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The National Calendar of Preventive Vaccinations is the Basis of the System of Immunoprophylaxis of Infectious Diseases

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Abstract: The NCSP includes vaccinations against two groups of infectious diseases – those that affect almost the entire population (so-called "childhood" infections), and those characterized by a severe course, a high degree of disability and mortality (tetanus, diphtheria, hepatitis B, polio). The timing of the start of preventive vaccinations is determined by the age at which infection is most likely and/or in which the disease is severe. For a number of "childhood" viral infections, the prevention of which is carried out by live vaccines, immunization is carried out after the elimination of maternal antibodies has occurred. The duration of revaccination is determined by the duration of preservation of the protective effect after the completion of the vaccination course. K.Emphasizes the legitimacy of detailing the schemes of vaccination prevention of specific infections, the need to develop multicomponent vaccines that facilitate compliance with the decreed terms of vaccination. The article substantiates the need for regular publication of Russian official guidelines on vaccineprevention.

Keywords: vaccination prevention, Vaccination calendar, combined vaccines.

Introduction

The concept of "Vaccination Vaccination Schedule" was formed in the 40-50s of the last century, when the list of vaccines used (smallpox, tuberculosis, diphtheria, tetanus) was supplemented with the associated pertussis-diphtheria-tetanus vaccine. Over the past decades, the number of diseases that are vaccinated under the NCCP has increased to 17 (these do not include vaccinations against cholera, typhoid and natural focal infections included in the NCCP of individual countries)[1], and the only "loss" – the exclusion of smallpox vaccine – was the result of humanity's first victory over smallpox. infections. Since 2006, vaccination calendars in some countries have included a vaccine to prevent a non-communicable disease-cervical cancer against the human papillomavirus. The list of preventive vaccinations of the National Chamber of Entrepreneurs of Russia, defined by Federal Law No. 157-FZ of September 17, 1998[2]. " On the Immunoprophylaxis of infectious Diseases "(as amended), includes vaccinations against hepatitis B, diphtheria, whooping cough, measles, rubella, polio, tetanus, tuberculosis, mumps, influenza, and hemophilic infection type B.By the same law, the right to approve the NCC is granted to the federal executive authority in the field of healthcare. The latter also establishes a list of preventive vaccinations for epidemic indications, which, in particular, includes vaccinations against hepatitis A and meningococcal infection-diseases included in the NCC of a number of countries. The NCP of Russia is put into effect by orders of the Ministry of Health, issued at significant intervals (1973, 1980, 1997, 2001, 2011 years), to which necessary changes are made periodically. The same practice existed until 1995 in the United States, but then the NCCP in this country began to be reviewed annually[3] . Since 2002, in the United States, in addition to the NCC for the age of 0-18 years, an annual Calendar of preventive vaccinations for adults has also been approved. In both cases, the Calendar (in the form of a table) is accompanied by a description of the schemes and features of the use of each of the vaccines. Abroad, the preparation of regular editions of the NCC is carried out by groups of specialists determined by the health authority, which include immunologists, pediatricians, neurologists, and infectious diseases specialists. In the UK, this work is carried out by the Joint Committee on Vaccination and Immunisation (JCVI), established in 1963 [4]. In addition to the main body, it includes nine sub-committees working in relevant areas. In Germany, this function is assigned to the Standing Committee on Vaccination (STIKO) at the Robert Koch Institute, which

consists of 12-18 specialists appointed for a three – year term[5]. In France, the development of proposals for NCPs is carried out by the Technical Committee on Vaccination (CTV), which consists of 18 members [6]. This review provides a generalized analysis of the NCPs of 196 countries, discusses immunization schemes and preparations included in the vaccination calendars of Russia, the USA, Canada, Brazil, Japan, Australia, Great Britain, France, Germany, Italy, as well as the latest editionsof the relevant WHO recommendations [7]. The material is presented in a series of sections, each of which is dedicated to one of the controlled infections. If at the first stages of the development and approval of the NCPP only the names of drugs used for immunoprophylaxis were indicated, then as new vaccines were developed, their detailed characteristics were included in the calendars (inactivated polio vaccine; DTPvaccine with acellular pertussis component-DTaP [8]; meningococcal tetravalent conjugate vaccine-MENACWY-D) and even their trade names (otarix® and otaTeq® for rotavirus vaccines, Gardasil® and Cervarix® for human papillomavirus vaccines)[9].

Methodology

The first immunization schedule was published in 1961 after the 13th World Health Assembly [10]. It is interesting that in those years, vaccination of children under the first year of life was not given due attention. Only in 1977, after the adoption of the FIR, WHO published a more "traditional" schedule of vaccinations, focused on infants. Subsequently, the pace of change accelerated, and WHO published more than 20 documents with recommendations for vaccination. In particular, the list of basic vaccinations recommended in 1984 for mandatory universal introduction of routine vaccinations in children has expanded from the original six (BCG, diphtheria, tetanus, pertussis, polio, measles) to the current eleven (supplemented with vaccination against hepatitis B, hemophilic infection, pneumococcal, rotavirus infection andhuman papillomavirus, HPV) [11]. In the WHO recommendations intended for national health systems, in order to develop immunization programs, a list of both priority preventive vaccinations for children of the general target group and an additional list of vaccines for children of certain risk groups, depending on the regionand age characteristics of residence, is allocated [12]. However, despite the brilliant successes and significant achievements of the vaccine prevention system, global trends in its development over the past 10 years indicate that the system of routine (mandatory) vaccination is experiencing a global crisis. Financing the procurement of vaccines according to the expanded WHO list and immunization programs is becoming an increasingly difficult task for health systems that are not adapted to highprevention costs. In addition, attention should be paid to a number of issues that challenge national infection safety and require strengthening the position of routine vaccine prevention as the most effective system for managing infectious diseases in the population, functioning within the health care system[13]. The annual report on global immunization programs, published in November 2018 by the WHO Strategic Advisory Group of Experts on Vaccination, predicts that the risks of infectious diseases will increase over the next decade due to massive urbanization and migration [14], global population growth, geopolitical uncertainty and military conflicts, and natural and environmental disasters[15].

Result and discussion

Hepatitis B Vaccinations against hepatitis B (HBV) are included in the calendars of virtually all countries, with two-thirds of the calendars providing for the first injection of the vaccine to a newborn in the first days of life, and the rest - at the age of six weeks to two months. The vaccination course consists of at least three vaccinations. The calendars of a number of countries (USA, Canada, Japan) recommend the introduction of specific human immunoglobulin simultaneously with the first vaccination for children born to women infected with the HV virus. This instruction is not available in the National Veterinary and Epidemiological Service of Russia, although it is contained in the instructions for the medical use of domestic HS-vaccines. Probably, the recommendation to vaccinate родильномдомеall newborns in the maternity hospital without exception, including those born to uninfected mothers, is due to the possibility of immunizing almost all children born, thereby eliminating the formation of a layer of non-immune contingent, which may form as a result of failure to appear for the first vaccination at a later date. This approach is widely used in the United States for rubella vaccination of non-immune puerperas. From our point of view, the transfer of the first

vaccination against HBV to a later age, on the one hand, should not affect the effectiveness of vaccination prevention of this infection, and on the other hand, it will knock the ground out from under the feet of vaccination opponents who convince mothers of the harmfulness of vaccination of newborns. In addition, it should be borne in mind that in the first two months of a child's life, a significant part of the pathology of the early postnatal period may persist or manifest, which has no connection with the vaccination, but can be attributed to the latter.

Tuberculosis Indefiance of the established opinion that vaccination against tuberculosis is not provided in most countries of the world, stubbornly supported by the anti-vaccination campaign, BCG vaccination is not included in the calendars of only 21 countries with a low incidence of this infection (Austria, Belgium, Czech Republic, Denmark, Spain, Germany, Australia, USA, etc. , as well as a number of island states). At the same time, it should be emphasized that the non-inclusion of tuberculosis vaccination in the Vaccination Calendar does not mean its exclusion from the medical practice of these countries. In most other countries, vaccination is provided to all children in the first days after birth, that is, at the age recommended by WHO, обеспечиваяthus ensuring the prevention генералиof generalized forms of infection. In some countries, vaccination is carried out at a later age or only children at risk are vaccinated. It is thanks to vaccine prevention that the annual number of cases of tuberculosis meningitis in Russia has decreased to 21-23 per year. At the same time, the implementation of revaccinations against tuberculosis carried out in Russia is provided for in the NCC of only ten countries. BCG vaccine is one of the oldest drugs available. Currently, fundamentally new tuberculosis vaccines are being developed (subunit with adjuvant, genetically engineered, and vector-based), and six companies are already conducting phase II-III clinical trials of new drugs. By the recommendations of the International Strategic Advisory Group of Experts on Immunization (SAGE) (November 2011), a technical group has been established to develop WHO recommendations for evaluating new vaccine clinical trial programs and protocols, as well as to interpret the results of phase II, III and IV clinical trials, with particular emphasis on safety assessment and the effectiveness of drugs.

Pertussis, diphtheria, tetanus Vaccination against these diseases in accordance with WHO recommendations is carried out in all countries. In recent years, the corpuscular pertussis component of the associated drug has been actively replaced by бесклеточнуюа cell-free pertussis vaccine (BCV), which includes a complex of antigens that ensure the development of immunity (pertussis токоидфиламентозный, filamentous hemagglutinin, pertactin in different proportions, and a number of other additional antigens). Since бесклеточныйthe cell-free preparation lacks the lipopolysaccharide component that determines the toxigenicity of a bacterial cell, its reactogenicity is insignificant, which allows for long-term revaccinations. Currently, the calendars of all countries of the European Union (with the exception of Poland), the United States, Canada, Australia, New Zealand and a number of other countries provide for the use of the acellular DPT vaccine. The low reactogenicity бесклеточнойof the cell-free pertussis vaccine made it possible to recommend the use of a drug with a reduced content of toxoids and an acellular pertussis component even for vaccinations of non-immune pregnant women. However, in November 2012, the SAGE expressed serious concern that, despite the high percentage of coverage of children of maternity age with full-scale vaccinations with revaccination, in some cases developed countries that use the acellular pertussis component vaccine have experienced an increase in the incidence of pertussis, including in younger age groups. A vivid confirmation of the validity of this conclusion is the situation in the United States, where the incidence of whooping cough in some states becomes epidemic outbreaks. From January 1 to June 16, 2012, the number of cases reached 2,520, which is 13 times higher than in the same period of the previous year. CGE expressed the opinion that the reasons for this situation are multifaceted and may be due, among other things, to a faster decrease in immunity when using BKV compared to the whole-cell vaccine. A working group on pertussis was established at the WHO SAGE meeting in November 2012 to review the available data and discuss possible updates to existing recommendations on pertussis vaccines. Since the development of recommendations will require considerable time, the SAGE suggests that countries that do not include BCV in the vaccination calendar should independently review the

available materials and make appropriate decisions. As for the countries that have switched to the use of BKV, SAGE advises to continue using this drug untilthe final conclusion is formed [3]. It should be emphasized that immunization of adolescents and adults against diphtheria and tetanus is carried out with drugs containing a reduced amount of anatoxins. The success achieved by the world community in the fight for global polio eradication due to mass vaccination with live polio vaccine in Africa and South-East Asia amounted to 74 and 76%, respectively [7], and allowed a number of countries to replace this drugwith inactivated vaccine (IPV) in the calendar. This decision was motivated by rare cases of vaccine-associated diseases. Poliomyelitis cases reported in both vaccinated and unvaccinated individuals who have come into contact with themнепривитых. In November 2012, the WHO SAGE supported the exclusion of the type 2 poliovirus component from the oral polio vaccine and recommended that all countries include at least one dose of inactivated vaccine in the routine immunization program to limit the risks that may be associated with the exclusion of the type 2 vaccine virus used. Currently, vaccination calendars in most countries recommend different combinations in the IPV-OPV vaccination schedule when starting a course of inactivated vaccination.

Measles, rubella, and mumps Immunization against measles, rubella, and mumps is included in the vaccination calendars of all countries and, as a rule, is carried out with an associated vaccine after reaching the age of 12 months. The validity of repeated vaccination against these infections, provided for by the calendars of most countries, was confirmed by the council of the Global Alliance for Vaccines and Immunization for Vaccines and Immunisation GAVI) in June 2012. ACIP documents emphasize the need for full-fledged immunization of women against rubella by the time they reach childbearing age. In some countries (Italy, Malaysia, Slovenia, and the Republic of Macedonia), the NCC provides for the vaccination of certain groups of women with rubella mono vaccine.

Conclusion

Hemophilic infection type b Conjugate vaccines against hemophilic infection type b (HIB) have been used for more than 20 years. By 2013, 177 countries, including Russia (2011), were included in the NCPP. The domestic vaccine is included in the State Register, but, unfortunately, the production of the drug has not yet been established, and the country is forced to purchase the vaccine abroad. The vaccination schedule is standard and depends on the age at which vaccinations are started. At the beginning of vaccination at the age of up to six months, the drug is administered three times at intervals of one to two months with a single revaccination one year after the last vaccination. At the beginning of vaccination at 7-11 months, the vaccine is administered twice, followed by revaccination after 18 months. At the age of one to three years, the drug is administered once. At an older age, vaccinations are not provided. The WHO SAGE, having considered the optimal vaccination schedule for HIB at its last meeting (November 2012), concluded that "the number of doses for primary immunization and the need for booster doses need to be analyzed before recommendations for optimizing the vaccination schedule are proposed". SAGE noted the possible dependence of the scheme on the epidemic situation, as well as the need to clarify the interval between vaccinations and analyze data on the potential effect of the HIB component of associated vaccines, including drugs containing бесклеточнуюcell-free pertussis vaccine.

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