

# Leproa in the Republic of Karakalpakstan: Issues of Epidemiology and Organization of the Fight Against the Disease

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**Abstract** The article deals with the epidemiology of leprosy. The author also notes that in the study of leprosy, much has not been finally clarified. The issues of the Karakalpak Republican Leper colony are considered.

**Keywords** Leprosy, Epidemiology, Republic of Karakalpakstan, Leper colony, Aral Sea region

## 1. Introduction

Leprosy is one of the oldest diseases known to mankind. Not only mentions of him, but even very specific medical and legal prescriptions related to a patient with leprosy (clinical manifestations, diagnosis, prevention - expulsion from communities, strict isolation, deprivation of inheritance rights, dissolution of marriages, etc.) are found in written monuments of mankind dating back to the XV-X centuries BC. (Indian Vedas, laws of Manu, ancient Chinese medical treatises, ancient Egyptian papyri, Old Testament of the Bible). [9]

In Europe, leprosy has been known since the 7th-8th centuries, but it became especially widespread in the 12th-16th centuries. Subsequently, the incidence dropped significantly. But, so far it has not been possible to obtain the growth of the causative agent of leprosy on artificial nutrient media, which significantly complicates the development of effective methods for diagnosing and combating this disease. [3] Leprosy ("prokaza" in Russian) is a generalized chronic infectious disease caused by *Mycobacterium leprae* and characterized by damage to the integumentary tissues - mucous membranes, mainly the respiratory tract, skin, and peripheral nervous system. In severe cases, damage to bone and muscle tissue, as well as parenchymal organs, is possible.

## 2. Materials and Methods

It should be noted that every year on the last Sunday of January, World Leprosy Day is celebrated, the purpose of which is to draw attention to this issue of the general world community. This day was established in 1954 thanks to the

many years of efforts of the French public figure Raoul Follereau (1903-1977), the founder of the Order of Mercy (1948) and the Federation of European Antileprosy Associations (1966), who devoted his whole life to the struggle for the rights of leprosy patients and won more for this title of "Saint Francis of the 20th century" during his lifetime. [4]

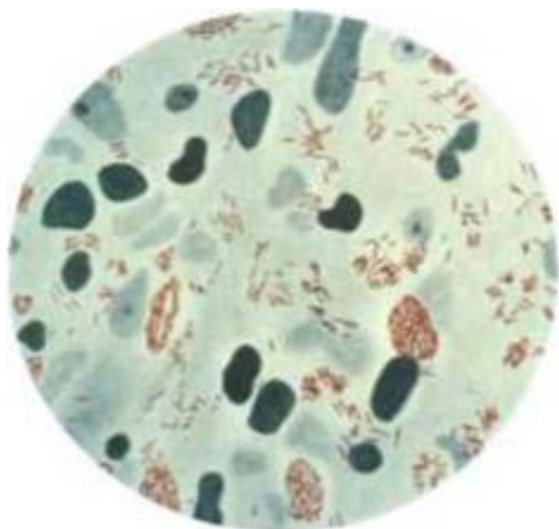
In the study of leprosy, much has not been finally clarified. At the moment, scientists are only just approaching the answer to the question: why do some people get leprosy, while others do not. For example, in the 19th century there were selfless doctors who inoculated themselves with a disease, but never got sick. According to statistics, no more than 2% of people are at serious risk when in contact with patients. Modern research shows that the risk of contracting leprosy is directly related to tissue compatibility genes. This is such a system in our body by which leukocytes recognize their own and foreign cells. [4]

After infection, a person goes through a stage of long-term incubation: in some cases, it is calculated for many years, leprosy is characterized by an extremely long (on average from 3 to 7 years, and sometimes up to 20 years or more) incubation period.

It passes almost asymptotically, has a long latent period of the development of the disease until the first clinical manifestations appear (malaise, weakness, drowsiness, paresthesia, feeling of chilliness), which the patient himself, and those around him, and medical workers do not always pay attention to. [1]

Leprosy in the early clinic is manifested by very diverse types, for example, changes in the color of the skin, single or multiple spotty rashes that vary in location, shape, size and color (erythematous, hypopigmented, hyperpigmented), limited or diffuse skin infiltrates, tubercles, nodes, papules, rhinitis and rashes on the mucous membranes, less often - leprosy pemphigus, prolapse of eyebrows and eyelashes

(madarosis), amyotrophy, paresis of peripheral nerves, violations of superficial types of sensitivity, trophic skin disorders, up to the formation of trophic ulcers. Often in the early stages there are also signs of peripheral vegetative insufficiency and symptoms of reflex-vascular disorders (marbling of the skin, cyanosis, pastosity of the hands and feet, impaired perspiration and sebum secretion). [5]



**Figure 1.** Immobile microorganisms with an unusually long reproduction cycle for bacteria

In 1873, the Norwegian doctor A. Hansen, while working in the hospital of St. Jorges, discovered the causative agent of leprosy - *Mycobacterium leprae*, and in 1874 he described this pathogen, which is a Gram-positive, acid- and alcohol-resistant rods 2-7 microns long, 0.2 in diameter - 0.5  $\mu$ m, stained red according to the Ziehl-Neelsen method. They are also immobile microorganisms with an unusually long reproduction cycle for bacteria (the duration of one division cycle lasts about 12 days). In shape, size, tinctorial properties and method of reproduction (transverse division) *M. leprae* are close to the causative agent of tuberculosis. *Bacillus Hansen* or *M. leprae*, as well as the causative agent of tuberculosis, belongs to the family *Mycobacteriaceae*, the genus *Mycobacteria*.

*M. leprae* is an intracellular parasite, which creates difficulties in its cultivation on artificial nutrient media. However, as mentioned above, unlike the causative agent of tuberculosis, the causative agent of leprosy has not yet been cultivated. Therefore, there are great difficulties in obtaining diagnostic preparations; a preventive vaccine has not been created. Although recent data indicate the development of a special medium containing hyaluronic acid, in which it was possible to inoculate this microorganism.

Leprosy sticks, resistant to acid and alcohol, have amazing species specificity. They only affect humans. Under natural conditions, it is a person who is the only reservoir and source of infection. For a long time, it was not possible to reproduce leprosy in laboratory animals, numerous attempts to infect laboratory animals over a long period were unsuccessful.

Only in 1960, C. Shepard reported limited local reproduction of *M. leprae* during intraplant infection of mice, and in 1971, V. Kirschheimer and E. Storrs successfully reproduced leprosy on nine-banded armadillos (*Dasypus novemcinctus*, Linn). Thus, it was found that in nature there are at least three more species of animals that are susceptible to infection and can be natural carriers of this infection (chimpanzees, mangabeys, nine-banded armadillos). Approximately 10% of armadillos living in Louisiana and eastern Texas are infected.

*M. leprae* are obligate intracellular parasites of the cells of the mononuclear phagocyte system, one division in the tissues of experimentally infected animals is 12-13 days. It is also known that, under certain conditions, *M. leprae* are able to remain viable outside the host organism for a long time (for years). *M. leprae* antigens are characterized by low immunogenicity. [4]

It is believed that the main route of transmission of leprosy infection is airborne, but the possibility of infection through the skin (in violation of its integrity) is also recognized. Leprosy is a much less contagious disease than, for example, tuberculosis. But infection with leprosy can also occur with prolonged direct contact between a healthy person and the source. The pathogen is released from the patient with nasal secretions, saliva, from the surface of open wounds, and with other biological fluids.

Gates for the penetration of infection are mucous membranes, open wounds, gastrointestinal tract. The contact must be long and constant. However, only a small number of contacts are exposed to infection, which depends on the reactivity of the body and the intensity of immunity against the pathogen.

### 3. Results and Discussions

At this stage of the development of science, when considering from the immunogenetic positions of the provisions of the existing theory of hereditary predisposition to leprosy, many of them move from the realm of assumptions to the soil of real facts. For example, one of the last patients in Krantau (it is village in Karakalpakstan) was a young collective farmer born in 1974. Conversations of doctors with the oldest inhabitants of the leper colony helped shed light on the source of its infection. It turns out that the late grandmother of an unsuspecting collective farmer more than thirty years ago was treated in Krantau. She became the cause of the misfortune of her own grandson.

Interestingly, leprosy is rarely passed from mother to child. This is the reason for the creation of children's leper colonies around the world. Children born to sick mothers and being healthy were forever separated from their parents and lived as contact persons in isolation. Another curious fact is that breast milk contains substances that pessimize Hansen's wand.

Leprosy, or Hansen's disease, is still quite common in the world, but especially in developing countries. According to

incomplete WHO data, as of October 1986, there were about 5341 thousand patients with leprosy registered in the world. Under the conditions of this incomplete registration, the prevalence is almost 120 per 100 thousand of the world's population. The population of Southeast Asia (prevalence 336 per 100 thousand population) and Africa (prevalence 210) are especially affected. In Europe, by this time there were 12,775 people with leprosy (prevalence 2), most of them were infected outside the European continent, but in some countries, for example, in Norway, there are internal foci. In 2000, WHO listed 91 countries with endemic foci of leprosy. India, Burma and Nepal together accounted for 70% of cases.

In Uzbekistan, leprosy patients are found mainly in Karakalpakstan, although according to the latest WHO data published in 2018, deaths from leprosy in Uzbekistan have reached 0 or 0.00% of total mortality. Age-adjusted mortality is 0.00 per 100,000 population. [9,10]

Although leprosy is now treated and is very rare, there are still leper colonies in the world, or, as they are called, leper colonies. For example, Abu Zaabal, an Egyptian leper colony 40 km from Cairo, was built in 1933. The police brought lepers here, who were not allowed to leave the colony, since isolation was considered the only treatment for leprosy at that time. Now the living conditions in this institution with all the necessary rooms are much better than in the poor villages from which these lepers came. That is why the 750 patients of the colony and another three to four thousand cured lepers living in the neighboring village of Abdel Moneim Riad do not want to leave this institution. They may not be afraid of the stigma and cruel insults in the back. This story is not about suffering and unhappiness, but rather about the daily life of the microcosm in a godforsaken place, separated from the world. Even in Egypt, many do not know about the existence of the Abu Zaabal leper shelter. [6]

An interesting fact is that the institute in which Gerhard Hansen discovered the causative agent of leprosy was founded in the 15th century in Bergen. It is now a museum and the best-preserved leper colony in northern Europe.

Leprosarium is a specialized medical and preventive institution that actively detects, isolates and treats patients with leprosy. Leprosarium is also an organizational and methodological center for the fight against leprosy.

Usually leper colonies are organized in endemic areas and only in rural areas. Therefore, the Karakalpak Republican Leper colony, being the only specialized medical institution in the Republic of Uzbekistan, is located in the Nukus region of the Republic of Karakalpakstan in the village of Shorkul. The leprosarium is actively engaged in the identification of patients with leprosy, isolates and treats these patients, and also constantly monitors the foci of leprosy and persons in contact with leprosy.

The leper colony includes an inpatient department with 60 beds, an outpatient office, and an organizational and epidemiological department. In the village of Shorkul, patients are provided with residential houses, they have their own subsidiary plots for agricultural work and various

crafts. Depending on the type and severity of the disease, patients stay in the leper colony from several months to several years. The attendants usually also live on the territory of the leprosarium in a zone conditionally separated from the patients' living area. For example, green spaces, ideally, but in our case - just a fence. Although in developed countries today it is no longer practiced to place patients in leper colonies.

The Aral Sea area in the lower reaches of the Amudarya River is considered an endemic area for the distribution of leprosy. This micro-region, rich in fish resources, at one time even led to the emergence of a "fish" theory of the onset of the disease, which turned out to be untenable. For example, there is still a belief among the people that if you eat fish dishes, then on this day it is forbidden to consume lactic acid products.

Even Ibn Sina (Avicenna) - a famous Persian doctor, being from 1002 to 1038 at the court of the Khorezmshahs in Kunya-Urgench, on the left bank of the Amu Darya just 34 km west of Nukus, described leprosy and was one of the first to separate it from others, similar external signs of disease. The word "leprosy" itself began to be used for leprosy thanks to Arabic translators from Greek, and over time became the official medical name for this disease. [7]

"In the East, psoriasis and vitiligo were mistakenly considered the initial and contagious stage of leprosy, so all patients with leprosy (mahau), psoriasis and vitiligo were removed to mahau villages. One of the largest mahau villages for 300 people was located near Tashkent on the banks of the Salar.

In the journal "Russian Doctor" (1903), I. Nazarov reported on the plight of patients in mahau villages. Rossikova, in her travel notes "Along the Amu Darya from Petro-Alexandrovsk to Nukus" (1902), noted that "... leprosy among the Karakalpaks is more common than among other nationalities." However, I. Avdakushin (1902) pointed out that there were no separate settlements for patients with leprosy in Karakalpakstan. Samarkand mahau-kishlaks Charkul, Vakhim, Tegerman, Garibkhonu and others were examined by leading Russian doctors N. Dmitrievsky (1881), K.M. Aframovic (1895). In 1884-1887, G.N. Minkh visited 10 mahau villages in Turkestan, examined 96 patients. The collection of accurate information about the number of patients with leprosy for the first time in Turkestan began in 1895. Doctors found many erroneous diagnoses. So, when examining residents of the mahau-village of Kunchi near Andijan, among 155 residents who were considered sick with leprosy, there were 61 patients with vitiligo, 93 healthy beggars, and only 1 patient with leprosy.

1. The first leper colony in Uzbekistan appeared only under Soviet rule in 1928 near Jizzakh in the village of Bakhmal, at the direction of Faizulla Khodjaev. Closed in 2006 due to the low number of patients. Before the establishment of this institution, patients with leprosy lived in earthen burrows on the Chulpan-ota hill in Samarkand, not far from the Ulugbek observatory, and often visited the Siab bazaar to beg for alms. True,

this is not accurate and most likely one of the urban legends. [8] Due to the endemicity of the Aral Sea region, the presence of a natural focus of leprosy here and the reduction in the number of patients, all specialized institutions of Uzbekistan are concentrated in Karakalpakstan. Then, taking into account the increased connectivity of remote areas, they reorganized into one, moving from quantity to a new quality. Until recently, there were several insti The Karakalpak leper colony in Krantau was closed in 2015;

2. City polyclinic for patients with leprosy in Nukus, transformed into a leprosy room;
3. Outpatient leprosy department of Nukus region, dispensaiy, "children's" leper colony, now it is a modern State institution - Karakalpak Republican Leper colony;
4. Research Institute of Leprosy in Nukus (now closed due to the death in the 90s of its founders, Soviet microbiologist, academician Ch.A. Abdirov);
5. The leprosy outpatient department in Muynak was closed in 2014. The patients were transferred to the Republican leper colony.

Today, leprosy (prokaza) is not widespread in Karakalpakstan. According to the Karakalpak State Leprosarium, as of January 1, 2021, there are 225 people with leprosy in total, 136 of them with many bacillary sources and 89 people with few bacillary sources. Of these, 26 people are treated in the hospital: 21 with many bacillary sources and 5 people with few bacillary sources. But new patients have not been identified.

It should be noted that the Government of the Republic of Uzbekistan and the Ministry of Health of the Republic of Uzbekistan, in particular, the Ministry of Health of the Republic of Karakalpakstan pay great attention to the problems of leprosy research. According to financial indicators for 2020, the leper colony was actually allocated 3,870,190.30 sum.

The Karakalpak Republican Leprosarium cooperates with the German nongovernmental organization Lepra-tuberkulose Ddinslaken. This organization provides great methodological and material assistance to leper colonies and patients around the world. So, she helps the Republican leper colony to provide patients with medicines and medical equipment.

## 4. Conclusions

Thus, we note that at this time leprosy is completely and relatively easily curable, only it will not be possible to eliminate the external consequences that it leaves on the human body during a long period of the course of the disease without treatment. It is on them, as a rule, that it is revealed. And treatment must be carried out in specialized medical and social institutions - leper colonies, however, after the end of treatment, the patient is not limited in freedom and leads a normal life, but is on an outpatient basis for life, checked for relapses.

We state with regret that there are practically not enough materials on leprosy in Uzbekistan, many materials and data exist in paper form in libraries in Russia and abroad. But the treatment of leprosy requires the participation of many specialists. In addition to antimicrobial therapy, consultations and treatment by an orthopedist, tutions: ophthalmologist, neuropathologist, physiotherapist may be needed. With timely diagnosis, leprosy is completely curable. [2] With delayed treatment, the disease leads to persistent morphological changes and disability of the patient.

Based on the foregoing, we consider it appropriate to recommend to the epidemiological services of our republic:

- It is necessary to conduct an annual screening of family and household contacts of patients with leprosy, and in the endemic zone to periodically and massively examine the population using modern methods of serological control;
- In conditions of sporadic incidence of leprosy, it is necessary to achieve limiting the growth in the number of cases by effectively examining "risk groups", increasing the role of clinical examination in this process based on active early detection.

Thus, in order to create the necessary conditions for maintaining the health of the population of our republic, it is necessary to ensure the availability of prevention, diagnosis and treatment of diseases using modern medical devices, as well as high- quality and effective drug therapy. And the creation of conditions for improving the quality and accessibility of medical care to the citizens of our country, taking into account the demographic situation, is a priority direction of state policy in the field of healthcare.

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