafy tops of vegetables, weeds, stalks, and the like), add bark and firewood, which are very rich in radionuclides, and make a bonfire. They are in fact creating a mini nuclear reactor by doing this, and they often use the bonfire to bake potatoes, a favorite food of all the locals, and not least of all, of the children. It is dangerous to use this source of fuel to cook meals, especially salty stuff like fat, sausage, kebabs (*shashlyk*). However, this is a favorite amusement of people all across Russia, including those in the Techa River Valley. Ash from this sort of fire serves as a source of secondary contamination of the soil. Yet, as people themselves told in 1998, this ash—together with other local organic stuff—served as the only fertilizer in the region.

Unfortunately, the local inhabitants are unable to follow many recommendations of specialists, which are either too expensive or unavailable on the spot. That is why they have to invent their own methods of soil deactivation: for example, they collect all the plant residue from the plot and bury it in deep pits (no less than 1 meter deep), fill these pits with clean earth, and plant perennial grasses over them. Those who practice this method know that it is also very important to add ceolite to the soil, but this compound, intended for deactivation, is practically unavailable in the Techa River region (Комарова

19976).

9 Livestock and Domestic Fowl

All the local inhabitants irrespective of ethnic affiliation keep cows in order to have fresh milk, dairy products, and meat. Although this demands a great deal of efforts, the number of cows has been growing in recent years. A crucial task is to store fodder for keeping cattle in stables over seven months or so (Figure 10). In earlier days, people used to cut grass close to the riverbed where they also bathed and got water. Nowadays, when they know about the radioactive contamination of the natural environment along the river, they would prefer to cut grass as far from the river as possible, but many people are unable to do that for lack of appropriate transport and other technical devices. Thus, having no other option, most of them have to gather fodder in the traditional way and from the same spots. Even those who have an access to more advanced technology are still vulnerable to radiation. Even if they cut grass as far as 10 or 15 miles from their villages, they are not free of the possibility that in summer their cattle might be taken by the village herders to graze on the river's flood plain (Комарова 1997r).

All the pastures in the vicinity of the villages are owned by collective farms. Therefore, the flood plain is the only area where private livestock (cattle, sheep, goats, and horses) can graze. Naturally, animals drink water from the river.

The Tatars and Bashkirs do not keep pigs. The Russians usually keep one



Figure 10 A village in the Techa River Valley with stored cattle fodder in front

or two pigs per household. These animals are fed with grain, bread, potatoes, food scraps, which are supplemented with greens in the summer. They only drink fresh water brought from the wells and are always kept in a pigsty. That is why they are less affected by radiation than other domestic animals.

Chickens are also fairly isolated of the Techa River effect. They are fed uncontaminated forage like grain in contrast to waterfowl (ducks and geese). The latter seek the riverside environment where they eat what is called "geese grass" and slime filled with radionuclides. People bring this stuff to their yards in order to store it as seasonal forage for their waterfowl. This is one more way for radioactive elements to get into the homesteads. And this is also a reason why chickens browsing in the yard can be affected by radiation as well. It is worth mentioning that waterfowls are raised mainly by the Tatars and Bashkirs, whereas everybody keeps chickens.

Livestock (excluding pigs) and domestic fowl are reproduced at the homesteads. People note that the young animals are usually weak, and often die before maturity. There are cases of mutant animals being born in the region. Unfortunately, most people are unable to buy domestic animals, fowl and forage from outside their region. Veterinarians often reject local domestic animals as deviant from permissible standards. As is case with gardening, the local inhabitants are unable to follow the advice of specialists who try to teach them how to protect animals from radiation. However, they use their own methods, in order to free their animals from radionuclides. For one or two months before slaughter, the animals are kept in a barn, isolated from the natural environment outside.

10 Fishing

After the upper courses of the river were depopulated, the river water cleared, because it stopped having any foreign materials wash into it. This caused the local inhabitants to invent a bitter joke: "The river is clean—except for radiation." The fishing resources of the Techa River are quite variable: one can catch crucian, carp, perch, roach, gudgeon, burbot, pike, sheat-fish, goby, ide, ruff, etc. there. Experienced fishermen maintain that nowadays there is more fish in the river and it is larger in size than it was in the past. Legends are widespread of mutant fish, white-eyed fish, and monstrous pike that attack waterfowl. Actually, there are other fishing-grounds (lakes) in the region but they are far away from the villages and their fishing resources are scarce. Therefore, people still prefer to fish in the Techa River.

Fishing is a traditional occupation of the local men who do it all year round (Figure 11). They say that they do not need to chop holes in the river ice because the "Mayak plant pours out hot wastewater that breaks up the ice and gives [fishermen] access to the flowing water. There are plenty of fish at these



Figure 11 Winter fishing on the Techa River

natural holes, and one is able to catch them by hand or with a landing-net." Usually, fishermen use a fishing rod and an ice axe in winter. In warmer times, they mainly use various kinds of fishing rods.

At the same time, the major part of the catch is made by poachers, who use illegal equipment like harpoons, nets, dragnets and other fish-traps, as well as explosives. More often than not, the poachers are people who make their living only by fishing. According to a survey in 1998, in recent times the locals consume more fish, but they buy it from local fishermen. Fish is an important part of the local diet, especially among the ethnic Russians. It is boiled, baked into pies, braised, salted, dried, fried, and smoked. The last two means of preparing are especially harmful in the local conditions: if it has been boiled, fish contain 10 times less ^{137}Cs and 2 times less ^{90}Sr than when it is fresh, whereas frying and smoking cause an increase in the amount of cancer inducing agents. Soups based on fish stock are especially popular among the Russians. However, a large amount of radionuclides become concentrated in the stock. Fish heads and gills absorb radionuclides, as well. Unfortunately, fish heads,

which are commonly used to make fish soup, are one of the favorite meals of the Russians. Only a few people refuse to use fish heads considering them to be a dangerous fish part where "radiation is concentrated."

Muslims never use fish that do not have scales. Sheat-fish is a scaleless fish that is common in the Techa River. At the same time, the Russians like it as well as many other fish species. Unfortunately, sheat-fish is a bottom-dwelling species that absorbs a large amount of the radionuclides.

It is worth noting that, in the view of researchers, fish take in radionuclides with their food and to some extent through their gills. Thus, the radionuclides accumulate mainly in the liver and bone tissues.

11 Food Habits

Subsistence economy provides the great bulk of one's needed foodstuffs in the local conditions of the Techa River Valley. In the past, this was a result of a poorly developed provision of food from elsewhere. Nowadays, although local stores and food markets are by no means short of food, they are still underused by the local people because of their shortage of financial resources. Most locals are only able to afford such staples as tea, groats, sugar, salt, flour, butter, pasta, and the like. After a jump in prices in recent years, many Russian and even some Tatar women have begun to bake bread at home, as they commonly did before the 1970s. People consider homemade bread "cheaper, tastier, healthy, and free of unwanted chemicals."

The most crucial issue raised by the local inhabitants is how to obtain uncontaminated foodstuffs. Only a few well-off people, who have their own means of transportation and sufficient financial resources, have no problem with that. The rest of the local inhabitants do their best to sell their own produce and buy other foodstuffs that in their view are uncontaminated.

Bartering foodstuff is common in the region. For example, a successful hunter or fisherman will exchange part of his bag or catch for vegetables or milk. It is common among the Russians to slaughter pigs in fall and to preserve pork by salting, braising or, more rarely, smoking. Just after a slaughter, some of the fresh meat is usually given to relatives, friends, and neighbors in the hope that they will reciprocate in future.

In winter they slaughter sheep and, less frequently, goats and bulls. This is the most common source of meat at that time of the year. The Russians supplement their diet by raising and slaughtering rabbits. As a rule, these meat resources are exhausted by about April, and from then to November only those who have enough money can have meat, which is bought at stores or food markets.

My surveys of 1993 and 1998 revealed that, over five years, consumption of meat and milk decreased and that of various vegetables and potatoes increased

Table 1 Consumption per person of various foodstuffs by the Techa River Valley population (according to surveys in 1993 and 1998)

Foodstuffs	1993		1998	
	kg/day	kg/year	kg/day	kg/year
Milk	0.613	223.7	0.600	219.0
Meat	0.205	74.8	0.150	54.8
Potatoes	0.300	109.5	0.385	140.5
Vegetables	0.050	18.3	0.100	36.5

(Table 1).

An analysis of the daily food consumption was carried out in 1998. The data at hand demonstrate that the contemporary local diet is in almost all dimensions much poorer than the intake recommended by specialists. For example, many people's diet lacks many kinds of foods that are highly recommended by nutritionists. Only the level of consumption of potatoes, pasta and milk was higher than the norm (Figure 12).

Children's diets are characterized by the overconsumption of pasta. Furthermore, the foods consumed by children includes products that are less appropriate for children, in the views of nutritionists, namely margarine, pork fat, wheat groats, sausages, and smoked meat. It is worth noting that locally produced sausages are especially unhealthy as the combination of meat and starch contains a great deal of 137-Cs.



Figure 12 Cooking in the Techa River Valley

The local diet is characterized by deficiencies of major nutrients and a low index of energy. It is well known that well-balanced nutrition is a major factor in health, the capacity for work, and the healthy growth of children. It also helps provide against the effects of the radionuclides. However, this is only true if the foodstuffs themselves do not serve as sources of internal radiation.

The local people are well aware that milk and meat serve the main sources of ingested radiation. It is also well established that when beef is boiled, up to 70 percent of the nuclides are left in the broth and 15 percent in the meat and bones. For this reason, one should avoid cooking broth, meat in jelly or in aspic, roast meat, and ragout. These dishes are very popular in Russian cookery. Intestines, which make an important contribution to the Russian diet, also accumulate a high volume of the radionuclides. In contrast, the Muslims are prohibited from using intestines for food; this is "haram" for them.

Two rules affect the Muslim life-style to a major extent: "haram" (that which is prohibited) and "halal" (that which is allowed) (Комарова 1998a; 1998b). Pork is an absolute "haram" for Muslims, and they are not even allowed to trade it. All the same, it is well established that pork is the least radioactive meat: first, because it absorbs less radiation than beef, consisting as it does of more meat and fat and less bone; second, because pigs alone among the local food animals do not graze near the Techa River; third, their food do not contain contaminated products in contrast with the other local food animals. Thus, beef is the most contaminated meat in the region, followed by domestic waterfowl, mutton, veal and pork.

Recently, the younger Tatars and Bashkirs have begun to eat pork. Older practicing Muslims still avoid doing that but, instructively, do not condemn other members of their families who do eat pork. Older Muslims stick to traditional food habits. Their diet is based on dairy products and meat: beef, mutton, waterfowl and horsemeat. The latter is a traditional part of the Turkic diet, although condemned by orthodox Muslim practice. Yet, although prohibited for Arabs, its consumption is allowed for the Turkic peoples. Horsemeat, having practically disappeared of the Tatar and Bashkir diet in the 1960s-1980s, came back again in the 1990s. The Russians treat horse meat as quite an exotic food, and much prefer beef and chicken.

All local people, regardless of their ethnic affiliation, appreciate chicken. Chicken broth is highly recommended by Russian physicians for weak or diseased people, and for children. It is thought to provide people energy in summer and to cure colds in winter. Chicken flesh and broth increase immunity, and strengthen joints and bones. Interesting enough, all these and other folk beliefs about a chicken-based diet are confirmed by specialists. Yet, all of this is true providing chickens were raised in an uncontaminated environment and fed with clean products. Also cooking them must follow such

specific rules as, for example, removing the skin. However, the local inhabitants ignore this requirement because, in their view, this worsens the flavor of food. Moreover, many traditional meals involve use of chicken skin. The same goes for using waterfowl, which also requires ingesting the skin.

Recently, the river valley locals have begun to revise their beliefs about what foods are healthy and what are not. This has actually brought them back to some of their traditional food habits. In particular, they have restored reliance on a diet heavy in fermented milk products, many of which had been abandoned during the last few decades. For example, the Bashkirs and, to a lesser extent, the Tatars traditionally believed that fermented mare's milk, *kumys*, cures all illnesses—including those brought about by radiation (Карнаузов 1948; Сигрист 1984). Physicians, too, regard it as capable of having a curative effect, as it contains a great deal of vitamin C and various antibiotics (Комарова 1994, 1996, 1997b, 1998; Komarova 1997). The Tatars and Bashkirs are convinced of the curative properties of other sour milk products, too, such as *airan* and *katyk* drinks, and various creams and cheeses (kinds of soft cheese: *pozme* [siuzme], *yeremchik*, *kurut*, etc.). *Kurut* cheese is particularly valued and said to cure several illnesses. Housewives have discovered that the mold growing on these milk products has another miraculous property: foodstuffs covered with this mold decrease in radioactivity; it is as if the mold has borrowed from them or devoured it. This remarkable discovery was made with the help of the personal dosimeters that have been made available to the local people in recent years (Комарова 1997r, 1998a).

This effect is confirmed by specialists who know that when milk is processed, the following fractions of radioactive elements are transferred to dairy products: 90-Sr—5 percent to cream, 27 percent to cottage cheese, 45 percent to cheese; 137-Cs—10 percent to cheese, 9 percent to soured cream, 21 percent to cottage cheese, 15 percent to butter. Therefore, specialists recommend the Techa River Valley inhabitants abandon the use of fresh milk. However, fresh milk together with honey is highly recommended by Shari'a (Muslim law) as the most appropriate food for true Muslims.

The Russians told me how they remove radionuclides from meat. They season the meat with oil for several hours or freeze it for 5-6 hours, after which they season it in a salt and vinegar solution. The oil method was disproved by specialists but they confirmed the positive effect of the freezing and seasoning technique.

The Tatars returned to their practice of cooking oat kissel (*kysal*), believing that it cleans the stomach of unwanted substances, including "radiation". The Turkic people also believe that hemp oil, the use of which had been abandoned for several decades, is much healthier than sunflower oil, in particular, with respect to cancers.

Simultaneously, people have begun to avoid those traditional food prac-

tices that they consider harmful in the present conditions. The Tatar and Bashkir women have given up their traditional roasting or frying of dough in fat to make *boursak*, *chak-chak*, *yuasa*, *kotlama*, *urama*, *salpak*, etc. They believe this cooking technique is more cancer-causing than others. Other foods long popular among nomads have also been abandoned, such as smoked goose, a smoked meat called *timper*, and *talkana*, "fat flour" (grain fried in oil). It is worth noting that cereal grain contains much more radionuclides than flour does.

An important characteristic of the region in question is intensive cross-cultural interaction, which includes the mutual influence of various ethnic traditions. In recent years, the main criterion for borrowing dishes has become their supposed wholesomeness (or conversely, not using those though unwholesome). For example, the Russians have borrowed from Tatar and Bashkir women an efficacious way of making tea. It is thought that tea "lives" for 5–7 minutes after hot water is added, during which time it is capable of driving radionuclides out of the organism; "old" tea is not healthy; and water for preparing tea should be allowed to "settle". The Russians have also borrowed the use of green tea from the Tatars and Bashkirs, and believe in its wholesome effects.

In the last few years, Tatar and Bashkir women have begun to preserve vegetables for the winter, following the Russian habit of storing "salty food" (Figure 13) as the Russians call it. This includes preserved vegetables, fruits, berries; salted foods; marinades; seasoning for soups; preserved vegetable



Figure 13 "Salty food"

mixture; tomato paste, as well as jelly, preserves and compotes of fruits and berries (both domesticated and wild). The Techa people believe that this sort of food contains less radionuclides than fresh ones. Yet, in fact, a large amount of radionuclides are absorbed by marinades and pickles, and they should not be used for food. At the same time, all these sorts of "salty food" are less harmful, providing they are seasoned in oil before being served on the table.

The Tatars and Bashkirs borrowed methods of mushroom processing from the Russians, as well: mushrooms are fried, dried, made greasy, pickled, etc. Over the last few years, the Techa River Valley inhabitants have abandoned the use of many mushroom species, which, they believe, absorb a large amount of radionuclides. Yet, they keep using some other less contaminated species. Indeed, their discrimination between the "clean" and "dirty" species of mushrooms has been generally confirmed by specialists who carried out mushroom tests for levels of contamination. Folk knowledge also includes the following two points—first, young mushrooms contain less radionuclides than old ones, and second, radionuclides accumulate mostly in the caps. Yet, people say, "A capless mushroom is not a mushroom at all," and keep eating the mushroom caps.

Most of local people use well water and water fountain sources for cooking, but they dislike the taste and would prefer river water better. However, they do not use the latter now because of contamination. They settle water before they use it, in the belief that it becomes cleaner and healthier. Sometimes, in order to clean the water they use filters, or run it through plain charcoal (a traditional method) or activated charcoal (bought in the drugstore). Some people use special purifiers to clean water.

While in field, I was teaching people food practices that would protect them from radiation. I discussed all these methods beforehand with specialists who approved my advice. In 1997, I carried out a mini-survey among the local women in order to figure out to what extent people were following my recommendations (Komarova 1995b). It turned out that 14 percent of the informants followed them "entirely", 52 percent "in general", and 34 percent followed only a few of recommendations. This means that people are familiar with the recommendations, but they are unable to rearrange their life-style overnight. Some required materials are not available at all in the region or are too expensive to be accessible. Another reason is a lack of an appropriate systematic training concerning ecological issues. Finally, as we will see further on, many people are still stuck with the paternalistic attitudes typical of the Soviet past.

12 Prophylaxis and Self-treatment

Most Techa residents suffer from the "river disease". Yet, only twice as less of them visit professional physicians. In general, the Techa residents, and especially the Muslim, avoid doing that. My surveys reveal that when asked, "Why didn't you ask for medical help after finding that you are ill?" most people replied "No time to see the doctor" or "They won't help, it's no use". People's feeling of doom increased when they discovered why doctors from Chelyabinsk had been coming to the villages for forty years and taking samples of their blood, spinal marrow, hair samples, and even teeth—while neither explaining why, nor revealing the results of the examination. After the secrets were revealed, people came to the conclusion that they had been serving guinea pigs for medical experiments. Today, the doctors involved admit they had been studying the problem for a long time, but say they were forced to remain silent (Kossenko 1991).

Now, people do not believe doctors, and do not believe they can help. At the same time, a survey of 1998 revealed that about 60 percent of the residents used self-treatments based on both folk approaches and aspects of specialized medical knowledge, and methods invented by contemporary healers. I have recorded dozens of prophylactics and treatments obtained from village women (Комарова 1994, 1996). Elderly women have acquired particular expertise in the prophylaxis and treatment of the gynecological diseases widespread among the local women, especially among aged Muslim women. The Techa women believe that many plant species are good for treating these particular diseases: red elder (*Sambucus racemosa*), sweet flag (*Acorus calamus*), aloe (*Aloe arborescent*), honey, pumpkins, bitter blue onions (*Allium cepa*). For other diseases they use a range of similar local and imported plants, including flax, hemp, spruce, pine, lemon, burdock, etc. They believe that nettle is a perfect species to drive radionuclides out of the human body. Actually, nettle has been always popular among the Russians: it is used in various food recipes, as a forage and also as a medicinal herb.

The Russians grow indoor plants, which, they believe have curative capacities such as aloe, chili pepper, etc. One species that is very popular among the Russians is called "tea fungus", or "Japanese fungus". They consider it a perfect means for driving radionuclides away. Recently, this particular "fungus" has become popular among the Tatars and Bashkirs as well.

The Russians also believe that fruits, vegetables and berries are good for one's health. Indeed, when berries are processed for juices, most of the radionuclides remain in the pulp. The Russians prepare infusions and decoctions of cranberry, blueberry, dog-rose, and beets with honey and lemon, bitter radish, as well as certain wild herbs. They also appreciate various sorts of tea

made of cherry, apples, figs, raspberries, grapes and dandelions.

Techa residents make use of medicines of animal origin, as well as plants. This is to be expected, since the Tatars, and especially the Bashkirs, have always had a culture rich in livestock-breeding traditions. The curative properties of these animal organs, tissues, and liquids have been confirmed by a whole series of scientific experiments (Комарова 1994, 1997r). For example, as has been already mentioned, the therapeutic effectiveness of *kumys* as well as various dairy products is well known (Комарова 19966). People are also aware of curative effects of dried sheep and horse dung and geese excrement for joints. In order to treat the latter, they also use formic acid from ants. There are also instances of treatments using urine. Finally, the Russians believe, quite correctly, that the Russian sweat bath (*Russkaia bania*) is not only generally healthy but has a curative effect. In their particular circumstances, it is a perfect means of driving away radionuclides.

Questions about self-treatment were put to men as well as women. Only a few of them managed to remember the names of a few grasses they had been told by their mothers, wives or female relatives. Most men stuck to the idea that vodka is next to a universal anti-radiation remedy. Some of the former staff of Mayak also believe that Cagor, Cabernet, and some sorts of cognac help drive away nuclides from the human body. These men claim that in the 1950s those working in the "dirty" sectors and exposed to the highest radiation were "treated" in this way by medical doctors (Комарова 1997a, 19976). It is worth noting that practicing Muslims never use alcoholic beverages. Yet, the consumption of alcohol by Muslims is growing rapidly in the region nowadays.

How effective are all these treatments in fact? According to oncologists, phytotherapists, endoecologists and other specialists involved in studying human survival in radioactive environments, the early stages of the diseases do allow immuno-correction through the use of certain folk methods: a healing diet, drinking water rich in certain metal ions, use of special exercises and herbal programs. Besides the essential oils, the coumarin, furocoumarin and their derivatives found in the local plants that are used in the South Urals may explain their health-giving effectiveness in cases of high radiation (Комарова 1996a, 1997д).

In all their quest for self-treatments, the Techa residents appreciate any recommendation, any medicine that seems promising for health care and is available locally. They test everything on themselves that they can manage to obtain, whether it is immunity stimulants, or means of water purification, or rusks enriched with fluorine and calcium, or powdered seaweed (*Laminaria Japonica*). There are legends of a wonder drug named "Momotaro".⁵⁾ Local residents have never used it and do not remember where the information about it came from. Yet, they keep recounting how some neighbors have recovered from serious sickness, caused by high radiation, with the help of "Momotaro".

All these stories sound convincing to the local inhabitants because it is said that "Momotaro" comes from Japan, and the prestige of Japanese medicine is very high among them as it is in Russia in general. The Techa residents are aware of the dreadful disasters in Hiroshima and Nagasaki, and believe that Japanese medical doctors might be able to help them.⁶⁾

13 Ethnic Aspects of Human Behavior in the Techa Region

A thoughtful observer might notice that local behavior is highly affected by ethnic factors, i. e. cultural preferences and religious loyalties, and not only by such dimensions as age, sex, educational level, social position, awareness of the threat of a radioactivity, etc. It is well confirmed that dirt and dust containing radionuclides are a dangerous source of exposure to radioactivity (Mapeй 1959; Моргулис 1988). That is why it is very important to clean one's belonging of dirt and dust regularly.

Unfortunately, the majority of the Techa residents ignore these recommendations and their dwellings and villages do not meet even simple standards of health care. Only a few people there are able to replace their old clothes and footwear regularly. Quite the opposite, clothes and footwear, especially those of kids, are often passed from one owner to another, and are used for years. The Tatars and Bashkirs, especially the religious ones, follow the custom (*hair*) in which a deceased person's clothes and other belonging are redistributed among relatives and neighbors. The Techa residents are especially attached to their outer winter clothes and knitwear, which they do not regularly shake free of dust. The same goes for bedding, carpets, and blankets. It is also worth noting that having numerous carpets, featherbeds, pillows, and blankets constitutes an important symbol of prestige among the Tatars and Bashkirs. They commonly hang carpets on the walls of the rooms but almost never clean them, as they have no vacuum cleaners.

The Tatars and Bashkirs leave their shoes at the entrance to the house, and thus leave radionuclides carried on the shoes outside the living space. In contrast, whereas it is common for Russians to change from street footwear to home shoes when they enter the house, this is by no means a strict rule. At the same time, while at home, Russian women change from work clothes to home clothes; they would never begin cooking or take kids in their arms before changing out of their work clothes. In contrast, rural men, regardless of ethnic affiliation, never change all their clothes when they come home; they just take off their dirty outer clothes and leave them at the entrance of the living room.

The Tatars and Bashkirs retain their symbolic norms of communication, which they have to respect. Men have to follow certain rules of respectful behavior. When meeting each other, men have to shake hands using both hands. This is a sign of cordiality and favor. To use only one hand, to the

contrary, especially when dealing with older men, is a sign of disrespect. People do not hesitate from concern that their hands might be covered with radioactive dust after they have been engaged in heavy manual labor.

When talking with each other, men have to assume a sitting position. For that, they will squat or even sit down on the ground. Even though they are aware of the radioactive contamination of the soil, they would never talk while standing, for this is considered impolite.

During recent years, the rules of Shari'a returned to importance in Muslim life after a long period of denial in the Soviet days. At the same time, in the contaminated Techa environment, strict respect for these rules does not suit people's health requirements. For example, a practicing Muslim has to do seventeen kinds of washing (*taharat*) before each of five daily prayers (*namaz*). In general, this rule accords perfectly well with the rules of personal hygiene recommended by specialists. However, it does not suit the Techa River Valley environment, where the water is highly contaminated with radioactive elements.

In general, gynecological cancers are less frequent among Muslims than among non-Muslims (Комарова 1998б, 1999б). This is the result of Muslim personal hygiene codes, requiring certain kinds of female cleanliness. Yet, the opposite pattern is revealed in the Techa River region, where it is the Muslim women who are suffering more from this sort of diseases. This is confirmed by the local physicians, who relate this to the Muslim behavioral norms in question. Indeed, when she leaves home—even if for only a few hours—a woman takes a special jug (*qumgan*) full of water with her in order to follow the Muslim norms of personal hygiene. Thus, this practice makes Muslim women especially vulnerable to gynecological cancers.

Pediatrician doctors worry that kids are being fed inappropriate food in the Tatar and Bashkir families, namely whole-fat milk and fatty meat, and are also given less drink and no juice at all. Following Islamic rule, Muslim women have to nurse their kids at the breast for no less than two years; however, women's milk may provide more harm than benefits in the highly contaminated local environment. Thus, whereas the infant mortality rate among Muslims was lower than that among Russian Orthodox Christians in the past, there is no such difference nowadays in the Techa River region (Комарова 1998б, 1999б, 1999в).

Practicing Muslims believe that they are not allowed to display most parts of their body to anybody but their spouse. It is even less permitted to show bare skin in presence of infidels. That is why, when they are sick, they avoid visiting physicians, and use extensive self-treatments and turn to healers instead.

Cultural attitudes toward pathology have influenced the way local residents express concerns about their families' health, and impact their decision-

making about seeking medical care. Muslims in this area, especially the elders, feel it is wrong to call attention to personal misfortune. They are particular about their privacy when it comes to deformity, pathology, or illness in the family. For instance, a child born with a deformity is regarded as punishment from Allah, and therefore any abnormality should be hidden from others and suffered alone. In contrast, Russian families demand public attention to their ailing children and seek special considerations and benefits. Muslim women condemn such behavior, maintaining that a sick or deformed child should not be used as a means to improve a family's living conditions or income.

Furthermore, the majority of Muslims will not allow a posthumous biopsy, and they bury the deceased before dark on the day of death. This is one of the reasons that there are still no reliable data on medical situation in the South Urals. Medical doctors are aware of very limited nature of present-day medical statistical data in the region (Kossenko et al. 1997) but do not consider cultural behavior and values as an important cause of the problem.

14 Conclusion

During the period of my field studies, the environmental situation in the Techa region has deteriorated rather than improved. Nowadays, this is the most contaminated region in the Russian Federation (Обзор 1998: 5). It is sufficient to note that waste products containing more than one billion curies of radiation are located in the region between the Techa and the Misheliak Rivers where the stores of radioactive wastes are concentrated (in contrast, the Chernobyl' area contains about 50 million curies) (Галимова и Соловьева 1994: 11; Литовский 1992: 67).⁷⁾

After the declassification of the data on the environmental disaster, a flood of information descended upon the local inhabitants and caused a highly emotional reaction among them. Most of them responded with a "retreat to the sickness", overt manifestation of their suffering, and the increase in psychosomatic diseases in addition to those caused by radiation.

In general, two tendencies were observed in people's behavior during recent years: one active and the other passive, which affected the ways people adapted themselves to the dangerous environment. Most of the local residents continued to maintain their traditional life-style without making any radical changes. These people perceive all their misfortunes and problems as an inevitable evil, a natural calamity, the Lord's punishment. In their consideration of what might be done, they rely solely on the so-called "Chernobyl' privileges." An attitude of dependency prevails among these people, and they do nothing to protect themselves from irradiation or follow the recommendations of specialists. Moreover, the great bulk of the Techa River residents are not very knowledgeable about ecological matters: in their own opinions, up to

80-85 percent of local inhabitants see themselves as ill-informed about the real conditions concerning radioactivity within the region. Unfortunately, the terms "environmental disaster" and "ecocide" have become so common that people seem to have become numb to the idea of danger and fear of contamination, especially since the culprit cannot be seen, heard or touched. This attitude, which rests on paternalism, is characteristic of those with a lower educational level and lower social position, who account for the majority of the local inhabitants.

In contrast, a minority of the local population (12-15 percent) takes an active position (Figure 14). They do their best to overcome the disaster. To achieve this end, they combine their efforts in a struggle for their rights for health and survival. Adaptation to the harsh environment leads them develop and elaborate a distinct style of behavior, and give up many of their former habits to the extent that their life-style is changing radically. Due to these people, an entire system of specific knowledge has developed in the region based on their experiences surviving conditions of great radioactive contamination. This system includes five different approaches to both folk and scientific knowledge. First, they maintain those aspects of folk tradition that, in people's views, are beneficial for their health in these ecocidal conditions. Second, they give up those common standards of behavior that have proved to be unhealthy in their present environment. Third, there has been a revitalization of those previously dropped folk habits that are considered beneficial. Fourth, they have invented new approaches to food to cope with the environ-



Figure 14 A meeting of environmental movement activists

ment in general. Finally, they have adapted scientific knowledge to the extent that it can meet the needs of the local residents. It is worth mentioning that this process has its peculiarities among various ethnic groups. It is understandable that it is impossible for local people within the disaster area to overturn their traditional life-styles overnight. The process of adaptation takes a while, and people are still suffering dreadful diseases and hardship.

A horrible uniqueness of the Techa residents' tragedy is that, in contrast to the Japanese Atomic bomb survivors, they, first, have been affected by radiation continuously for about half a century, and second, they are suffering not only from external exposure but from internal sources of radiation as well. The latter is the result of their using local water and food containing 90-Sr.

Whereas the risk of external exposure is a function of a distance from the source of radiation (the Mayak facility), a study of internal exposure demonstrates a more complex cause-and-effect pattern. The health risks of the Techa River residents are closely linked with certain other additional factors other than distance from the Mayak facility alone (Романюха и др. 1994: 148; Kossenko et al. 1997: 58) (Figure 15).

Scientists do not provide a completely satisfactory explanation of these additional factors. At the same time, my study demonstrates that the exposure to internal irradiation depends mainly on the behavior of the people in the contamination zone (see above for the two basic tendencies on the part of Techa residents' toward the risks of radiation exposure) as well as religious and cultural factors affecting this behavior.

Hence, I would like to introduce a two-level approach to the health security of the local residents. My starting point is the well established con-

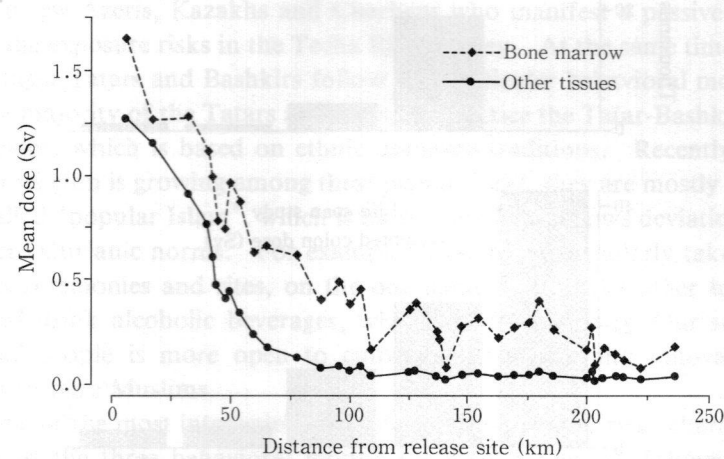


Figure 15 Mean doses to the marrow and other tissues for Techa River villages by distance from the release point. Internal exposures contribute significantly to marrow doses, while doses to other tissues are largely due to external exposure (Kossenko et al., 1997)

clusion (Мопрылис 1988) that internal exposure is a function of the food consumed (94 percent), drinking water (5 percent) and air breathed (1 percent). I argue that every human being is able to be an active agent in the process of surviving in the Techa River Valley environment, providing he or she takes special measures to secure him/herself from the risks of internal exposure. To do that, people must, first, stop using contaminated foodstuffs and water, and second, they must effectively control the respiratory means of radionuclides' migration into their bodies (Figure 16).

On one level, my approach focuses on the health risks of internal radioactive exposure, irrespective to religious and cultural differences in human behavior. On another level, one must acknowledge that people are affected

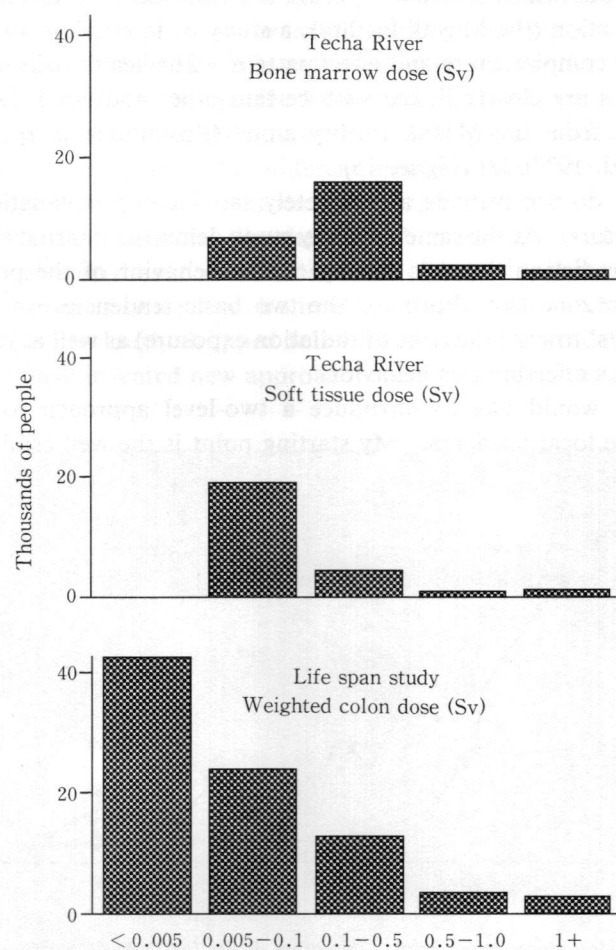


Figure 16 Comparison of the distributions of bone marrow and soft tissue doses in the Techa River cohort to the Life Span Study weighted colon dose distribution (Kossenko et al., 1997)

differently by the same radiation agents, depending on their reliance on different cultural and religious norms of behavior. Thus, this approach appreciates the diversity of ethnic and religious behavioral models. Coming back to our Techa case study, it makes sense to distinguish between three such models, namely the "Russian", the Tatar-Bashkir", and the "Muslim".

The Russian model is characteristic of a few Ukrainians, Belorussians, Mordvinians and Chuvash, as well as ethnic Russians. A lower level of ethnic self-awareness is generally typical of all of them. Ethnic differences manifest themselves mostly in food habits and subsistence economics. There are only a few religious devotees in this group who are actually Orthodox Christians. In the radioactivity-contaminated environment, their religious attitudes are of major psycho-therapeutic importance. However, they do not help to establish any effective control of external exposure. It is well-known that, in respect to food habits, Orthodox Christian beliefs are based on the principle of Christian freedom formulated by St. Paul: "But food does not commend us to God; for neither, if we eat, are we the better; nor, if we do not eat, are we the worse" (1 Cor. 8: 8). Yet, Christians are supposed to avoid both overeating and alcoholism. The Russian model is practiced by the bulk of those Techa residents who actively pursue their aspiration to improve living and health conditions in the Techa River Valley.

The Muslim model of behavior resets on the Qur'anic dogmas, which are especially sensitive with respect to food practices and hygiene of the believers. Yet, I discovered that strictly following the Shari'a regulations causes serious health problems in the environmental conditions of the Techa River Valley. The Muslim model of behavior is mostly typical of elder Tatars and Bashkirs as well as a few Azeris, Kazakhs and Chechens who manifest a passive attitude toward the exposure risks in the Techa River Valley. At the same time, only a few younger Tatars and Bashkirs follow this particular behavioral model.

The majority of the Tatars and Bashkirs practice the Tatar-Bashkir model of behavior, which is based on ethnic domestic traditions. Recently, an interest in religion is growing among these people. Yet, they are mostly oriented to so-called "popular Islam", which is more liberal and allows deviations from the severe Qur'anic norms. For example, these people regularly take part in religious ceremonies and rites, on the one hand, but on the other hand, eat pork and drink alcoholic beverages, which are forbidden by Qur'an. This group of people is more open to cultural borrowings and innovations in contrast to pure Muslims.

Some of the most interesting examples of the exposure risks characteristic of each of the three behavioral models are recorded in the following table (Table 2). This table shows the major effects of various food habits and hygiene norms on internal exposure risks. One can trace the same cause-and-effect patterns in other vital spheres of life as well, namely child care,

Table 2 Behavioral models in respect to internal exposure risks

Cultural and/or religious behavior	Behavioral model: Russian (R), Muslim (M), and Tatar-Bashkir (T/B)	Positive (+) or negative (-) effect
I. Food habits		
1. Breast-feeding up to 2 years of age	M	-
2. Dominance of heavy foods in children's diets (meat, milk, dairy products)	T/B, M	-
3. Heavy consumption of fresh milk	M, R	-
4. Frequent use of fermented milk products	T/B	+
5. Use of waterfowls (geese, ducks) and their eggs	M, T/B	-
6. Pork	R, T/B	+
7. Intestines	R	-
8. Eating meat and fish broth	R	-
9. Eating fish at all	R, T/B, M	-
10. "Salty food"	R	+
11. Meals roasted/fried in fat	T/B, M	-
12. Meat cooked over an the open fire	R	-
13. Potatoes baked in ashes	R	-
14. Green tea	T/B, M	+
15. Mushrooms	R	-
16. Prohibition against eating scale-less fish (deep water species)	M	+
17. Prohibition against fresh onion and garlic	M	-
II. Personal hygiene		
1. Frequent daily bathing	M	-
2. Taking off foot-wear at the entrance to one's house	T/B, M	+
3. Changing out of work clothes at home	R	+
4. Use of sweat baths	R	+
5. Continuous use of carpets, blankets, pillows without shaking out the dust	T/B, M	-
6. Redistribution of the personal belongings of a deceased person to relatives and neighbors	M	-
7. Use of cheesecloth bandages as protection against breathing dust	R	+
8. Permanent use of headgear	M	+
9. Prohibition against smoking	M	+
10. Prohibition against women swimming or sun-bathing at the river	M	+

prophylaxis and self-treatment, the keeping of domesticated animals and fowl, gardening, fishing, hunting, etc.

The treatment of high radiation exposure has nowadays become a problem for all humanity: it is not limited by the boundaries of nations, nor political or religious orientation, nor age, nor sex. In the conditions of Techa River Valley,

it is important to acknowledge that human behavior and its variations might serve as an important factor in adaptation, which may improve or worsen conditions of human life and health. Contemporary Russian authorities are not able to take radical measures, like resettling the Techa people to uncontaminated area or, even to provide them uncontaminated foodstuff, water, health care, etc. That is why the results of my study can and should be used to teach the local people how to survive in their contaminated environment.

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Notes

- 1) It was officially stated that the "Mayak" plant has stopped using the river for waste disposal in 1956. Yet, nowadays it is recognized that contaminated water from this plant is still flowing into the river. It is worth noting that "Mayak" is still engaged in the nuclear industry converting fuel for nuclear reactors, although it stopped producing plutonium for the military as of November 1, 1990. It is also worth noting that the so-called Kyshtym accident, which occurred in 1957, caused a radioactive cloud of 20 million curie to cover 217 villages with a population of over 300,000. Then, in 1967, a hurricane raised the radioactive soil surface from the dead Karachai Lake, which served as Mayak's waste site, and over 43 villages were affected by this occurrence.
- 2) The BER is the biological equivalent of the Roentgen used by the Russian scientists for measuring of an ability of human organism to absorb radiation. One BER is equal to 0.01 Sievert.
- 3) The problem of "low doses" of radiation is of crucial importance to the local residents, for those who were affected by these "low doses" received no compensations at all. In fact, there is no unanimous approach to this issue among the Russian scientists. Some of the latter consider "low doses" very dangerous to human health, especially in the long-term, since it is the descendants of those irradiated who suffer most of all from them. Yet, Russian officials argue that the "low doses" are harmless.
- 4) mR/hour—a unit for radiation measurement used in Russia. For humans, an acceptable level of radiation is between 5 and 30 mR/hour. 1 mR/hour is equal to 0.005 micro Sieverts per year.
- 5) "Momotaro" is a medicine first made of the sea-weed, *Clorella vulgaris* E-25, by professor M. Ogaki in 1978 at the Pasteur Institute (Kyoto) (Murao S., T. Ishii and M. Ogaki. Patent Laid-Open No 129535/1986). After thorough studies, the medicine was evaluated highly by the Russian specialists in medical radiology (Institute of Medical Radiology, Obninsk). In their view, "Momotaro" should be highly recommended to people in regions affected by radiation.
- 6) The Techa residents are aware of the curative qualities of seafood, especially seaweed. They believe that the latter drives the radionuclides out of the human body, and assume that the number of casualties would have been much higher in Hiroshima and Nagasaki if the people there had not eaten seafood in large quantities.
- 7) The entire river network including Techa, Iset', Tobol, Irtysh, Ob' down to the Arctic Ocean is contaminated by radioactive waste. Between 1961 and 1993, wastewater with a cumulative radioactivity of 73,700 curie of 90-Sr was carried out into the ocean from the whole of Russian

territory. Of that, 44.3 percent went into the Karskoe Sea, which was an evident result of the Mayak plant's activity. Specialists predict that the process of contamination caused by the Techa River waters will last for a long time (Ровинский 1998: 25).

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