

## IMMUNIZATION STRATEGY AGAINST MENINGOCOCCAL DISEASES IN THE CZECH ARMY (1993-1998)

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### Summary

*In spite of sporadic occurrence of Invasive Meningococcal Diseases (IMD), epidemics with high death rates and sequelae are nothing exceptional. N. Meningitidis B was replaced by a new clone of N. meningitidis C: 2a: P1.2 (P1.5). Recruits of military troops deployed in the Olomouc district have occurred among the first afflicted. The clinical outlook resulted even in few deaths. Mass immunization of all the recruits demonstrated increasing immunization coverage reaching up to 98 % in 1998. Vaccine against A+C (Pasteur Merieux) has been used. The mass immunization of all the recruits was followed by a substantial decrease of IMD incidence, which has almost disappeared since that time.*

KEY WORDS: IMD - Invasive Meningococcal Disease; Meningococcal meningitis; Military troops; Mass immunization.

Meningococcal meningitis is an infectious disease occurring in human population mostly sporadically, but even large epidemics with high case fatality ratio (CFR) and serious sequelae in afflicted individuals are very well known. *N. Meningitidis* is the agent causing the disease. Regarding an air-borne transmission of agent specific conditions in military troops seem to be suitable to a spread of infection and higher occurrence of IMD has been registered in various armies (e.g. USA, Finland, Italy).

Early 1993 a new epidemiological and clinical situation in IMD has been developed in the North Moravia region of the Czech Republic. Up to now prevailing etiological agent of Meningococcal meningitis *N. meningitidis* B was replaced by a new clone of *N. meningitidis* C: 2a P1.2 (P1.5) which has not been proved in the Czech Republic since

1979. The diseases caused by the clone of *Meningococcus* have more serious course with high case fatality rate (20 % in 1993), frequently with atypical clinical picture. Among the first afflicted by IMD were conscripts of troops deployed in Olomouc district, too. Six cases of IMD have occurred during the first 4 months of the year, one of those with lethal conclusion. *N. Meningitidis* C has been proved in 3 cases, in other cases no serotyping was carried out.

Based on distribution of disease, epidemiological situation in civilian sector and differences in occurrence of *N. meningitidis* among soldiers in troops of North Moravia region (10-20% carrier rate) comparing to West Bohemia (2% carrier rate), the situation was solved through extraordinary immunization. During this provision about 13 500 soldiers were immunized in garrisons of North Moravia. Meningococcal polysaccharide vaccine with protecti-

vity against serogroup A+C was used. Till the end of 1993 no other disease has been notified in the Czech Army.

In 1994 it is going to further increase in numbers of IMD in civilian population with spread to all the districts of the Czech Republic. Four cases were recorded also in military at the same time. It was decided to carry out detection of carrier rate of *N. meningitidis* in military troops deployed in 8 garrisons all around the Czech Republic. *N. Meningitidis* group C was recognized and proved in 2.2 % of tested persons, and the positive results were obtained in all the regions and in 3/4 of tested troops. Rate of *N. meningitidis* ranged 6-16 % in some groups of contacts with persons afflicted by IMD; the occurrence in others was only sporadic. The results of testing on carriership within healthy groups of recruits and within groups of above mentioned contacts thus have proved, in point of view of followed bacterial agents and possibility of their transmission conditions for development of IMD cases are present in majority of troops.

Based on analysis of IMD occurrence among the Czech army recruits in the first half of 1995 (8 cases of the disease, incidence rate 16 per 100 000, 4 times higher than in civilian age cohort 15-19 years), results of epidemiological study about spread of the disease agent in military troops and consultations with National laboratory for Meningococcal diseases of the State Institute of Health in Prague, the Chief epidemiologist of the Czech Army has decided on carrying out of extraordinary immunization against Meningococcal diseases in recruits entering a basic military service. This decision was approved by the chief hygienist of the Czech Republic. Surgeon general has published Methodological Act No 6/1995 „Extraordinary immunization against Meningococcal diseases“ which set up pool of the army members eligible to immunization, type of vaccine and way of its administration, way of vaccine distribution, guidelines for carrying out the immunization and management of appropriate documentation to handle and secure immunization in the Czech Army.

Meningococcal vaccine containing purified capsular polysaccharide antigen C is used for vaccination. Only one vaccine available was Meningococcal A+C vaccine of Pasteur Merieux company in the Czech Republic at that time. Immunization is carried out in all recruits entering conscript service starting with July 95 term in a mass way. To secure precise dosage, aseptic conditions during vaccination and for effective use of the vaccine one dose pack is used. Each person eligible for vaccination has a right to refuse this provision. Provingly documented immunization less than 24 months before entering the conscript's service is considered to be valid and booster doze is not provided.

Since July 1995 till April 1998 104 317 recruits in total have been immunized using above-mentioned way. Number of immunized, immunization rate and number of adverse reactions after vaccination is mentioned in following table in single years. Number of those, who were immunized before entering the service ranges round 0.5 %. Refusing rate reached only 0.05 %. Absolute contraindication prohibited immunizing 0.2 % persons. Concerning relatively high risk of acquiring IMD in 2<sup>nd</sup> to 3<sup>rd</sup> week after entering the conscript service, where the most rapid settlement of upper airways is developed in single persons in newly created groups with whole day - close contact of all their members and due to physical and psychological stress in not very good hygienic conditions it is very important, to immunize all the recruits at the very beginning (till the 3<sup>rd</sup> day after entering at latest to protect them against the disease development as soon as possible). The immunization coverage increased step by step out of 80% up to 97-98% in current time period thanks to attention, which was given to this activity by both management and health care facilities of our army. In 2-3% recruits it is necessary to postpone vaccination because of short-term contraindication.

Adverse reactions, which require visit at medical point, are rare, mostly not very serious and rapidly vanishing. They represent ratio 0.2-1.9 %, avg. 0.58 %. Local signs represented 58.9 %, general 41.1 %. The most frequent symptoms are in following chart I. Occurrence of general reactions is mostly overestimated, because of simultaneous immunization against tetanus and this vaccine could cause some adverse reactions. The used vaccine is possible to evaluate as safe with very low reactivity.

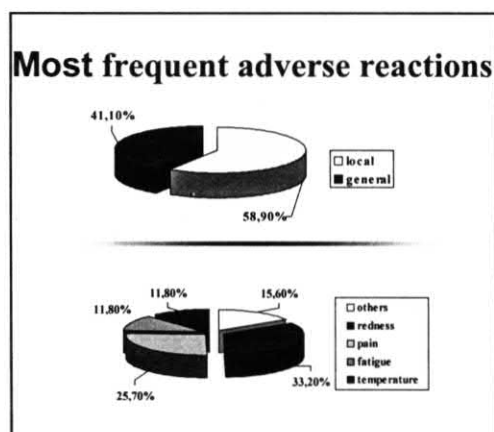


Chart 1

In view of rather early physical challenge to organism of recruit and necessity to carry out immunization against Meningococcal diseases after entering military troops we were interested in immunity response after vaccination. A level of post-

vaccination bactericide antibodies *N. meningitidis* C was detected by bactericide test according to National Laboratory for Meningococci of the State Health Institute in samples of sera collected in days 0, 14 and 28. The results proved presence of bactericide antibodies after 14 days since vaccination in 96% recruits and this ratio did not increase with widening interval after immunization (table I.)

Table 1

Anti-meningococcal Abs anti-C before and after vaccination

Samples taking	No. of samples	Seroconv. Abs.	Seroconv. %
Day 0	108	2	1.85
Day 14	109	105	96.33
Day 28	104	100	96.15

Since introducing extraordinary immunization in July only one case of vaccine failure was recorded in the Czech Army recruits. The disease originated in provingly immunized soldier in June 1996 after 3 month military service. The disease manifested under picture of Meningococcal meningitis, in CSF *N.*

meningitidis C: 2a: P1.2 was cultivated (Serotyping was done in National Laboratory).

Introduction of immunizing recruits against Meningococcal infectious has decreased occurrence of IMD substantially. Mass immunization of all recruits does not allow comparing morbidity rates in immunized and non-immunized persons within the army. However it is possible to compare military and civilian population, which is not covered by similar provision up to now. Since the number of IMD caused unambiguously by *N. meningitidis* C has decreased in civilian population of the Czech Republic in 1996 by 14 % according to previous year. The same decrease in military was by 87.5%. Comparing the disease development in civilian population (particularly age specific morbidity in 15-19 year cohort) and in military after introducing vaccination it is possible to estimate 18-21 cases of IMD were protected by immunizing recruits since June 95 till June 98, what means by CFR more than 10 % at minimum 2 deaths were eliminated.

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