Measurement and reporting of vaccination effectiveness of Hepatitis B

Results of the EUROHEP.NET feasibility survey

N. Neuschäfer-Rube[1], J. Hallauer[1], S.Boccalini[2]
K. Van Herck[3], E. Leuridan[3]

[1] Universitätsklinikum Charité, Medizinische Fakultät Humboldt Universität, Berlin
[2] Department of Public Health, University of Florence, Italy
[3] Centre for the Evaluation of Vaccination, University of Antwerp, Belgium

Objectives

- To give an overall picture of the effectiveness of the existing hepatitis B vaccination programmes in the participating countries.
- To study the feasibility to formulate guidelines to enable uniform measurement and reporting of the vaccination effectiveness.

Methods

- 20 countries (AT, BE, BG, CZ, EE, DE, GR, HU, IL, IT, LV, LT, LU, MT, NL, PL, RO, SK, SL, UK) participated in the EUROHEP.NET survey (2003).
- Based on the results of this survey, an overview is given of:
  - the existing universal hepatitis B vaccination programmes
  - the birth cohorts already covered by these programmes
  - the available coverage rates for the universal programmes.
- The country-specific incidence data for hepatitis B over the period 1990-2001 were used to get a rough estimate of the effectiveness of these programmes (data not shown here).

Birth cohorts covered by universal hepatitis B vaccination

Age in 2003:	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Year of birth	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Country																											
AT																											
BE																											
BG																											
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PL																											
RO																											
SK																											
SI																											
England and Wales																											

no programme
neonatal/infant programmes
childhood/adolescent programmes
overlap of programmes

Coverage rates of the universal hepatitis B vaccination programmes

Universal programmes for neonates and infants

Country	Starting age	1995	1996	1997	1998	1999	2000	2001
AT	3 months					33.5%	33.2%	41.8%
BE (1)	4 months					50-68%		
BG	newborn	95.4%	93.5%	77.2%	97.1%	97.3%	93.7%	93.3%
CZ	9 weeks							97.0%
EE	newborn							
DE (2)	2 months							41.0%
GR	newborn				89.3%			
HU								
IL	newborn	>95%	>95%	>95%	>95%	>95%	>95%	
IT (1)	3 months	93.0%	94.0%	96.0%	96.0%	96.0%	96.0%	96.0%
LV	newborn					94.9%	95.0%	96.1%
LT	2 days				95.7%	95.2%	99.0%	99.2%
LU	1-2 months							94.5%
MT								
NL								
PL	newborn						99.3%	99.6%
RO	newborn			99.9%	99.9%	98.9%	99.0%	98.0%
SK	9 weeks				50.0%	99.2%	99.2%	99.4%
SI								
England and Wales								

(1) coverage at 24 months
(2) coverage at 5 years old

Universal programmes for children and adolescents

Country	Starting age	1995	1996	1997	1998	1999	2000	2001
AT								
BE	11-12 years							
BG								
CZ	12 years							96.5%
EE	12-13 years						75.0%	89.5%
DE	10 years							
GR	6 years							
HU	14 years					99.6%	99.5%	99.9%
IL								
IT (1)	12 years	92.0%	>93%	>93%	>93%	>93%	>93%	>93%
LV								
LT	12 years							
LU								
MT	9 years							
NL								
PL	14 years					12.5%	86.8%	93.6%
RO	9 years							
SK								
SI	6-7 years				90.0%	98.0%	96.6%	97.0%
England and Wales								

no programme in place
existing programme, but no coverage data available

Discussion

- The table on birth cohorts covered by universal hepatitis B vaccination clearly shows the programmes implemented in the participating countries and the number of cohorts targeted. Countries with universal infant and adolescent vaccination programmes in place are able to reach a significant part of their population within a relatively short time. Therefore, this seems to be the optimal strategy, combining the advantages of both programmes until the immun-ized infant cohorts have reached the age when adolescent vaccination takes place.
- As soon as a critical mass of a certain cohort is vaccinated, we may expect that circulation will come down, transmission will be better controlled in a certain age group (where most of the mixing happens or will happen in the future) and the effect of the programme will be more than the benefit of the individual vaccination only.
- Studies on vaccination coverage and disease breakthrough as well as sero-epidemiological surveys are important to evaluate vaccination effectiveness. Coverage rates are measured in most particpa-ting countries with universal vaccination programmes in place, although the age at which coverage is measured differs, as well as the frequency of measuring.

Effectiveness of universal vaccination

- Vaccination efficacy is defined as "the extent to which (vaccination) produces a beneficial result under ideal conditions (mostly a randomised controlled trial)"; vaccination effectiveness is defined as "the extent to which (vaccination), when deployed in the field, does what it is intended to do for a defined population" (as defined in *John Last. A dictionary of Epidemiology, 2nd Edition. Oxford University Press, 1988, ISBN: 0-19-505481-4*).
- As such, effectiveness of universal hepatitis B vaccination programmes should be assessed by evaluating the extent to which hepatitis B is subject to control in the population of a given country.
- While we realise correctly measuring effectiveness of a universal vaccination programme is extremely difficult, if not impossible, we tried to use the incidence data obtained from the EUROHEP.NET survey for a rough estimate of the actual effectiveness:
- To assess the average trend for reported acute hepatitis B cases for the period 1990-2001, the slope of the linear trend line fitted to the incidence data was calculated for each country. This showed an overall negative trend of acute hepatitis B incidence in 16/20 countries. Countries that did not show this overall negative trend include both participating countries that had no universal vaccination programme in place during the years 1990-2001.
- An attempt to discriminate between the slopes of the linear trend lines fitted to the incidence data before and after the onset of a universal vaccination programme was judged meaningless. After all, one should in that case take into account the coverage rates of that specific vaccination programme, eventual changes in the methodology or completeness of the reporting system and the fact that it would take a number of years before any measured effect on hepatitis B incidence or burden of disease can be attributed to universal hepatitis B vaccination, especially in the case of infant vaccination.