CAN MODELLING ANTIBIOTIC USE BE A TOOL TO BETTER POLICY MAKING?

Nathalie Vernaz-Hegi[1], Pascal Bonnabry[1], Jacques Schrenzel[2], Stephan Harbarth[3]

[1]Pharmacy, [2]Laboratory of bacteriology, [3]Infection Control Program,University Hospitals of Geneva (HUG), Switzerland

1) Model Theory

The relationship between drug consumption and clinical or ecologic effects is important, but difficult to measure. There is a need to develop modelling tools guiding policy changes. To determine **the interest of modelling drug use**, we examined the temporal relation between antibiotic use and the incidence of methicillin-resistant *Staphylococcus aureus* (MRSA) and *Clostridium difficile* in our tertiary care hospital.

2) Modelling: time series analysis

Using time series analysis, we performed a transfer model with aggregated data on antibiotic use. We assessed their effect on the incidence of clinical isolates of MRSA and *C. difficile* from February 2000 to September 2006. The WHO ATC/DDD classification was used as reference normalized per 100 patient-days (PD).

4) Policy making

This study shows that modelling antibiotic use can inform policy makers about negative adverse effects of certain antibiotic agents on selection of MRSA and may ultimately guide control and prevention. Regarding our results, restriction of several broad- spectrum antibiotic agents might positively impact on MRSA. This method can also be applied to other classes of drugs.

3) Result

From the 84% of total antibiotic use (average 33 DDD/100PD) analyzed, 38% showed to have a temporal relation with MRSA incidence (figure1 and table 1) while no association was detected for *C. difficile (figure 2)*.
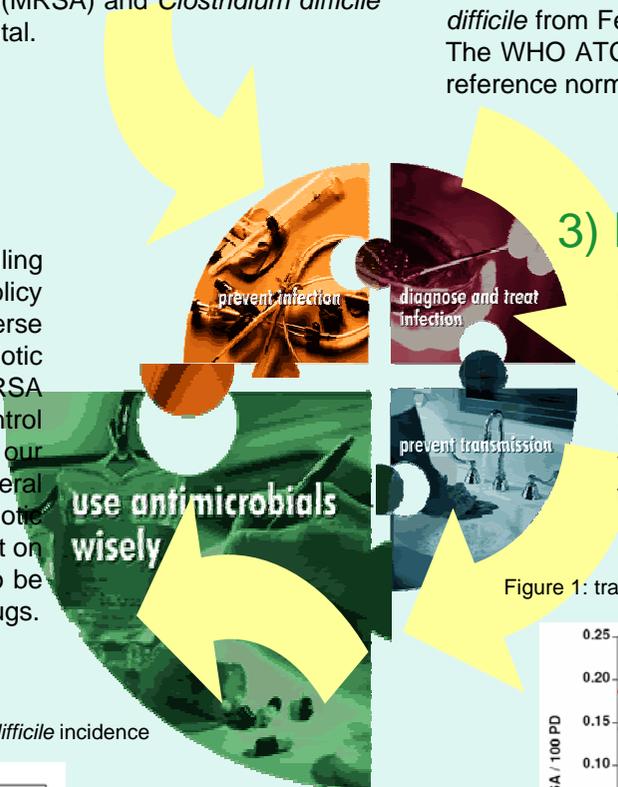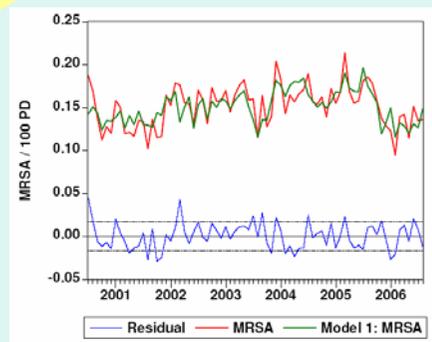

Figure 1: transfer function model on MRSA incidence

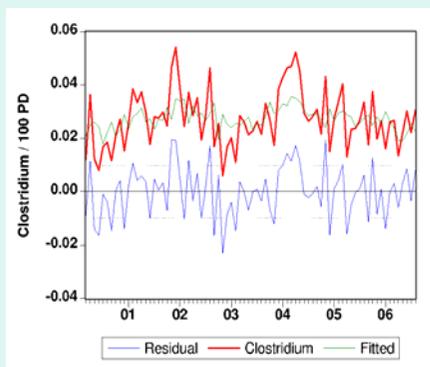Figure 2: transfer function model on *C. difficile* incidence

Table 1: transfer function model on *MRSA* incidence explaining 57% of the incidence over time

Variable	Lag (months)	Parameter (SE)	t-statistic	P
Constant		-0.079 (0.030)	-2.62	0.0110
Fluoroquinolones	1	0.010 (0.004)	2.71	0.0088
Macrolides	1	0.014 (0.004)	3.61	0.0006
Macrolides	4	0.012 (0.004)	3.19	0.0022
3rd generation cephalosporins	4	0.014 (0.006)	2.15	0.0352
3rd generation cephalosporins	5	0.015 (0.007)	2.21	0.0309
Cefepime	3	0.014 (0.006)	2.56	0.0129
Piperacillin/tazobactam	3	0.041 (0.014)	2.97	0.0042
Autoregressive term	1	0.546 (0.168)	3.24	0.0019
Moving average term	1	-0.732 (0.164)	-4.46	0.0000

Example: for fluoroquinolone an increase of 1DDD/100PD of antibiotic use increased significantly 1 month later the incidence of MRSA isolates per 100 PD by 0.01 (=parameter).

Conflict of interest : nothing to disclose

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HUG Hôpitaux Universitaires de Genève