

# Should children adopted from abroad be screened for methicillin-resistant *Staphylococcus aureus*? Original article

## Abstract

**Background.** Patients with increased risk of colonisation with Methicillin-resistant *Staphylococcus aureus* (MRSA) are screened before admission to hospitals in Norway, Denmark and the Netherlands have introduced routine screening of all children adopted from abroad before hospital admission. The present study aims at identifying whether children adopted to Norway had a higher risk of being MRSA positive than other children of the same age.

**Methods.** Incidence rates and relative risks for MRSA infections or colonisation were calculated for children adopted from abroad and for other children. Data from Statistics Norway and the Norwegian Surveillance System for Communicable Diseases (MSIS) were used.

**Results.** The incidence rate for confirmed MRSA infection in children < three years of age adopted from abroad was 1.1 per 1 000 person year, and that for other children was 0.034 per 1 000 person year in the period 1995–2005. In this period, adopted children had 33 times increased risk of being notified with MRSA infection. In 2005, the incidence rate for detected colonisation with MRSA was 3.7/1 000 person year for adopted children and 0.053/1 000 person year for other children; i.e. in this year the risk of being found colonised with MRSA was 70 times higher for children adopted from abroad than for others.

**Interpretation.** Norwegian hospitals should introduce screening for MRSA at hospital admission as a routine for children adopted from abroad during the last 12 months. The Norwegian Institute of Public Health should continue to survey the incidence of MRSA among groups in the population and prospectively change the recommendations for MRSA screening according to new knowledge.

Declared conflicts of interest: None

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*Staphylococcus aureus* can cause a wide variety of infections – anything from superficial harmless skin infections to life-threatening invasive ones (1). Resistance to antibiotics is a global public health problem, and the most frequently identified resistant bacterium in Europe and many other places in the world is the methicillin-resistant *Staphylococcus aureus* (MRSA) (2).

MRSA is resistant to all beta-lactam antibacterial agents and leads to greater morbidity and higher treatment costs than other staphylococcus infections (3, 4).

In contrast to other European countries, the Netherlands and Nordic countries have a low incidence of MRSA (2, 5). In 2005, 460 cases of infection or colonisation of MRSA were reported to the Norwegian Surveillance System for Communicable Diseases (MSIS). MRSA made up less than 1 % of *S.aureus* found in blood culture (5, 6). The current Norwegian prevention strategy mainly aims to prevent MRSA from becoming endemic in hospitals and nursing homes. Before admitting patients to a health institution, it has therefore become a routine to screen those who have an increased risk of being carriers (e.g. patients who have been hospitalized in countries other than the Netherlands and the Nordic countries) (7).

Radke and his collaborators have previously described MRSA in children adopted from China to Norway. They have recommended routine testing of children adopted from abroad when hospitalisation is planned and possibly also in other situations (8). Denmark and the Netherlands, two other countries with low incidences of MRSA, have implemented national recommendations on routine testing of MRSA in children adopted from abroad upon admission to hospital (9,10).

Norwegian recommendations for preventive measures against MRSA are currently being revised by the Norwegian Institute of Public Health. To support the decision on whether children adopted from abroad should be tested routinely, we wished to assess whether they in the period 1995–2005 were more likely to be found MRSA positive

than children not adopted from abroad in the same age group.

## Material and methods.

The number of children reported to have MRSA was retrieved from the Norwegian Surveillance System for Communicable Diseases (MSIS). Notification of MRSA infection became mandatory in 1995. From 2005 it also became compulsory to notify carriers, i.e. MRSA detected on skin or mucosa without clinical manifestation.

We limited the study to children below three years of age, because those adopted from abroad have lived a short time in Norway and it is therefore most probable that they have acquired MRSA abroad. 83 % of those adopted to Norway in the study period were younger than three years. Data from 2005 were analysed separately, as the notification for MRSA carrier condition became a legal requirement that year.

Data were retrieved from Statistics Norway on population and number of adoptions from abroad per year, by the child's age upon arrival to the country. This was used to calculate the number of person years in Norway up to three years of age for each group during the study period. The children below three years, adopted from abroad, had a mean age of 0.89 years upon arrival to Norway. We estimated the number of person years for those adopted from abroad by multiplying the total number of adopted with 2.11. Person years for those adopted from abroad were subtracted from the population to estimate the number of person years for children below three years of age that were not adopted from abroad.

The incidence rate for the two groups and the relative risk expressed as incidence rate ratio (IRR) was calculated for the entire period 1995–2005 and separately for 2005.

## Results

In the period 1995–2005, the MSIS was notified about 94 children below three years with

## Main message

- Children adopted from abroad have an increased risk of being MRSA positive.
- Children adopted from abroad should be tested for MRSA upon admission to hospital.

**Table 1** Clinical situation upon detection of MRSA in children below three years of age in Norway, 1995–2005

Clinical picture	Adopted from abroad	Other children	Total
Wounds/skin infections	9	40	49
Ear infections	5	5	10
Ocular infections		8	8
Sepsis/meningitis		6	6
Urinary infections		2	2
Unknown		5	5
Asymptomatic carriers <sup>1</sup>	5	9	14
Total	19	75	94

<sup>1</sup> Notification of MRSA detection without clinical infection became compulsory from 2005

MRSA. 19 (20%) of these were adopted from abroad (tab 1). 80 of the children had an MRSA infection, and six of the 80 (7.5%) were notified to have a serious invasive infection. None of those adopted from abroad were reported to have a serious infection.

5 950 children were adopted from abroad in the period 1995–2005; they had spent a total of 12 555 person years in Norway. 14 were reported to have an MRSA infection, so the incidence rate was 1.1 in 1 000 person years (tab 2). In the same period, other children younger than three years had 1 939 867 person years in the country. Among these 66 had an MRSA infection, so the incidence rate was 0.034 per 1 000. The incidence rate was thereby 33 times as high in the adopted children as in the others (tab 2).

In 2005, when compulsory notification of MRSA carriers came into force; nine children with MRSA infection and 14 carriers were reported. It was therefore possible to calculate the relative risk of being a carrier or having an infection. The incidence rate for detection of MRSA carriers was 70 times higher in those adopted from abroad than in other children (tab 2). The incidence rate for MRSA detection this year was 5.2 in 1 000 person years, which means that 192 children adopted from abroad need to be tested before one child is found to be positive with MRSA.

## Discussion

We found that children adopted from abroad before they were three years of age (in the

period 1995–2005) had a risk of being notified with MRSA that was 33 times higher than children not adopted from abroad. In 2005, the risk for detecting carriers was 70 times higher among children adopted from abroad. No serious invasive infections have been reported in these children.

### Methodological problems

The number of positive MRSA findings will reflect the number of tests performed. There is currently no national recommendation to test children adopted from abroad. It may still be the case that children in this group are tested more frequently than others. Possible explanations why doctors or parents request such tests, may be that they have heard about the increased risk of MRSA in this group, that they worry about exotic infections or are generally more aware of health risks in these children. If children adopted from abroad have been tested more than those who are not adopted, our material may be biased in such a way that the incidence in those adopted from abroad has been overestimated.

On the other hand, the data quality in the MSIS database may give a selection bias in relation to adoption status. The form for reporting of infectious disease does not contain separate questions about international adoption. This information is interpreted and coded by us on the background of information provided about the patient's mother' and father's country of origin and additional information given in the field for comments.

This information may be missing, wrong-

ly filled in or be misinterpreted when the data are entered into the database. This may have caused data on adopted children to be analysed as part of the other group, and the incidence in the adopted could thereby be underestimated.

### Routine testing of MRSA?

About 20% of otherwise healthy individuals are long-term carriers of Staphylococcus aureus in the nose. The bacteria can cause infections if they get the chance to penetrate skin or mucosa (11,12). Serious infections occur in persons who have another main disease, a weakened defense against infections or both (1,13). Patients in health institutions are especially vulnerable. The results in this study indicate that children adopted from abroad have an increased risk of being MRSA carriers, but that general testing at arrival will only give a few positive results annually. According to data from MSIS no serious infections have been detected in those adopted from abroad. On the other hand there are rare examples of complications after MRSA infections in this group of children. (14). One argument to start general MRSA testing of adopted children upon arrival to the country is that it enables treatment of infections and carrier states. This may spare the child for later MRSA infections and prevent spread of infection to close contacts and to vulnerable patients within the health services. One important argument against routine testing of MRSA upon arrival to the country is the danger of stigmatisation. To be a carrier of MRSA is not dangerous for otherwise healthy children or for close contacts who are healthy. MRSA may in some cases be difficult to eradicate. To be found MRSA positive upon arrival may render the parents unnecessarily anxious, especially if there is not an indication for eradication of the carrier state or in cases where the eradication is not successful. It is mainly upon admission to health institutions that one should take precautions against transmission of MRSA. Children and adults with MRSA who live at home should live their lives in a normal way, without restriction regarding their participation in day-care centres, school, working life (outside the health services) and leisure activities. Children who come from other countries, look diffe-

**Table 2** Incidence of MRSA in children adopted from abroad and other children below three years in Norway, 1995–2005

	Adopted from abroad		Other children		
	Number/person years	Incidence rate (per 1 000 person years)	Number/person years	Incidence rate (per 1 000 person years)	Relative risk (95% CI)
Notified MRSA infections 1995–2005	14/12 555	1,1	66/1 939 867	0,034	33 (18–58)
Notified MRSA infections 2005	2/1 344	1,5	7/169 771	0,041	36 (8–174)
Notified MRSA carriers 2005	5/1 344	3,7	9/169 771	0,053	70 (24–209)
Totally notified MRSA positive 2005	7/1 344	5,2	16/169 771	0,094	55 (23–134)

rent, speak another language and have unfamiliar habits meet many challenges in relation to integration in the Norwegian society. Fear of infection may prevent the integration process and lead to stigmatisation of children adopted from abroad.

Even if no serious MRSA infections have been reported in children adopted from abroad, and MRSA carriers do not pose a threat to otherwise healthy children, the risk for spreading the bacteria to those especially prone to infection is a challenge that should be taken seriously. The Norwegian Institute of Public Health do give advice about MRSA testing of groups who require hospitalisation and are suspected to be MRSA positive (7). Children adopted from abroad have not yet been regarded as a group at special risk of acquiring MRSA.

The results from our study indicate that children who have recently been adopted from abroad should be regarded in the same way as others with an increased risk of MRSA carriership for whom MRSA is currently tested upon admission to a health institution. The study does not provide evidence on whether the incidence of MRSA in the group studied is high enough to justify the economical aspects of routine testing.

If the incidence rate remains on the 2005 level or increases, this will strengthen the argument for testing upon admission to hospital. This presumes that the incidence rate reflects a real prevalence in this group.

Even if the hospitals should start to test children adopted from abroad, these only make up 20% of those in our material who are below three years of age and have MRSA. 80% of those below three years, reported to have MRSA to MSIS in the period 1995–2005, would therefore not be discovered through a routine test of all adopted children. The Scandinavian Society for Antimicrobial Chemotherapy (SSAC), Nordic Working Party on MRSA, issued a report in 2004 where they strongly recommended co-ordination of the Nordic countries' measures against MRSA (15). Adoption of routines in Norway similar to those in Denmark and the Netherlands (all children adopted from abroad are tested for MRSA upon admission to hospital) would contribute to a more similar screening practice in the low endemic countries.

Many carriers will get rid of MRSA after a certain time without undergoing eradication. If testing of adopted children before admission to institution(s) becomes a routine, this should only be required during a certain time after arrival to the country, for example for children who have been adopted from abroad during the last 12 months.

## Conclusion

The results of our study show that children adopted from abroad (below three years of age) have a higher risk of being notified as having MRSA than others of the same age.

This fact is an important argument for testing these children for MRSA upon admission to hospital. Even if there are sound arguments against MRSA testing of adopted children, our conclusion is that Norwegian hospitals should routinely test whether children who have been adopted from abroad during the last 12 months are MRSA positive. The Norwegian Institute of Public Health should continue surveillance of MRSA in this group and alter the advice they give for MRSA testing if new knowledge provides reasons to do so.

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