REGIONAL VARIATION AND TEMPORAL TRENDS OF METICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* USING THE SENTINEL SURVEILLANCE OF ANTIBIOTIC RESISTANCE IN SWITZERLAND (SEARCH)

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Introduction and purpose

Staphylococcus aureus is a leading cause of community-associated and nosocomial infections world-wide. Large geographic variations exist between and within countries and even hospitals, in terms of meticillin-resistance (MRSA). A striking North-South gradient for MRSA has been demonstrated in Europe with lowest rates in Scandinavian countries and the Netherlands. Here we present national surveillance data for MRSA in Switzerland using a novel surveillance program.

Methods

- A laboratory-based active surveillance system (SEARCH, www.search.ifik.unibe.ch) was used (please see also Poster No 1962). Data from 9 (in 2004) up to 15 (in 2007) microbiology laboratories were included in this analysis.
- Laboratories provided resistance and epidemiologic data from in- and outpatients with *S. aureus* isolated from any anatomical source between 2004 and 2007 to a central database. Duplicate isolates were excluded.
- Non-multidrug resistant MRSA as a potential marker for community-associated (cMRSA) was defined as susceptibility to ≥3 of the following: ciprofloxacin, clindamycin, tetracycline and trimethoprim-sulfamethoxazole (TMP/SMX).
- Proportions were compared using X^2 –test or Fisher's exact test; temporal trends were calculated using Cochran-Armitage X^2-test. Correlations were analyzed using Pearson's correlation coefficient. P ≤0.05 two-tailed was considered statistically significant.

Results

Table 1. MRSA and demographics (2004-2007)

	MRSA	MSSA	MRSA in %	p
Location at time of culture				
Long-term care	56	130	30.1	<0.001
Inpatients	487	5387	8.3	<0.001
ICU	219	2481	8.1	<0.001*
Outpatients	386	9718	3.8	<0.001
Gender				
Female	1335	18780	6.6	<0.001
Male	1752	19784	8.1	
Age category				
<2	116	2809	4.0	<0.001
2 to 5	52	1174	4.2	(p for trend)
5 to 15	69	3510	1.9	
15 to 40	545	11227	4.6	
40 to 65	718	11088	6.1	
>=65	2044	11743	14.8	

* ICU is subgroup of inpatients; p=0.134 for comparison between ICU and remaining inpatients

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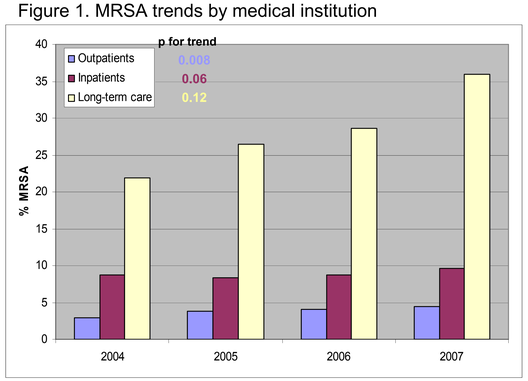
Figure 1. MRSA trends by medical institution



Cave: small denominators for long-term care areas (n=186).

Significant increases in MRSA prevalence were seen in females from 6.1% in 2004 to 7.4% in 2007 (p=0.004), but not in males (from 8.4% in 2004 to 8.6% in 2007; p=0.48).

Figure 2. MRSA trends by age group (yrs)

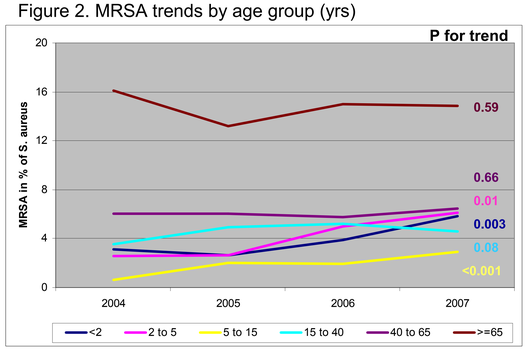
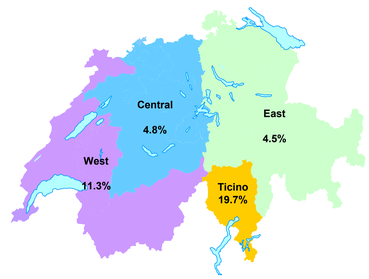


Figure 3. Prevalence of Meticillin-resistance 2004-2007 by region

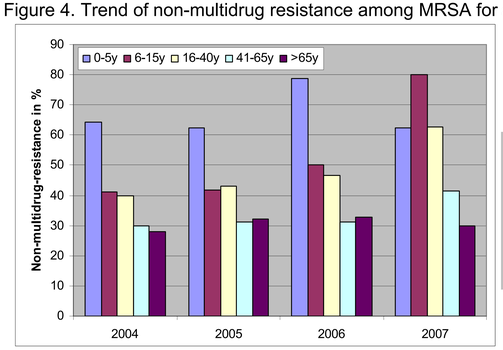


MRSA prevalence in Ticino was about 4-fold higher and in Western Switzerland about 2.5-fold higher than in Eastern and Central Switzerland (p<0.001, for each comparison).

Table 2. Geographic differences in Meticillin-resistance over time

	East	Central	West	Ticino	total
2004	3.5%	4.6%	10.6%	22.1%	7.30%
2005	4.0%	4.5%	10.5%	19.2%	6.80%
2006	5.1%	4.7%	10.6%	20.0%	7.40%
2007	5.1%	5.2%	12.3%	17.6%	8.00%
p for trend	**0.001**	0.16	0.09	**0.01**	**0.014**

Figure 4. Trend of non-multidrug resistance among MRSA for age



p for trend

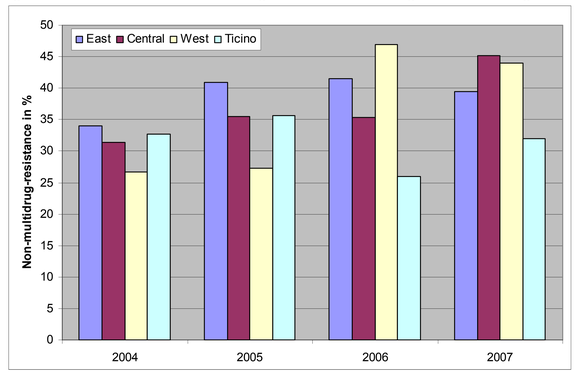
0.98
0.02
<0.001
0.02
0.55

Table 3. Antibiotic resistance of MRSA in % over time

		Ciprofloxacin resistant	n	Clindamycin resistant	n	Erythromycin resistant	n	Fusidic acid resistant	n	Gentamicin resistant	n	Rifampicin resistant	n	Tetracycline resistant	n	TMP/SMX resistant	n
East	2004	38.3	60	21.0	62	26.5	34	13.8	29	20.0	55	1.7	60	16.0	25	5.5	55
East	2005	58.7	92	26.7	90	48.3	58	8.1	62	25.3	83	12.4	89	19.2	52	7.2	83
East	2006	56.7	120	35.0	117	61.0	77	6.7	75	17.1	111	2.6	114	13.9	65	2.6	114
East	2007	48.0	123	35.3	119	57.0	100	6.5	93	20.5	122	1.7	116	7.9	76	5.0	101
X2 test for trend		0.63		**0.03**		**0.004**		0.26		0.67		0.11		0.09		0.54	
Central	2004	74.0	200	57.4	197	70.1	197	3.8	159	30.4	201	4.0	201	11.1	162	5.6	198
Central	2005	68.1	204	48.2	193	68.5	200	6.8	163	22.0	200	6.5	199	18.8	165	5.6	195
Central	2006	72.7	238	38.8	227	59.0	190	5.4	186	16.1	236	6.9	233	11.0	145	1.8	226
Central	2007	61.3	279	35.7	266	49.6	236	5.4	187	15.0	274	5.2	272	13.3	158	3.1	261
X2 test for trend		**0.009**		**<0.001**		**<0.001**		0.69		**<0.001**		0.65		0.93		0.06	
West	2004	97.9	48	53.0	66	81.8	66	2.1	48	24.0	75	0.0	67	0.0	46	4.4	69
West	2005	97.7	43	60.8	74	89.2	74	2.3	43	18.2	77	0.0	74	0.0	43	3.9	77
West	2006	82.2	247	42.3	267	71.0	262	2.0	247	10.7	272	4.1	269	6.0	233	2.2	273
West	2007	87.8	278	46.8	310	78.5	293	2.9	277	16.8	310	3.6	307	8.2	269	3.8	313
X2 test for trend		0.08		0.13		0.29		0.63		0.25		0.07		**0.008**		0.96	
Ticino	2004	97.1	279	58.0	226	73.6	208	15.5	84	7.3	260	2.8	247	1.5	259	0.4	260
Ticino	2005	93.0	230	56.0	193	64.9	188	15.1	206	6.1	213	0.0	210	2.3	219	0.5	213
Ticino	2006	98.3	179	67.6	145	70.4	142	5.0	160	6.1	165	1.2	167	1.8	166	0.6	162
Ticino	2007	93.2	222	59.9	182	62.5	184	2.4	213	1.9	213	0.0	212	1.9	214	1.9	210
X2 test for trend		0.21		0.31		0.05		**<0.001**		**0.01**		**0.01**		0.87		0.08	

(n=tested)

Figure 5. Trends of non-multidrug resistance among MRSA for regions



p for trend

0.49
0.002
0.002
0.43

Overall, non-multidrug resistance of MRSA (Fig. 5) was least prevalent in Ticino compared with the other regions (p<0.02 for each comparison), whereas the differences between the other regions were non-significant.

Non-multidrug resistance was significantly more prevalent in outpatients than inpatients (RR: 1.38, p<0.001). Significant increases over time were observed in inpatients. Trends in long-term facilities (LTF) might be affected by diagnostic bias and small numbers.

Table 4. Non-multidrug resistance in % of all MRSA

	Inpatient	Outpatient	LTF
2004	28.7	53.7	85.7
2005	33.9	44.3	33.3
2006	36.8	45.9	41.7
2007	39.6	52.2	28.6
p for trend	<0.001	0.89	0.02

Conclusions

- In Switzerland MRSA-prevalence is still relatively low, but higher than in Scandinavian countries and time trends are increasing. There are marked regional differences with both a North-South and an East-West gradient mirroring European trends across countries.
- MRSA remains more frequent in healthcare facilities than the community, but trends in the latter are increasing. The high MRSA prevalence in long-term care facilities might be influenced by a diagnostic bias.
- Indicators for spread of cMRSA in Switzerland are:
  - Increasing MRSA prevalence in the community and in children.
  - Increasing prevalence of non-multidrug resistant MRSA in children.
  - High prevalences of non-multidrug resistant MRSA in outpatients.

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