

## Vaccination for viral hepatitis in industrial health

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### Introduction

The practice of industrial health medicine, exclusively preventive, concerns the work-force and has a single aim – to protect the health of the worker – on three levels :

- Ensuring that no worker can come to harm on account of working conditions ;
- Early detection of any health problem that might nevertheless appear or be aggravated by working conditions ;
- Contributing to the inspection of working conditions and the physical environment in order to eliminate any health risk or avoid any harmful factors being introduced through oversight, carelessness or ignorance.

Prevention of hepatitis is an excellent example for illustrating the role of the industrial health doctor. His main responsibilities are as follows :

- adapting work-stations and working methods ;
- making arrangements for the collective and individual protection of workers ;
- detecting health problems through regular biological screening ; taking part, as far as he is competent, in the follow-up to industrial injuries ;
- ensuring the protection of workers through vaccinations and taking on the follow-up.

As soon as the hepatitis B vaccine came onto the market, industrial health doctors proceeded with massive vaccination of exposed workers, more particularly health professionals. The number of work-related illnesses declared for hepatitis B fell rapidly, approaching zero in recent years.

### 1. Legislative aspects in Belgium

A. *Protection of workers against risk related to exposure to biological agents (Royal Decrees of 4/8/96 and of 22/4/99)*

These two legal texts are the cornerstones to the policy of protection against all biological agents including hepatitis viruses.

Although we do not wish to give an exhaustive account of these decrees, certain articles must be brought to notice as concerns vaccination :

Article 44 : if the evaluation reveals that workers are exposed or liable to be exposed to biological agents for which an effective vaccine is available, the employer must provide the possibility of vaccination to his employees insofar as they are not already immunised.

Article 45 : the employer informs the employees concerned, as soon as they are taken on and before exposure to biological agents, of the availability of an effective vaccine. These employees are also informed of the advantages and disadvantages of both vaccination and non-vaccination.

Article 46 : vaccinations and revaccinations are carried out by prevention advisers – industrial health doctors, or by other doctors chosen by the workers in question - NB : these doctors have to produce a vaccination certificate for the industrial health doctor (article 54).

Article 47 : employers are forbidden to place or keep in work employees subject to compulsory vaccination and for whom they have no vaccination record.

Articles 63 and following : define practical arrangements for vaccination against hepatitis B, which is compulsory for certain categories of workers.

B. *Modes of reimbursement by the Occupational Diseases Fund (Fonds des Maladies Professionnelles (FMP))*

Intervention by the FMP is limited to private sector enterprises and to certain public administrations, provincial or local, who pay subscriptions.

#### HEPATITIS A

The 17/6/2002 Royal Decree provides for the FMP to cover the charge for vaccinating non-immunised employees in contact with faeces.

#### HEPATITIS B

This intervention applies to various types of occupational situations :

1. Risks of occupational disease or accidental contamination where the risk is manifestly increased, i.e. definitely greater than that incurred by the general population, to the exclusion, automatically, of occasional exposure.

Annex VI to title V, chapter III of the Code of Industrial Welfare (Code du Bien Etre au Travail) gives a definition of the organisms and workers for whom vaccination is compulsory.

Organisms	Workers
Services providing medical examinations and/or medical treatment.	All employees working in these services (medical, paramedical, technical and maintenance staff), with the exception of administrative staff, that is those who never come into contact with substances that might contain the virus, whether or not they form part of the services' staff. More particularly targeted are employees working in renal dialysis services, anaesthesia services, operating theatres, sterilisation services, intensive care services, internal medicine services and treatment (especially hepatology) and emergency services.
Blood-transfusion laboratories.	All staff, except administrative staff, that is those who never come into contact with substances that might contain the virus.
Clinical biology laboratories.	Idem.
Oncological research laboratories.	Idem.
Preparation laboratories for hepatitis B vaccine.	Idem.
Anatomopathology laboratories.	Idem.
Dentists' surgeries.	Idem.
Laundry services for treatment centres.	Idem.
Social support services and emergency services.	Idem.
Residential institutions for the mentally ill.	All caring and educational staff.
Funeral services.	All staff dealing with shrouding and embalming of bodies.
Experimental animal centres and zoological gardens.	Workers who have direct contact with anthropoids.
Detention centres.	Prison guards.
Other organisms.	Workers who, for occupational reasons, spend time repeatedly or for long periods in areas with a great preponderance of hepatitis B (South-East Asia and Africa).  Workers for whom the results of evaluation reveal the possibility of exposure to the hepatitis B virus.

- Staff of hospital services and medical or paramedical surgeries ;
  - Staff of laboratories for analysing blood or biological products that might be contaminated by the virus (clinical biology, anatomopathology, oncology, ...) ;
  - Medical, dentistry and paramedical students, before reaching professional training ;
  - Dental surgery staff ;
  - Laundry staff attached to treatment centres.
2. increased risk on the basis of risk evaluation ; the FMP can nevertheless check the presence of risk on its own initiative.
- Staff in services caring for patients with long-term illness, as well as in retirement and care homes (*Maison de repos et de soins* (MRS) ;
  - Carers in institutions for the mentally handicapped ;
  - Staff of crèches ;

- Day nurses and nursery staff ;
- Home helps ;
- Employees in non-clinical laboratories and students training in circumstances where they are in contact with human blood or biological products (biology, biotechnology, genetic engineering laboratories and those where blood analysis kits are assembled, etc..) ;
- Ambulance staff ;
- Firemen in emergency services ;
- Company firemen on call at 100 ;
- Professional firemen in provincial and local administrations ;
- Funeral services employees called on to work within hospital precincts ;
- Staff dealing with the sale or repairs of apparatus in medical use and who may be in contact with blood or other biological products ;

- Teachers in special schools for the handicapped (in the private sector, without State subsidy). These teachers often have to give treatment to the handicapped in their care ;
- Teaching staff in medico-pedagogic institutions for the same reasons ;
- Laundry staff working in treatment centres ;
- Psychologists working in individual therapy centres ;
- Cleaners in day-centres for the handicapped ;
- Managerial and supervising staff in protected workshops which occupy mentally handicapped persons.

3. The following are excluded from FMP reimbursement of the vaccine

- Prison guards : the risk is occasional and furthermore, federal authority staff have no right to refunding of preventive health care charges, according to the legislation on occupational diseases ;
- Police officers : they are not exposed to increased risk ;
- Laundry workers who are not in contact with laundry from treatment centres ;
- First-aid personnel : the risk is occasional ;
- Merchant marine sailors : they are not exposed to increased risk and are not part of caring staff ;
- Staff dealing with the sale and repair of laboratory apparatus not destined for medical use ;
- Zoological garden staff : they are not on caring staff ;
- Refuse collectors : they are not on caring staff ;
- Funeral services staff who are not called on to work within hospital precincts.

If this FMP list is compared with that of the Code du Bien-être au Travail (Industrial Welfare Code) or with the conclusions from risk-analysis carried out by industrial health doctors, discrepancies become evident. In consequence, certain employers propose vaccination to workers, of their own accord and at their own expense, when the risk-analysis has shown that increased risk of contamination by the hepatitis B virus exists.

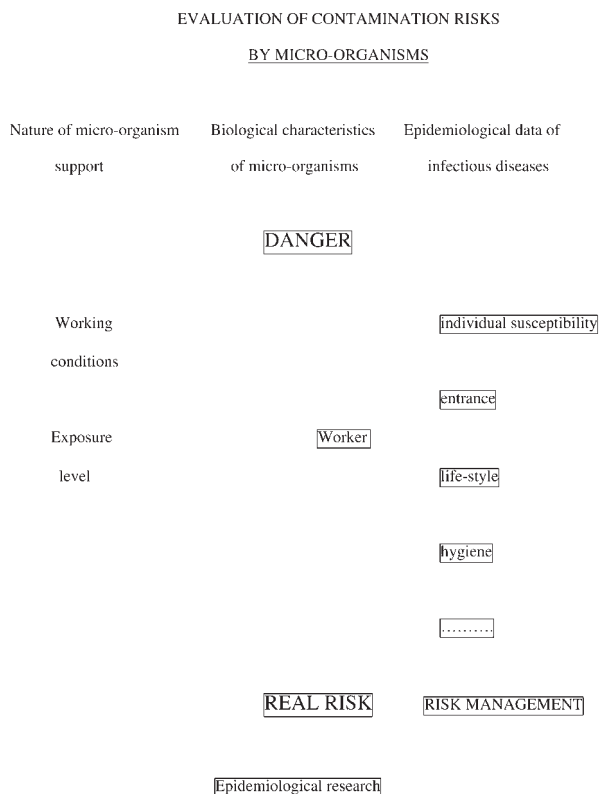
## 2. Risk analysis

Whereas in certain occupational sectors exposure to risk is self-evident, in some situations, however, the decision to recommend vaccination is only taken after a risk-analysis procedure.

Clearly, the contamination risks for workers in the same occupation are not necessarily identical, but may vary according to actual working conditions and even to individual factors.

The analysis procedure depends on the appreciation of all these extrinsic and intrinsic factors (Fig. 1).

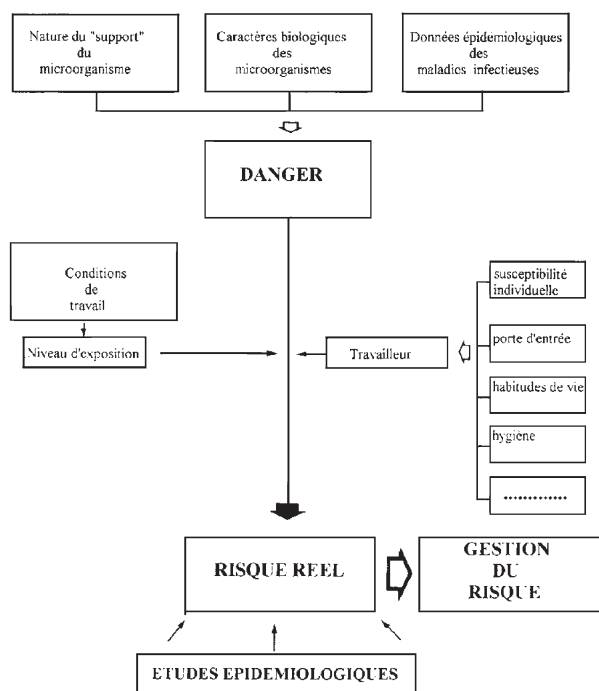
The following lines present some considerations arising from our respective experience in providing vaccination against the hepatitis A and B virus.



Adapté from Schlosser et Lacharموise 1996)

Fig. 1

## EVALUATION DES RISQUES DE CONTAMINATION PAR MICROORGANISMES



Adapté from Schlosser et Lacharموise 1996)

Fig. 2

## A. Hepatitis A

Vaccination against hepatitis A in industrial health must be considered in the two following situations :

- When risk analysis has revealed the existence of increased risk of contact with the virus : protective measures for workers ;
- In order to prevent transmission of the disease (essentially in the food sector) : protective measures for consumers.

a) Subjects exposed to increased risk of contact with the virus :

1. Hospital staff in the following services : emergency, pediatry, gastro-enterology, infectiology, medical analysis laboratories.
2. Staff who collect, sort and deal with soiled linen in treatment centres.
3. Staff in crèches, nurseries, nursery school teachers (particularly in schools with a partly immigrant population) ; a larger number of hepatitis A cases being observed in children in autumn (after the end of holidays and a possible return to their native country).
4. Staff in institutions for the mentally and physically handicapped.
5. Work stations exposed to liquid waste.

Many studies have shown a significant difference between exposed and non-exposed workers (Odd ratio of 1,8 to 2,6), with a good correlation between prevalence of the infection and length of exposure (FORESTIE-AUTER and ABADIA 1996, SCHLOSSER and LACHARMOISE 1996 – SCHLOSSER and ROUDOT-THORAVAL 1996, BENBRIK and Coll. 2000).

HAV resistance in the environment is considerable. Its persistence in liquid waste, superficial water and the ground runs to three months at 25°.

- Staff employed in the running and maintenance of drainage networks. Staff using inspection networks (telephone lines, compressed air circuits, water supply).
  - Staff employed in the running and maintenance of sewage-works.
  - Technicians in liquid-waste analysis laboratories.
  - Plumbers, construction workers and public works employees dealing with drainage networks (connection, maintenance) or individual drainage systems (septic tanks).
  - Firemen : possible exposure to liquid waste while dealing with flooding.
6. Staff dealing with collection, sorting and treatment of non-inert and non-industrial waste products.
  7. Staff in the food sector

According to certain studies, the risk of HAV infection in the staff of this sector appears significantly

higher than among the general population. In this case, the risk varies greatly according to the geographic zone and the type of activity. On the other hand, some studies show no difference.

The soiled nature of certain food-products is the probable source of worker contamination (TOUCHE, 1995).

8. Staff working with primates, which can be healthy carriers of the hepatitis A virus.
  9. Workers on missions to foreign countries in endemic zones.
- b) Subjects presenting an occupational risk of transmitting the disease

This means employees of the food sector and particularly of restaurant services. The literature has reported a certain number of food contaminations coming from infected employees (Touche, 1995, Guisnet, 1995).

The vaccination of the staff employed in food manipulation thus constitutes a means of preventing contamination of food-products and so of the consumer.

## B. Hepatitis B

a) The hospital sector

Hospitals are the high-risk sector par excellence as far as HBV contamination is concerned. In fact it is in this professional environment that the vaccination policy for this virus was initiated in the early eighties.

It can be considered that, apart from administrative personnel, all staff categories working with a hospital are at risk. Whether during technical, diagnostic or curative acts or following on from these acts, such as during tidying and clean-up of places of work or instruments, or again during maintenance operations, the staff is at the mercy of pricks, cuts, splashing, ...

b) Non-hospital sectors

The following sectors are considered under this denomination :

- Assistance to and/or care of persons, including in private medical and dental surgeries ;
- Emergency services : SAMU (Emergency Medical Assistance Service), firemen and police officers ;
- The waste-disposal sector ;
- Various professional categories such as workers travelling in endemic zones, prison guards, funeral services employees ...

1. Assistance to and/or care of persons

1.1. Staff in retirement and care homes (RH and RCH)

*Maisons de repos et de soins (MRS) and maisons de repos (MR) :*

**MRS** : to be compared with hospital centres ;

**MR** : acts of less medical or technical nature, but often in less safe working conditions, which increases the risk.

#### 1.2. Crèche staff

Opinions are divided concerning justification for vaccination in this sector. It seems, however, advisable, considering the larger and larger population shifts in our country, even in rural areas.

#### 1.3. Home care and assistance services (family-helps, help to the aged)

The risk is often underestimated, the tasks carried out by workers being very diversified and involving close contact with the person assisted (washing procedures, treatment of slight physical ailments ....)

#### 1.4. Non-hospital institutions for the accommodation of the mentally ill and/or persons in a difficult situation.

To various degrees and for a range of reasons (presence of Down's syndrome, psychotic patients, drug-addicts) the contamination-risk is here considerably higher than in the general population (Vandamme *et coll.*, 1995).

#### 1.5. Staff in dentists' surgeries and private doctors' surgeries are of course to be assimilated to hospital staff.

### 2. Emergency services

In emergency services, the risk of contact with blood and/or infected secretions is well established for fire and ambulance men (disengagement of bodies) and emergency medical staff.

In the case of police officers, however, as a New Zealand study has shown (BANDARANAYAKE and Coll., 1991), only activities in a risk-sector are associated with higher sero-prevalence and might justify vaccination. Risk-analysis is thus all-important in this case. In practice, we have adopted the attitude of targeting officers exposed to increased risk (intervention teams, anti-drug patrols...).

### 3. Waste collection, sorting and recycling.

The risks run by these workers are less well-known. There is a particularly high risk for refuse-collectors picking up hospital waste, but there is still a risk at other work-stations, for example :

- The presence of needles in plastic bottles, causing pricks during sorting ;
- The presence of medical material (drip kits, needles), placed by mistake or fraud in the general waste and constituting a risk for the refuse-collectors and reception staff at the rubbish-tip ;
- The presence of needles in garden waste liable to cause injury during manipulation of compost...

With these occupational categories should be associated workers in various public or private administrations employed in the maintenance of open spaces, parking-lots, green verges ...

#### 4. Other professions to be considered :

- Persons travelling or working in risk-zones ;
- Prison guards ;
- Funeral services staff,....

## 3. Practical procedures

### A. Vaccination schedules

#### - Hepatitis A

- |                      |                  |
|----------------------|------------------|
| 1 <sup>st</sup> dose | - month 0        |
| 2 <sup>nd</sup> dose | - months 6 to 12 |

Previous screening for immunity is indicated for persons who have spent over a year in a tropical country or are already 40 years old : they have probably been exposed to the virus, often without symptoms. This dosage is indispensable for obtaining an FMP refund of the vaccine.

#### - Hepatitis B

- In the absence of FMP intervention :

#### Short schedule

- |                      |           |
|----------------------|-----------|
| 1 <sup>st</sup> dose | - month 0 |
| 2 <sup>nd</sup> dose | - month 1 |
| 3 <sup>rd</sup> dose | - month 6 |
| HBs antibodies       | - month 8 |

- In the case of FMP intervention, when the risk is manifestly increased :

#### Long schedule

- |                      |            |
|----------------------|------------|
| 1 <sup>st</sup> dose | - month 0  |
| 2 <sup>nd</sup> dose | - month 1  |
| 3 <sup>rd</sup> dose | - month 2  |
| 4 <sup>th</sup> dose | - month 12 |
| HBs antibodies       | - month 14 |

If, following the dosage, the antibody rate is below 10 IU/ml, a double injection is given ; a new dosage is carried out after 2 months. In the absence of response, the worker is considered as unresponsive and the procedure is interrupted.

- Exception for student jobs

The 3/5/1999 Royal Decree lays down that it is forbidden to employ young people on jobs considered dangerous, in particular, work involving exposure to biological agents. There are derogations for students working within their professional training schemes.

However, timing considerations (medical examination, end of school or academic term) often make it impossible to apply the schedules described above.

In addition to universal precautionary measures, another short vaccination schedule may then be proposed :

1 <sup>st</sup> dose	– day 0
2 <sup>nd</sup> dose	– day 7
3 <sup>rd</sup> dose	– day 21

Combined vaccination by TWINRIX®

1 <sup>st</sup> dose	– month 0
2 <sup>nd</sup> dose	– month 1
3 <sup>rd</sup> dose	– month 6

The 20/3/2001 Royal Decree allows refunding of TWINRIX® where hepatitis B vaccination is indicated.

Three doses are refunded ; a further injection in the form of HB VAX II® or ENGERIX® B can also be refunded when the antibody rate is below 100 IU/ml.

## B. VACCINATION CONTRA-INDICATIONS

In our practice, we note the following situations :

- Pregnancy and breast-feeding : relative contra-indications ; in practice, measures distancing the patient from biological risks have generally been taken within maternity protection schemes (2/5/1995 Royal Decree) ;
- Allergy to vaccine components (Thiomersal®) ;
- Personal neurological disorder antecedents.

For hepatitis B, our service considers that the worker presenting side-effects to the vaccination or shown as unresponsive, has complied with his legal obligations. A vaccination certificate is, in this case, delivered to the employer.

## C. REFUSAL OF COMPULSORY VACCINATION

In the case of persons who refuse vaccination and for whom there are no contra-indications, the industrial health doctor informs the employer that the employee has not complied with this legal obligation.

## Conclusion

Hepatitis A and Hepatitis B vaccines have been an important step forward in the last 20 years and given industrial health doctors an essential tool for managing the worrying problem of hepatitis in different occupational sectors.

In view of the high cost of vaccines, both for the collectivity (in the case of FMP intervention) and for enterprises, this procedure should be reserved to employee categories for which a rigorous evaluation of working conditions has revealed an increased risk in comparison with the general public.

## References

1. BANDARANAYAKE D.R., SALMOND C.E., TOBIAS M.I. Occupational risk of hepatitis B for Police and Customs personnel. *Am. J. Epidemiol.*, 1991, **134** (12) ; 1447-53.

2. BENDRIK E., TIBERGUENT A., DOMONT A. Enquête comparative de séro-prévalence de l'hépatite A entre des personnels d'une station d'épuration, de l'assainissement et administratif. *Arch. maladies professionnelles*, 2000, **61** (1) : 7-28.
3. DOMART M. Séroprévalence de l'hépatite A chez le personnel de cuisine des hôpitaux de l'AP-H.P. in Actes des 5<sup>èmes</sup> journées de Médecine du travail, Epidémiologie, Ergonomie dans les petites et moyennes entreprises. *Symposium sur l'hépatite A*, Amiens, 1995, p. 59.
4. Fonds des Maladies Professionnelles. Vaccination contre l'hépatite : critères et procédure de remboursement. FMP – Bruxelles, avril 2001, 20 p.
5. FORESTIE-AUTER A.F., ABADIA G. Hépatite A et eaux usées. Stratégie vaccinale en milieu de travail. Documents pour le médecin du travail, 1996, **65** : 7-8.
6. GUISET P. Le risque alimentaire : étude de la séroprévalence chez les professionnels, in Actes des 5<sup>èmes</sup> journées de Médecine du travail, Epidémiologie, Ergonomie dans les petites et moyennes entreprises. *Symposium sur l'hépatite A*, Amiens, 1995 p. 58.
7. SCHLOSSER O., LACHARMOISE J.L. Risques microbiologiques au contact des eaux usées : méthode d'évaluation : XXIV<sup>es</sup> journées nationales de Médecine du travail, juin 1996. *Arch. maladies professionnelles*, 1995, **58** (4) : 370-372.
8. SCHLOSSER O., ROUDOT-THORAVALE F. Expositions professionnelles aux eaux usées et risque d'hépatite virale A. *Arch. maladies professionnelles* 1995, **56** (1) : 23-27.
9. TOUCHE S. Le risque en milieu alimentaire in Actes des 5<sup>èmes</sup> journées de Médecine du travail, Epidémiologie, Ergonomie dans les petites et moyennes entreprises. *Symposium sur l'hépatite A*, Amiens 1995, 56-57.
10. VANDAMME P., CRAMM N., VAN DER AUXERA J.C., VRANCKX R., MEHEUS A. Horizontal transmission of hepatitis virus. *The Lancet*, 1995, **345** : 27-29.

## LEGAL TEXTS

Ministère de l'Emploi et du Travail.

4 août 1996 – Arrêté Royal concernant la protection des travailleurs contre les risques liés à l'exposition des agents biologiques au travail.

M.B., 01/10/1996, 25285-25336.

Ministère de l'Emploi et du Travail.

29 avril 1999 – Arrêté Royal modifiant l'Arrêté Royal du 4 août 1996 concernant la protection des travailleurs contre les risques liés à l'exposition des agents biologiques au travail.

M.B., 07/10/1999, 37917-37944.

Ministère des Affaires Sociales, de la Santé Publique et de l'Environnement.

20 mars 2001- Arrêté Royal modifiant l'Arrêté Royal du 28 juin 1983 établissant une nomenclature spécifique pour prestation de soins de santé en matière d'assurance maladies professionnelles.

M.B., 12/04/2001.

Ministère des Affaires Sociales, de la Santé Publique et de l'Environnement.

17 juin 2002- Arrêté Royal modifiant l'Arrêté Royal du 28 juin 1983 établissant une nomenclature spécifique pour prestation de soins de santé en matière d'assurance maladies professionnelles.

M.B., 17/07/2002, p. 32311.

Ministère de l'Emploi et du travail.

3 mai 1999- Arrêté Royal relatif à la protection des jeunes au travail.

M.B., 03/06/1999.