National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Surveillance of work-related infectious diseases

Report 205014008/2010

C.T. Heimeriks, D. Beaujean, J. Maas

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in the Netherlands in 2009

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Abstract

Surveillance of work-related infectious diseases
Analysis of work-related infectious diseases in the Netherlands in 2009

The number of notifications of infectious diseases contracted by people at work in the Netherlands in 2009 is low, and represents only one to two per cent of the total number of notifications of infectious diseases. However, these data are not complete. Part of the reason for this incompleteness is because the occupational link is not registered (in Osiris) or the source of infection is unknown. Research commissioned by the Ministry of Social Affairs and Employment (SZW) and carried out by the Centre for Infectious Disease Control and Prevention (CIb) from the National Institute for Public Health and the Environment (RIVM), shows that, compared with previous years, there is a slight increase in notifications. With this research, SZW aims to increase the knowledge base on work-related infectious diseases and share this knowledge with employers, employees and occupational health professionals so that they can introduce appropriate measures.

For the purpose of this research, an analysis was made of both the registration system for notifiable diseases at the RIVM (Osiris) and the registration system for occupational diseases at the Netherlands Center for Occupational Diseases (NCvB). In 2009, a comparable number of work-related infectious diseases was reported: 154 in Osiris and 155 at the NCvB. Both systems show a slight increase compared with previous years. When registering in Osiris, patients are asked questions about the infectious disease they have contracted. In August 2009, new questions were added to the Osiris questionnaire about the exposure of employees to infectious diseases whilst at work. This provides insight into the relationship between the different infectious diseases and the profession, type of work and the professional sector in which patients are active.

Osiris, which is managed by the RIVM, records the notifiable infectious diseases as reported by the Public Health Services (GGD). Most of the work-related notifications in Osiris were for infectious diseases contracted while people were working abroad. Although the increase in work-related notifications in Osiris is largely due to Q-fever, malaria and hepatitis B are also frequently reported as work-related diseases. Notifications of infectious diseases to the NCvB register are made by occupational health professionals. In this register, the majority of the work-related diseases reported were contracted by people working in the health care sector or those working with animals. At the NCvB the most commonly reported infectious diseases were intestinal infections, skin infections and Q-fever.

Key words:
registration, infectious disease, occupational, employees, occupational health

Rapport in het kort

Surveillance Arbeidsgerelateerde Infectieziekten
Analyse arbeidsgerelateerde infectieziekten 2009

Het aantal registraties van infectieziekten die Nederlanders tijdens hun werk oplopen is in 2009 laag, een tot twee procent van het totale aantal geregistreerde infectieziekten. Dit aantal is echter niet volledig. Dat komt gedeeltelijk omdat de arbeidsrelatie vaak niet wordt geregistreerd, en deels omdat de locatie van de infectiebron vaak als 'onbekend' wordt geregistreerd (in Osiris). Ten opzichte van voorgaande jaren is een lichte stijging waarneembaar. Dit blijkt uit onderzoek van het RIVM, in opdracht van het ministerie van Sociale Zaken en Werkgelegenheid (SZW). SZW wil de kennis over arbeidsgerelateerde infectieziekten vergroten en doorgeven aan werkgevers, werknemers en arbodienstverleners, zodat zij maatregelen kunnen nemen.

Voor het onderzoek zijn de twee belangrijkste Nederlandse registratiesystemen van infectieziekten/ziekten geanalyseerd: Osiris en de beroepsziektenregistratie van het Nederlands Centrum voor Beroepsziekten (NCvB). In 2009 zijn in Osiris en bij het NCvB een vergelijkbaar aantal arbeidsgerelateerde infectieziekten gemeld, namelijk 154 en 155. Voor beide systemen is dit een lichte toename ten opzichte van voorgaande jaren. Bij registratie in Osiris worden vragen gesteld aan de patiënt over de opgelopen infectieziekte. Sinds augustus 2009 is de Osiris-vragenlijst aangevuld met extra vragen over blootstelling van werknemers aan infectieziekten tijdens het werk. Dit levert informatie op over de relatie tussen branches/beroepen, werkzaamheden en soorten infectieziekten.

In Osiris, dat wordt beheerd door het RIVM, melden GGD'en de meldingsplichtige infectieziekten. De meeste meldingen zijn van arbeidsgerelateerde infectieziekten opgelopen door mensen die voor hun werk in het buitenland verblijven. Q-koorts is echter de voornaamste veroorzaker van de toename van het aantal arbeidsgerelateerde meldingen in Osiris. Daarnaast hebben ook malaria en hepatitis B een belangrijk aandeel. Bij het NCvB melden bedrijfs- en verzekeringsartsen infectieziekten. Zij melden hoofdzakelijk werknemers die een infectieziekte hebben opgelopen tijdens het werk in de gezondheidszorg of na contact met dieren. Infectieziekten die het meest worden gemeld bij het NCvB zijn darminfecties, huidinfecties en Q-koorts.

Trefwoorden
registratie, infectieziekte, arbeidsgerelateerd, werknemers, arbo

Summary

For the third time[1], the National Institute for Public Health and the Environment (RIVM) has made an analysis of the work-related infectious diseases in the registration system for notifiable infectious diseases at the RIVM (Osiris) and the registration system for occupational diseases at the Netherlands Center for Occupational Diseases (NCvB). This analysis was commissioned by the Ministry of Social Affairs and Employment (SZW).

In 2009, the number of work-related infectious diseases reported to both registers was comparable, with 154 in Osiris and 155 at the NCvB. In both registration systems, more work-related infectious diseases were reported in 2009 than in previous years. In Osiris, this increase was largely due to the increase in the number of Q-fever notifications but there was also an increase in the number of other infectious diseases reported. The increase in notifications to the NCvB was mainly due to more reports of intestinal infections and Q-fever infections.

In Osiris 24 different notifiable infectious diseases were reported, exposure to which could have occurred at work. Most of these infectious disease reports were for Q-fever, malaria and hepatitis B. In contrast, most of the NCvB notifications were for intestinal infections, followed by zoonoses, tuberculosis and skin infections. More than half of the work-related notifications in Osiris were for diseases contracted during work activities abroad. Other work-related infectious diseases were contracted when people had contact with animals, were performing work activities in the health care sector or in the educational sector. Two-thirds of the NCvB notifications concern employees working in health care and welfare.

In August 2009, more detailed and work-related questions were added to the Osiris questionnaire. These are completed by the Public Health Services (GGD) as soon as it has been established that a patient has contracted a notifiable infectious disease. For example, questions are asked about the sectors and professions from which the notifications are forthcoming. This additional information enables the risk moments to be brought into focus.

Both registration systems differ in respect of the professionals who provide the information and in respect of the patient populations. This makes the interpretation of the data more difficult. That there is some degree of overlap between the registered data is something that cannot be ruled out. This is because reports from doctors at the GGD are independent from those coming from the occupational health and safety services, which means that the same report may appear in both

[1] Previous reports on the Surveillance of Work-related Infectious Diseases in the Netherlands were as follows: in 2009 report number 205014004 was published (http://www.rivm.nl/bibliotheek/rapporten/205014004.pdf) and in 2007 report number 205014002 (http://www.rivm.nl/bibliotheek/rapporten/205014002.pdf).

systems. In spite of this, the data do provide insight into trends in the numbers and sectors as well as notification behaviour.

The type of infectious disease reported in the NCvB registration system for occupational diseases is very different from those reported in Osiris. This is not surprising because in Osiris only notifiable infectious diseases are registered whereas the NCvB registers all infectious diseases that are considered to be occupationally linked. By combining the data from the two registration systems, a broader and more comprehensive picture can be obtained of the occurrence of infectious diseases that are occupationally linked.

Osiris is a more reliable registration system as far as epidemic and travel-related infectious diseases are concerned. The NCvB is more reliable for infectious diseases that are linked to the health care sector and for skin infections. In this respect, both registration systems seem to complement each other. It is striking that the NCvB contains more reports of work-related tuberculosis infections than the register at the KNCV Tuberculosis Foundation. Yet, there appears to be some underreporting concerning relatively unknown infectious diseases. For example, four cases of work-related notifications of leptospirosis were reported to the Royal Tropical Institute (KIT) and in Osiris in 2009 but there was no report of this disease at the NCvB.

In August 2009, more detailed and work-related questions were added to the Osiris questionnaire. These are completed by the GGD as soon as it has been established that a patient has contracted a notifiable infectious disease. The additions to the questionnaire will result in substantially more information becoming available. In order to make good use of this information, a more detailed examination of the data will have to be carried out in future as to the profession and the professional sector in which a patient is employed and which work activities were being performed when the possible exposure took place. Moreover, more specific information relating to individual diseases can be examined. This will provide useful information for the NCvB.

1 Introduction

Every year, as commissioned by the Ministry of Social Affairs and Employment (SZW) the Centre for Infectious Disease Control (CIb) at the National Institute for Public Health and the Environment (RIVM) makes an analysis of the incidence of work-related infectious diseases in the Netherlands. Information is obtained from the registration system for notifiable infectious diseases at the RIVM (Osiris) and the system for the registration of occupational diseases used by the Netherlands Center for Occupational Diseases (NCvB). An overview is then made of the type and number of work-related infectious disease reports in the two registration systems with the aim of contributing to the knowledge base in this domain as well as gaining insight into current trends. An additional aim is to increase the awareness of employers, employees and occupational health professionals.

In the reports of previous years there has been some discussion on the fact that while both registration systems present a picture of the occurrence of work-related infectious diseases, a comparison of the data from both systems is problematic. This is because the two registration systems draw from different sources. In Osiris, notifiable infectious diseases are registered in accordance with the Public Health Act and the reports of these diseases are made by the Public Health Services (GGD). At the NCvB, it is the occupational and insurance physicians who report cases of infectious diseases that are thought to be occupationally linked. This is not limited to just the infectious diseases that are notifiable in accordance with the Public Health Act. From the previous reports, it has transpired that a combined analysis of the two registration systems provides a more complete picture regarding the trends in work-related infectious diseases in the Netherlands and of notification behaviour.

Apart from Osiris and the NCvB system, data from the Dutch Royal Tropical Institute (KIT), the National Reference Laboratory (for leptospirosis) and the KNCV Tuberculosis Foundation was also used.

The results from Osiris will be discussed in chapter 2 and the results from the NCvB registration system in chapter 3. Chapter 4 will compare the notifications for leptospirosis made to the KIT with those made to the National Reference Laboratory for Leptospirosis. The notifications of tuberculosis made to the KNCV will be compared with those registered in Osiris and in the NCvB registration system. The data from Osiris and the NCvB will subsequently be compared in chapter 5. Finally, chapter 6 will set out the conclusions and recommendations.

2 Osiris Registration System

2.1 Introduction

Osiris is the name of the registration system used by the Public Health Services (hereafter GGD) to record notifiable infectious diseases. The GGD services receive this information from the doctors and laboratories that have a notification obligation under the Public Health Act. There are 43 infectious diseases that currently fall under the Public Health Act (see Appendix 1). The GGD registers the reports of infectious diseases in Osiris and assesses whether or not additional measures need to be taken in order to prevent further human to human transmission of infectious diseases that occur.

Since 2001, the Osiris system has also included information on whether or not the disease was contracted whilst a person was involved in professional practice. In August 2009, some extra registration possibilities were added. A summary of these extra possibilities is given below.

Question in Osiris since 2001:	**Possible answers:**
Was the disease probably contracted whilst the patient was involved in professional practice?	Yes, in the Netherlands Yes, abroad No Not known Not applicable

Since August 2009, when this question is answered with a Yes, then the following more detailed questions are added:

1. a) What working activities was the patient probably performing when he contracted the disease? (open question)

1. b) In which sector does the patient work?	Health care sector Laboratory Caring for homeless people, asylum seekers or suchlike Agriculture Working with animals or animal products Waste disposal Field sales Sex industry Cleaning industry Education/childcare Food industry Other sector, namely:

1. c) To which profession does the patient belong? (open question)

The analysis also includes the sex, age, any hospital admissions and also death (where relevant) of the patient.
The SAS statistical analysis programme was used to analyse the data registered in Osiris.

2.2 Results

Work-related infectious diseases
In 2007, 10 392 notifications were made in Osiris and 11 838 in 2008. In 2009 the number of notifications registered was 15 806. For 2007 the number of notifications with an occupational link was 108 while in 2008 this was 113; this represents 1% of the total notifications. In 2009, 1% of the notifications (n = 154) again had a possible occupational link. These 154 work-related notifiable infectious diseases were mainly registrations of the following: Q-fever (78 reports), malaria (34 reports), hepatitis B (acute and chronic, 14 reports), shigella (9 reports) and hepatitis A (8 reports), see Figure 1.

In 2009, an occupational link with the patient's work could be established for 24 different notifiable infectious diseases whilst in previous years this was only the case for 16 diseases.

The types of infectious diseases reported in 2009 (see Figure 1) are in accord with those of previous years. Q-fever is one exception to the above. Up until 2008, only one or two reports of work-related Q-fever cases were made each year. 2008 saw the first increase in the number of reported cases (n = 31) of Q-fever with an occupational link. In 2009 a total of 78 reports were made of patients with Q-fever that had probably been contracted while they were at work.

In addition, the total number of patients with Q-fever registered in Osiris has increased sharply. For example, in 2007 the average number of patients registered each year was fifteen. However, with the outbreaks of Q-fever on goat farms in the province of Brabant, the number of notifications for patients with Q-fever has increased sharply since 2007. In 2009 a total of 2317 Q-fever patients was registered in Osiris. Of these, 3.3% (n = 78) were work-related.

There was an increase in the number of work-related notifications for malaria and hepatitis B. The number of notifications of malaria increased from 28 in 2008 to 34 in 2009. The number of notifications for hepatitis B doubled from 7 notifications in 2008 to 14 in 2009. There were no reported cases with an occupational link for the following five notifiable infectious diseases: brucellosis, typhoid fever, acute hepatitis C, paratyphoid A fever and rubella.

The Osiris questionnaire for Legionnaires' disease was changed in 2008. The question of whether or not the disease was contracted during work hours was removed. This question was, however, reinstated in August 2009. It is therefore not possible to compare data for this disease for the whole of 2009. The data shown in this figure should therefore be viewed with this in mind.

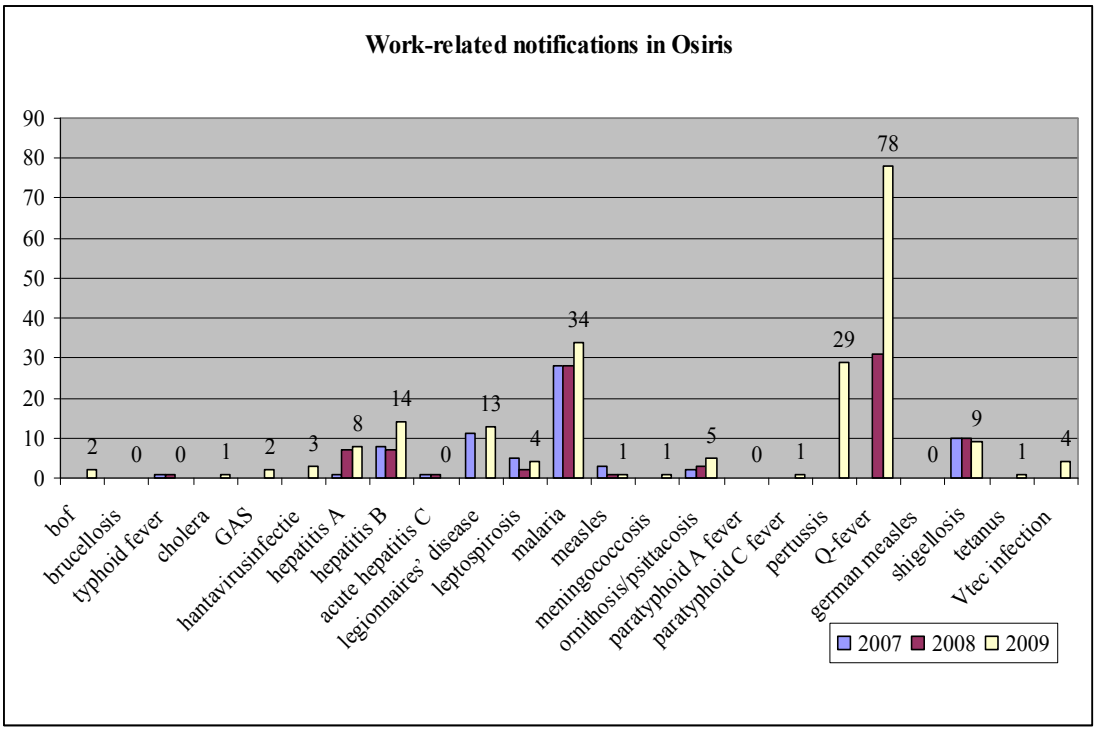

Figure 1. Work-related notifications in Osiris for 2007, 2008 and 2009.

Source or place of contamination

Osiris contains one question on the possible source or place of the contamination. It should be noted here that the source or place of contamination is not directly linked to a patient's professional practice. Because this is an open question, the responses often provide relevant information about the patient's profession and the specific working conditions. The question regarding the possible source and place of contamination is included in the questionnaire for all notifiable diseases except malaria.

In August 2009, additional questions were included in Osiris regarding the type of work, the professional sector and the profession of the patient. These questions have only been included in the questionnaire since August 2009. Therefore, data for the first half of 2009 are unavailable. This could lead to a distortion of the entire picture, considering the seasonal dependency of some disease incidence.

More than half (55%) of the cases of work-related notifiable infectious diseases – which require registration in accordance with the Public Health Act – were contracted during work activities abroad. This is followed by working with animals (7%) working in health care (6%) and working in education (4%). For 20% of the patients who contracted an infectious disease whilst at work, the professional sector in which they work is an unknown factor. This corresponds with the results of previous reports (see Figure 2). Appendix 2 provides an overview, by disease, of the sectors in which the patients who contracted a work-related infectious disease are working.

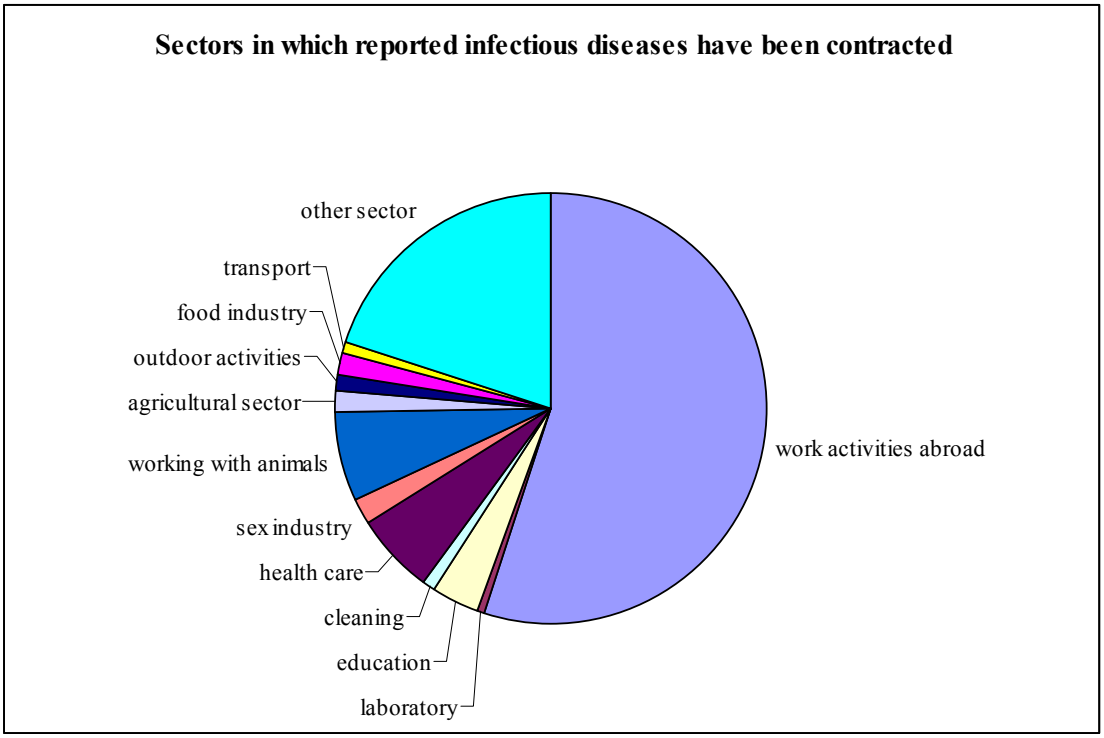

Figure 2. Sectors in which reported infectious diseases have been contracted

Age and sex

Work-related infectious diseases are reported more often for men than for women. The following infectious diseases are reported more often in men: Legionnaires' disease (94%), leptospirosis (100%), typhoid fever (100%), hepatitis B (60%), Q-fever (69%) and malaria (82%).
The following infectious diseases are mainly reported in women: rubella (89%), hepatitis C (73%), pertussis (76%) and measles (71%).
Generally speaking, the prevalence of work-related infectious diseases is evenly distributed over the age categories of the working population.

Hospital admission and mortality

Because notifiable infectious diseases are generally quite severe diseases, a relatively high percentage of patients need to be admitted to hospital. In the last nine years, three deaths have occurred which can partly be attributed to an infectious disease that was occupationally linked. These were registrations for Legionnaires’ disease, shigella and malaria.

Completeness of work-related notifications in Osiris

It is probable that there is some under-reporting of the number of work-related notifications in Osiris. One explanation for this is that in approximately half of the Osiris notifications, the questionnaire contained no information on whether or not the disease had been contracted at work.

3 NCvB registration system for occupational diseases

3.1 Introduction

The Netherlands Center for Occupational Diseases (NCvB) is a center of expertise for occupational health professionals and employees' organisations, government institutions and policy-makers. One of the tasks of the NCvB is the registration and detection of occupational diseases through the national reporting and registration system. Occupational physicians (including company doctors) are legally required to report occupational diseases and occupationally-linked conditions to the NCvB in accordance with Article 9 of the Working Conditions Act. The aim of the registration system is to improve the quality of prevention, early diagnosis, treatment and supervision of work-related conditions.

The system provides information on the incidence and spread of occupational diseases and highlights associated trends. This enables new occupational diseases to be recognised.
The number of notifications at NCvB has remained fairly stable in recent years with 5500 - 6000 reported cases each year. Occupational infectious diseases represent only a small proportion of all reported occupational diseases. In the 9 years up to 2009, an average of 112 notifications of work-related infectious diseases were made each year. In 2009 itself, the number of notifications was 155.

3.2 Results

In 2009 there were 155 notifications of infectious diseases that were contracted at work and registered in the NCvB registration system. Most of these notifications were for intestinal infections, followed by zoonoses including leptospirosis, ornithosis, Q-fever, Lyme disease and skin infections; see Appendix 3, Figure 3 and Table 1.

Two-thirds (67%, n = 103) of the registered infections occurred in employees working in health care and welfare. The conditions were mainly intestinal infections and respiratory infections, see Appendix 4.

The number of notifications and the type of infectious disease contracted in 2009 corresponds with the results from previous years, see Appendix 3. The exception here is the number of notifications for intestinal infections and Q-fever. The number of notifications for employees with an intestinal infection increased in comparison with previous years. There were no notifications of patients with work-related Q-fever in 2007 and 2008. In 2009 there were twelve notifications of this disease.

	2008	2009
Intestinal infections	40	56
Tuberculosis	15	20
Malaria	5	8
Skin infections	13	13
Zoonoses	10	1
Q-fever	-	12
HIV	5	1
Hepatitis B	2	4
Respiratory infections	-	11
Hepatitis A	-	-
Lyme disease	10	8
Legionnaires' disease	1	1
Hepatitis C	5	-
MRSA	9	15
Other infectious diseases	2	5
Total	117	155

Table 1. Notifications at NCvB for 2008 and 2009

Completeness of notifications of occupational diseases

In spite of the obligation to report occupational diseases, underreporting continues to occur. Research shows that the main obstacles that prevent occupational physicians from reporting occupational diseases are – lack of clarity on causality, lack of knowledge regarding the NCvB guidelines, lack of time and fear of legal complications. [2] It is expected that this will also apply to work-related infectious diseases.

[2] reference: http://www.rivm.nl/vtv/object_document/o3384n16932.html, Blok ZC. (Dissertation in Dutch only) *Het melden van beroepsziekten aan het NCvB: een nadere verkenning*, 2001.

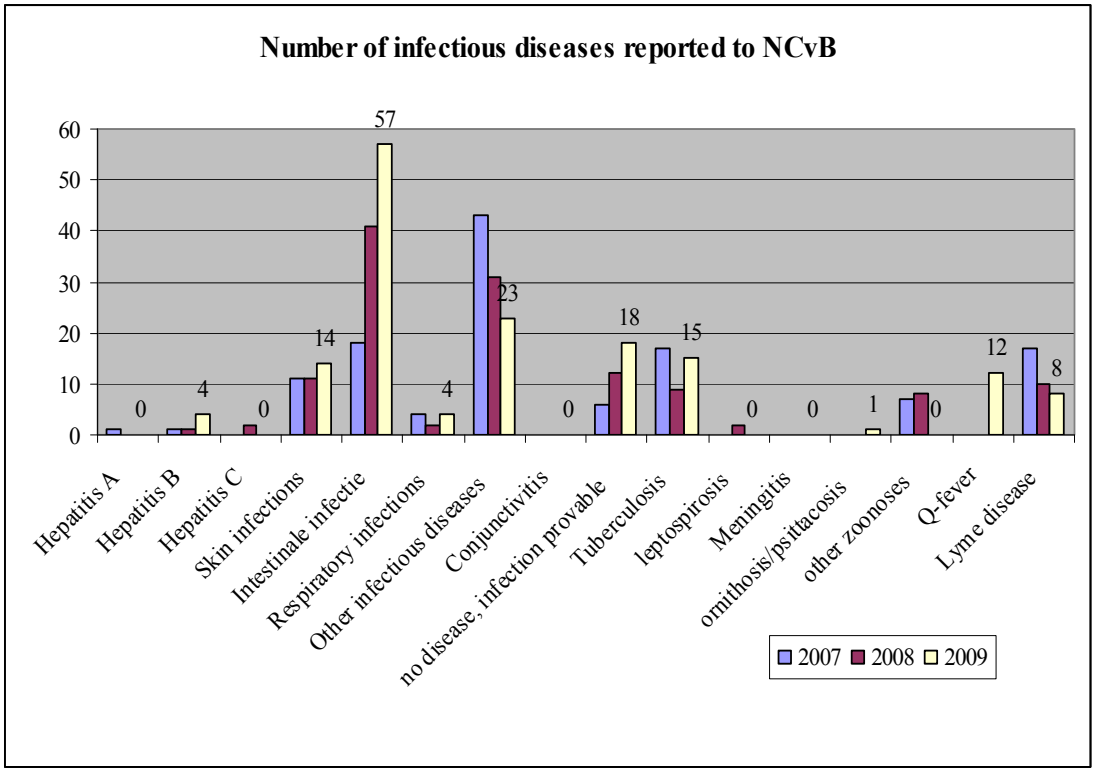

Figure 3. Number of infectious diseases reported to NCvB as an occupational disease

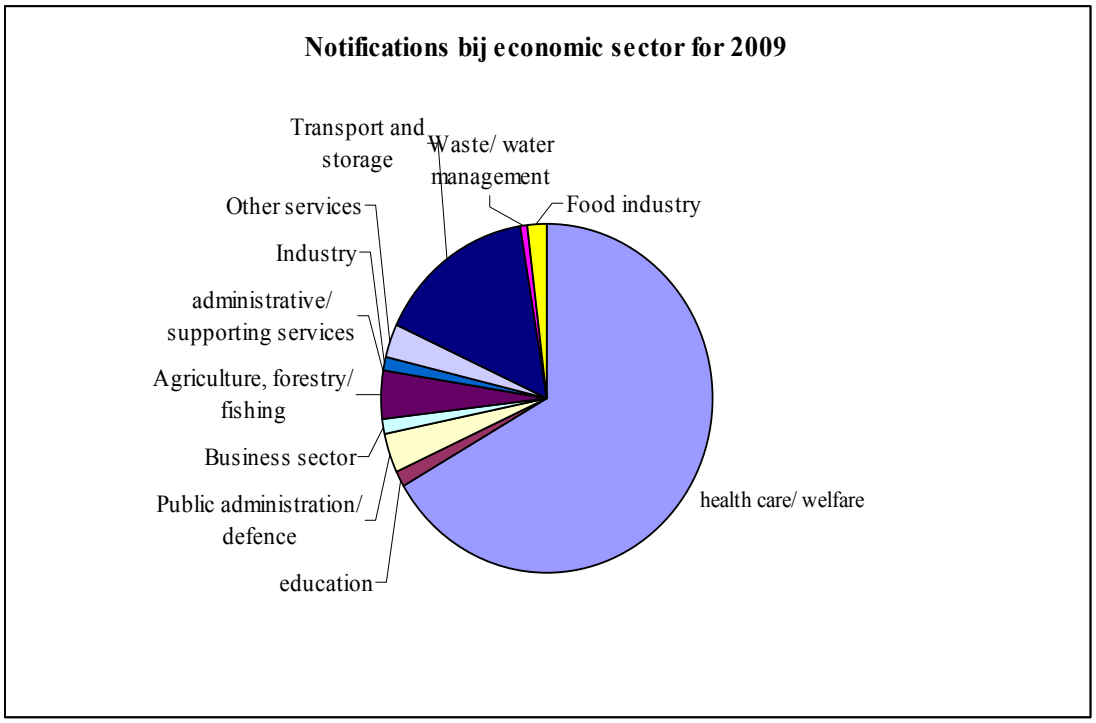

Figure 4. Notifications at NCvB for 2009 by economic sector

4 Other registration systems

4.1 Introduction

As well as the NCvB register and Osiris, there are also special registration systems in use for tuberculosis and leptospirosis. All cases of possible contamination with leptospirosis are sent to the Royal Tropical Institute (KIT) for microbiological testing. The KIT also registers how contamination could have occurred. Cases of tuberculosis are not registered in Osiris but in the Netherlands Tuberculosis Register (NTR) at the Royal Netherlands Tuberculosis Foundation (KNCV).

4.2 Leptospirosis notifications

Leptospirosis is a zoonotic disease that presents a clinical picture that varies from one that is flu-like to extremely serious with a fatal outcome. Leptospira that are particularly common in the Netherlands are Weil's disease and mud fever. As an occupational disease, it occurs among sewage workers and rat catchers.

Below is an overview from the KIT and Osiris of the total number of notifications and the number of patients with leptospirosis who were possibly infected in the workplace in the Netherlands from 2000 to 2009.

	KIT total	**KIT work-related**	**Osiris total**	**Osiris work-related**
2005	29	5	27	5
2006	27	4	23	2
2007	41	8	41	5
2008	34	6	35	2
2009	24	4	21	4
total	155	27	147	18

Table 2. Number of patients with work-related leptospirosis (data from KIT and Osiris)

Each year, there are comparable numbers of notifications at the KIT and in Osiris. Although the number of notifications is very small, the situation appears to be stable. The professions of the patients as determined by the KIT include the following: cattle farmer, crop farmer, rat catcher, fisherman, sewage worker, horticulturist and professional diver.

The work-related notifications in Osiris are connected with people performing work tasks that involve water, such as work in sewers or with ditch water. Unfortunately, the specific work tasks are not known for one-third of the cases registered in Osiris. The remaining registrations concern work with mice or rats or in the agricultural sector.

In 2009, four work-related disease notifications were registered at the KIT and in Osiris.
At the NCvB five notifications of work-related leptospirosis were made for the period 2002 to 2009 and in 2009 there were no notifications whatsoever.

4.3 Registration of tuberculosis at the Royal Netherlands Tuberculosis Foundation

In the Netherlands, all cases of tuberculosis are registered in the Netherlands Tuberculosis Register (NTR) at the Royal Netherlands Tuberculosis Foundation (KNCV). Each Public Health Service (GGD) has its own regional tuberculosis control programme. Each year the GGD screen approximately 10,000 – 12,000 workers who come into contact with people from tuberculosis risk groups in the course of their work. They are screened for the presence of an active or latent tuberculosis infection. The GGD registers patients in Osiris and this data is processed in the NTR register that is managed by the KNCV.

Since 2005, the registrations have been divided into four categories of professions that have regular contact with people from the risk groups during working hours. These professional groups are: those working in health care, in welfare, in refugee work, asylum seeker reception and the judicial system and those working in other sectors.

	Number of occupational contacts with risk groups for active tuberculosis (KNCV)	**Occupationally-linked infection of tuberculosis reported to the NCvB**
2005	12	20
2006	3	23
2007	9	12
2008	11	9
2009	8	15

Table 3. Occupational contacts with risk groups
Source: surveillance reports on the tuberculosis situation in the Netherlands from the KNCV Tuberculosis Foundation

In 2009, 1157 tuberculosis cases were reported to the NTR. This figure is 16% lower than in 2008. Of the 8 employees who had contracted tuberculosis at work, 6 were employed in health care, 1 in welfare work and 1 in refugee and asylum seeker reception with the judicial system. According to the KNCV surveillance report, each year 3 to 19 employees working with people in risk groups contract tuberculosis.

In the NCvB registration system for occupational diseases, reports are also registered from employees who have contracted tuberculosis or have tested Mantoux-positive as a result of their work.
Considering that the KNCV performs active case-finding, it should be possible to find almost all other tuberculosis patients who are occupationally linked to the ones in the register. It is possible that the focus is on only a limited group of employees who have contact with

people from risk groups. Other professions that may be at risk are therefore ruled out.

The NCvB data show that in reality, a larger group is exposed to tuberculosis. One possible explanation for this is that in a few cases the Mantoux test result is false-positive but the occupational physician interprets the result as positive – for example, this could occur during a medical check-up. Later, during a more detailed examination at the GGD (e.g. additional testing with the Quantiferon test) the result is confirmed to be false-positive and it will consequently not be registered.

The added value of the KIT and the KNCV information is that a comparison of these data provides a better picture of the completeness of the data on the number of notifications registered in Osiris and the registration of occupational diseases at the NCvB. The tuberculosis notifications in Osiris are managed by the KNCV. These data are necessary in order to know which notifications have been made by the GGD.

5 Comparison of the Osiris and NCvB Registration Systems

5.1 Introduction

The NCvB registration system for occupational diseases and the Osiris system for public health contain relevant information on infectious diseases that occur in a working environment. It is fairly difficult to compare the registration data from Osiris and the NCvB because the professionals who deliver the information differ in the two systems as do the patient populations involved. However, any comparison that is made may indicate possible trends regarding the notification of diseases and provide pointers for relative increases in the incidence of certain infectious diseases and their occupational links with certain occupational sectors and professions. The differences and similarities between the registration systems are described below, as are the identified trends.

5.2 Results

Increase in number of notifications

It is striking that there was an increase in 2009 in both registration systems of the number of cases of infectious diseases that were possibly occupationally linked.

In 2007 and 2008 there were 70 and 94 cases respectively registered in Osiris for which the patient reported having contracted the disease at work. For 2009 the number of notifications rose to 154. This increase probably results from the increase in the number of Q-fever patients who probably contracted the disease whilst performing work activities. However, the increase in the number of notifications could be due to the fact that people are now specifically being asked about any possible link with their work.

At the NCvB, there has also been an increase in the number of notifications for occupational infectious diseases compared with previous years. In 2009 there were 155 notifications compared with only 117 in 2008. The increase in the number of notifications at the NCvB can be largely attributed to the increase in the number of intestinal infections and cases of Q-fever.

Q-fever

Many goat farms are not affiliated to occupational health and safety services and consequently do not have access to an occupational physician. The relatively high number of notifications in Osiris (n = 78) compared with those at the NCvB (n = 12) can be explained by the absence of an occupational physician because general practitioners are often the first to make the diagnosis and they report the case to the GGD.

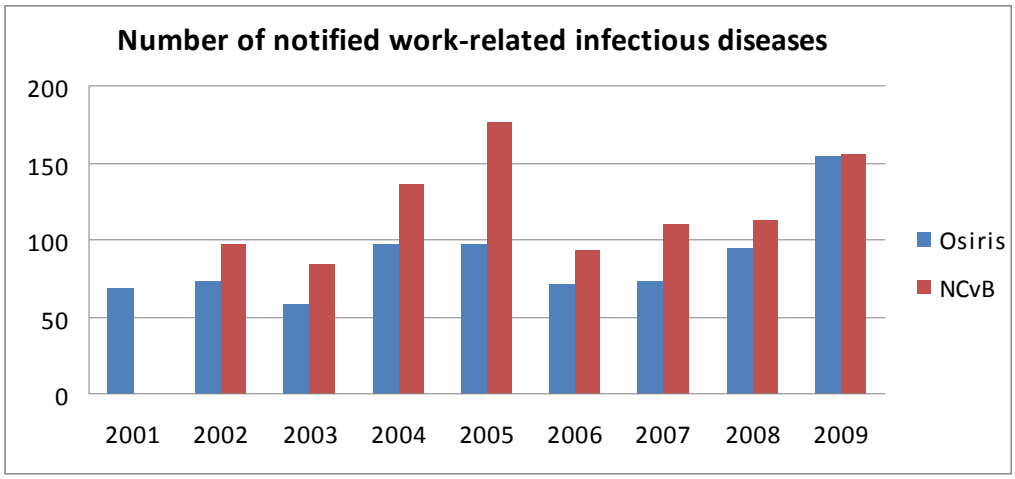

Figure 5. Number of notified work-related infectious diseases at the NCvB and in Osiris

Although technical reasons prevent an automatic statistical analysis of the surveillance data, there does seem to be a slight trend occurring. The number of reported occupational infectious diseases has been rising since 2007. It is possible that this increase is connected to the fact that the outbreaks of swine flu and Q-fever have led to people thinking about work-related infectious diseases sooner – an increased *awareness*. This viewpoint is certainly supported by the fact that the number of visitors to the KIZA web site (expert information on infectious diseases and work) has increased from approximately 3000 per year to about 10000. Another explanation could be that there is a report bias, especially from the GGD. Nowadays, there is more focus on an occupational link which means that this information is forthcoming much more readily than was the case in the past.

Type of infectious disease

In Osiris the infectious diseases that were most frequently reported as having been contracted at work were: Q-fever, malaria, hepatitis B and pertussis. In contrast, at the NCvB the diseases were: intestinal infections, skin infections and Q-fever.

Source of infectious disease

There are notable differences between the two registration systems as regards the place where or the sector in which the infectious disease was contracted. This is largely due to the type of infectious disease that is reported. More than half of the work-related notifications in Osiris concern cases that were contracted abroad. In addition, other prominent sources of work-related infectious diseases reported in Osiris are: working with animals, the health care sector and education.

This is in contrast with NCvB registration, where a relatively large proportion of the notifications come from the health care sector alone. Basically this means that both registration systems complement each other. It looks as if the Osiris registration system detects epidemic diseases and travellers‘ infectious diseases sooner, whereas in contrast, the NCvB register has more intestinal infections and skin infections that are contracted at work in the health care sector.

Infectious diseases that are notifiable under the Public Health Act

Both registration systems have been checked for possible overlap. That there is some degree of overlap at case level cannot be ruled out but considering the difference in the reported diseases, the systems appear to complement each other. The overlap is in those infectious diseases that are notifiable according to the Public Health Act and for which an occupational link is indicated. In 2009 the following occupational diseases were reported to the NCvB that also required notification under the Public Health Act: hepatitis A, B, C, Legionnaires' disease, malaria, tuberculosis, leptospirosis, ornithosis and Q-fever. Of these diseases, 26 cases were reported to the NCvB register. Because the notifications could not be traced back to case level, there is unfortunately no proof of whether all these cases were also registered in Osiris.

In Osiris there were 154 notifications registered for which the patient indicated an occupational link. These 154 notifications are sharply contrasted with the 26 formally registered occupational infectious disease notifications at the NCvB. Part of the discrepancy is probably due to the fact that occupational physicians do not always report all occupational diseases. In addition, the outbreak of Q-fever, which accounted for 78 of the 154 notifications, may have caused a temporary increase in the number of Osiris notifications.

It is not known whether there is any underreporting in Osiris for work-related notifications. However, it is known that the question of whether a disease has been contracted at work is usually answered with "unknown” by patients. It is possible that some of these patients have indeed contracted a work-related infectious disease.

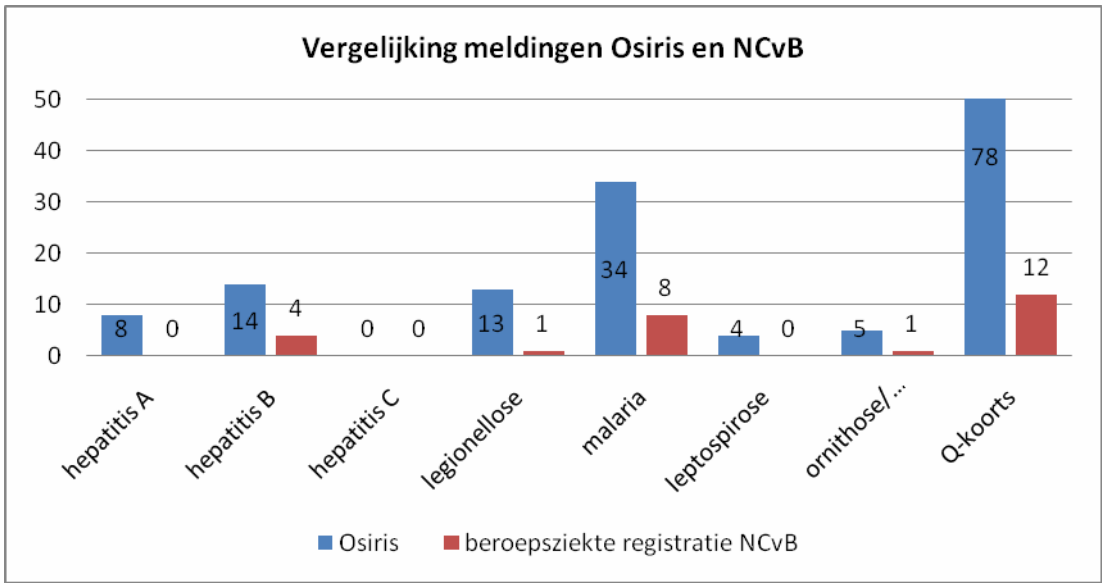

Figure 6. Reported notifiable infectious diseases at the NCvB and Osiris for 2009

Leptospirosis and tuberculosis

The report summaries from the KIT also indicate that there is underreporting in the NCvB register. In 2009 for example, four work-related cases of leptospirosis were registered at the KIT while no registration was received at the NCvB.

The tuberculosis reports from the GGD are registered at the KNCV and not at the RIVM. In 2009, eight work-related cases were reported to the KNCV. Fifteen notifications were at the NCvB in 2009. This suggests a possible underreporting at the KNCV and Osiris regarding the number of work-related infections.

This chapter will explain why a link between public and occupational health services - as advised by the SZW - will provide added value. Among other things, this would facilitate comparison and analysis of data from different registration instruments. This surveillance highlights the shortcomings of the instruments due to the differences in their objectives. However, an improvement can already be seen that offers an opportunity for further improvements in the domain of public health protection and that of employees' occupational health.

6 Conclusions and recommendations

6.1 Conclusions

In both the Osiris and the NCvB registration system, the number of notifications for work-related infectious diseases has increased. In Osiris, the increase is due primarily to the increase in the number of work-related Q-fever patients. At the NCvB, the increase is due primarily to more notifications of employees with intestinal infections and Q-fever.

The type of infectious diseases reported in the NCvB registration system for occupational diseases differs from those in Osiris. This is not surprising because only notifiable infectious diseases are registered in Osiris whereas the NCvB registers infectious diseases that are considered to be occupationally linked. A combination of both registration systems provides a more complete picture of the incidence of infectious diseases at work. In both registration systems there are many similarities with previous reports concerning the report of infectious diseases and the sector in which the disease was contracted.

In August 2009, more detailed and work-related questions about the patients were added to the Osiris questionnaire; which is completed by GGD staff. These additions provide more information on the type of work, the professional sector and the profession of the patient, making it easier to bring the risk moments into focus. It is expected that these questions will provide valuable information in the coming years that will benefit employers, employees and occupational health professionals alike.

It is not known whether there is any underreporting in Osiris for work-related notifications. However, we do know that the question of whether a disease has been contracted at work is usually answered with "unknown” by patients. It is possible that some of these patients have indeed contracted a work-related infectious disease.

6.2 Recommendations

The additional questions in Osiris regarding exposure of patients in the work environment provide interesting supplementary information. As well as providing insight into the correlation between professional sectors and professions and the type of infectious disease that occurs, they also give information on possible trends and the notification behaviour of both GGD staff and occupational health professionals.

The additions to the questionnaire will result in substantially more information becoming available. In order to make good use of this information, in future a more detailed examination will have to be carried out as to the professional sectors and professions in which patients are employed and what work activities were being performed when the exposure probably took place. In addition, more specific information on each individual infectious disease can be obtained. This will provide useful information for occupational health professionals, employers and employees.

Employees who work in health care, those who work with animals and employees who live or travel abroad for their work are at increased risk of being exposed to infectious diseases in their work environment. Both employers and employees must be well informed about any such risk and also know about any preventive measures that need to be taken in such a situation. In order to prevent cases of disease occurring, occupational health professionals should point out to companies that their risk inventory/evaluation and plan of approach should contain details of preventive measures. Occupational health and safety services can derive information on this subject by using the arbo-inf@ct e-mail address as well as the KIZA site.

In approximately half of the notifications in Osiris it is not known whether the patient contracted the disease whilst at work. It is not clear why this information is lacking. It is possible that some of these patients did indeed contract the disease whilst at work. Therefore, in order to gain more information on the above, we recommend making contact with the GGD in question. Because these data have to be obtained within one year, quarterly reports on the work-related questions in Osiris are necessary.

More insight into the notification behaviour of all professionals concerned is important when designing interventions for the purpose of incentivising notification behaviour. At present, there does appear to be an increasing trend in the number of disease notifications.

More information would be gained if the notifications from Osiris could also be put on the NCvB register. We therefore recommend looking into possibilities for making a link between the two registration systems, which would facilitate automatic analysis of the data.

Appendix 1 Number of notifiable diseases in Osiris for 2009

Group	Infectious diseases	Work-related notifications 2009	Total number of notifications[3]
Group A	Smallpox	-	0
	Polio	-	0
	Severe acute respiratory syndrome (SARS)	-	0
	New influenza A (H1N1)	-	3 415
Group B1	Human infection with avian influenza virus	-	0
	Diphtheria	-	0
	Plague (bubonic)	-	0
	Rabies	-	0
	Tuberculosis*	-	1 160
	Viral hemorrhagic fever	-	0
Group B2	Typhoid fever	0	20
	Cholera	1	3
	Hepatitis A	8	176
	Acute hepatitis B	14	202
	Acute hepatitis C	0	52
	Whooping cough	29	6 503
	Measles	-	11
	Paratyphoid A fever***	0	12
	Paratyphoid B fever	-	14
	Paratyphoid C fever	1	3
	German measles	0	7
	Shiga Toxin Producing Escherichia coli (STEC)/Enterohemorrhagic *E.coli* (EHEC) infection	4	264
	Shigella	9	465
	Invasive group A Streptococcal infection	2	252
	Food poisoning**	-	36

[3] These figures are based on the definite number of notifications (approved by the RIVM) in accordance with the Public Health Act.

Group	Infectious diseases	Work-related notifications 2009	Total number of notifications[3]
Group C	Anthrax	-	0
	Mumps	2	32
	Botulism	-	0
	Brucellosis	0	4
	Variant Creutzfeldt-Jakob disease	-	8
	Yellow fever	-	0
	Invasive *Haemophilus influenzae* type b infection	3	15
	Hantavirus infection	13	8
	Legionnaires' disease	4	240
	Leptospirosis	-	25
	Listeriosis	34	47
	Malaria	1	243
	Meningococcal disease	-	153
	MRSA infection (clusters outside hospitals)	-	10
	Childhood invasive pneumococcal disease (up to 5 years)	5	35
	Psittacosis	78	72
	Q-fever	1	2 317
	Tetanus	-	1
	Trichinosis	-	1
	West Nile Virus Infection	-	0

Appendix 2 Source of work-related infectious disease in Osiris

Infectious disease	Work-related notifications in 2009	Sector where the contamination took place[4] (period 2001 - 2009)		
Mumps*	2	Not known	2	(100 %)
Brucellosis	0	Laboratory Consumption of milk/cheese from own cattle[5]	1 1	(50 %) (50 %)
Typhoid fever	0	Laboratory Abroad Not known	1 3 1	(20 %) (60 %) (20 %)
Cholera*	1	Abroad/air travel	1	(100 %)
GAS* Invasive group A Streptococcal infection	2	Food industry Other sector	50 50	(50 %) (50 %)
Hantavirus infection*	3	Field sales Cleaning industry Not known	1 1 1	(33 %) (33 %) (33 %)
Hepatitis A	8	Abroad Education/childcare Cleaning industry Other sector/not known	28 19 5 16	(41 %) (28 %) (7 %) (24 %)
Hepatitis B	14	Abroad[6] Health care sector[7] Sex industry Other[8] Not known	22 34 13 10 25	(21 %) (33 %) (13 %) (10 %) (24 %)

* Registrated since 2009

4 Percentage comparable with the total number of work-related infectious diseases for 2001 up to and including 2009.

5 Could be occupationally linked if person is working abroad.

6 Includes various employees from the health care sector, (dentist, midwife, nurse).

7 Employees working in the health care sector, First Aid workers, needlestick/sharps injury, mental health care sector.

8 Cleaners (2), security staff, police, hairdresser, laboratory worker, animal laboratory.

Infectious disease	Work-related notifications in 2009	Sector where the contamination took place[4] (period 2001 - 2009)		
Acute hepatitis C (2001 – 2003, acute and carrier)	0	Abroad Health care sector Other (vet. lab worker) Not known[9]	1 3 1 6	(7 %) (40 %) (7 %) (47 %)
Legionnaires' disease	13	Abroad Building industry Agriculture Transport Other/unknown[10]	19 4 3 8 24	(33 %) (7 %) (5 %) (14 %) (41 %)
Leptospirosis	4	Contact with mice/rats Contact with water Agricultural sector Other/unknown	6 11 7 10	(18 %) (32 %) (21 %) (29 %)
Malaria[11]	34			
Measles	1	Health care sector Mental health care sector Laboratory Other sector/not known	3 2 1 2	(37,5 %) (25 %) (12,5 %) (25 %)
Meningococcosis	1	Education Other/unknown	1 3	(25 %) (75 %)
Ornithosis/psittacosis	5	Working with birds Other/unknown	22 7	(76 %) (24 %)
Paratyphoid A fever	0	Abroad	2	(100 %)
Paratyphoid C fever*	1	Abroad	1	(100 %)
Pertussis* (whooping cough)	29	Health care sector Reception of homeless/asylum seekers Education/childcare Other sector	5 1 11 12	(17 %) (3 %) (38 %) (41 %)

* Registrated since 2009

9 5 reports indicated that drug use, sexual contact or tattoos had played a role.

10 5 employees at cooling towers CS Amsterdam, 2 with high pressure spray guns and 2 plumbers.

11 Source or location of contamination is not included on questionnaire

Infectious disease	Work-related notifications in 2009	Sector where the contamination took place[4] (period 2001 - 2009)		
Q-fever	78	Agricultural sector (crops)	10	(8 %)
		Agricultural sector (cattle)	38	(32 %)
		Caring for animals/vet	19	(16 %)
		Meat industry	10	(8 %)
		Cattle transport/agriculture	7	(6 %)
		Leather industry	2	(2 %)
		Wool or felt production	1	(1 %)
		Abroad	3	(3 %)
		Other sector	29	(24 %)
Rubella (German measles)	0	School	6	(67 %)
		Not known	3	(33 %)
Shigella bacillary dysentery	9	Abroad[12]	45	(56 %)
		Zoo[13]	6	(8 %)
		School	5	(6 %)
		Laboratory	2	(3 %)
		Not known	22	(27 %)
Tetanus	1	Agriculture	1	100 %
VTEC infection Shiga Toxin Producing Escherichia coli (STEC)/ Enterohemorrhagic *E.coli* (EHEC) infection	4	Agriculture	2	50 %
		Not known	2	50 %

[12] Includes military service abroad.

[13] Contracted whilst taking care of monkeys in a zoo.

Appendix 3 Infectious diseases registered at the NCvB

Infectious disease[14]	Notifications in 2009	Average number of occupational infectious diseases per year (totals) 2002 - 2009
Hepatitis A *	0	0.2 (2)
Hepatitis B*	4	1.4 (13)
Hepatitis C *	0	0.3 (3)
Skin infections	14	14.9 (134)
Intestinal infection	57	30.1 (271)
Respiratory infections	4	2.4 (22)
Other specific infectious diseases		
Schistosomiasis (bilharzia)	0	0.1 (1)
Dengue fever	3	1.2 (11)
Legionnaires' disease*	1	0.8 (7)
Malaria*	8	6.0 (54)
MRSA	2	7.7 (69)
Other specific infectious diseases	9 (including 8 new influenza H1N1)	4.2 (38)
Conjunctivitis	0	0.9 (8)
No sickness (infection detected in blood sample)	18	6.7 (60)
Tuberculosis and positive Mantoux test*	15	20.7 (186)
Zoonoses		
Leptospirosis *	0	0.6 (5)
Meningitis	0	0.1 (1)
Ornithosis/psittacosis*	1	0.7 (6)
Other Zoonoses	0	1.8 (16)
Q-fever*	12	1.6 (14)
Rickettsia conorii	0	0.1 (1)
Toxoplasmosis	0	0.1 (1)
Lyme disease	8	9.0 (81)
Glandular fever	0	0.2 (2)
Total	155	111.8 (1 006)

[14] Infectious diseases with an * are infectious diseases that are notifiable under the Public Health Act.

Appendix 4 Work-related infectious diseases per sector (NCvB)

Infectious disease	**Notifications in 2009**	**Sector where disease was contracted** (number and percentage, 2002 to 2009)		
Hepatitis A	0	Education	1	(50 %)
		Food industry	1	(50 %)
Hepatitis B	4	Health and welfare	9	(69 %)
		Public administration and defence	2	(15 %)
		Business sector	1	
		(8% %)		
		Industry	1	(8 %)
Hepatitis C	0	Health and welfare	2	(67 %)
		Public administration and defence	1	(33 %)
Skin infections	14	Health and welfare	60	(45 %)
		Public administration and defence	9	(7 %)
		Agriculture	1	(1 %)
		Industry	18	(13 %)
		Other services	39	(29 %)
		Transport and storage	4	(3 %)
		Waste and water management	1	(1 %)
		Food industry	2	(1 %)
Intestinal infection	57	Health and welfare	177	(65 %)
		Industry	2	(1 %)
		Other services	34	(13 %)
		Transport and storage	58	(21 %)
		Other services	34	(23 %)
Other infectious diseases (e.g. Legionnaires' disease, malaria, MRSA)	23	Health and welfare	166	(87 %)
		Public administration and defence	7	(4 %)
		Other services	8	(4 %)
		Transport and storage	9	(5 %)
Respiratory infections/ tuberculosis	19	Health and welfare	154	(74 %)
		Public administration and defence	23	(11 %)
		Business sector	3	(1 %)
		Other services	28	(13 %)
Zoonoses (including ornithosis, Q-fever, Lyme disease)	21	Education	9	(7 %)
		Health and welfare	9	(7 %)
		Public administration and defence	30	(24 %)
		Agriculture, forestry and fishing	36	(29 %)
		Other services	29	(23 %)
		Waste and waste water management		11
		Food industry	1	(1 %)
No sickness (detected in blood sample) e.g., needlestick/sharp injury	18	Health and welfare	50	(83 %)
		Public administration and defence	3	(6 %)
		Food industry	7	(11 %)

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