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# Laboratory-Acquired Infections in Belgium (2007-2012)

## An online Survey

ABSA , Kansas City, 21October 2013

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# Laboratory-Acquired Infections in Belgium 2007-2012




- Introduction
- Belgian LAI Survey 2007-2012
- Conclusions
- Recommendations

# Introduction
## History



**Golden age of microbiology1866 - 1893**

First contaminations in the lab

- **Ingestion via "mouth" pipetting:**
  >> diphteria, cholera

- **Parenteral inocculation (syringes):**
  >> brucellosis, tetanus

# Introduction
# Aim of the survey



- Gathering information on **bio-incidents** and **LAIs** in Belgian micro-biological laboratories to gain insight into possible underlying causes so as to provide the biosafety officer with tools which can enhance biological safety.

# Introduction
# definitions



- **L**aboratory-**A**cquired **I**nfections (LAIs)

  *« All direct or indirect human infections with or without the onset of symptoms following exposure to pathogenic organisms in a micro-biological laboratory »*

- Bio-incidents

  *« All irregularities that occur while handling GMOs or pathogenic organisms »*

# Introduction
# Belgian LAI Survey 2007-2012



- **2012:** Online LAI survey in Flanders organized by SBB at the request of the Flemish Agency for Care and Health, Department Public health and Surveillance.

- **2013:** Extended over whole Belgium (Flemish, Walloon and Brussels-capital region)

**>> Two types of questionnaires:**

**Survey 1. Biosafety officer, prevention officer, occupational health practitioner**
**>> 213 institutions invited**

**Survey 2. Personnel (survey 2)**
**>> 26 institutions invited (873 employees)**

# Introduction
# Belgian LAI Survey 2007-2012



- **Tool:** **Limesurvey 2.0**, free online web survey tool with an automatic invitation, reminder and confirmation e-mail system


www.limesurvey.org

  - **Anonymous**

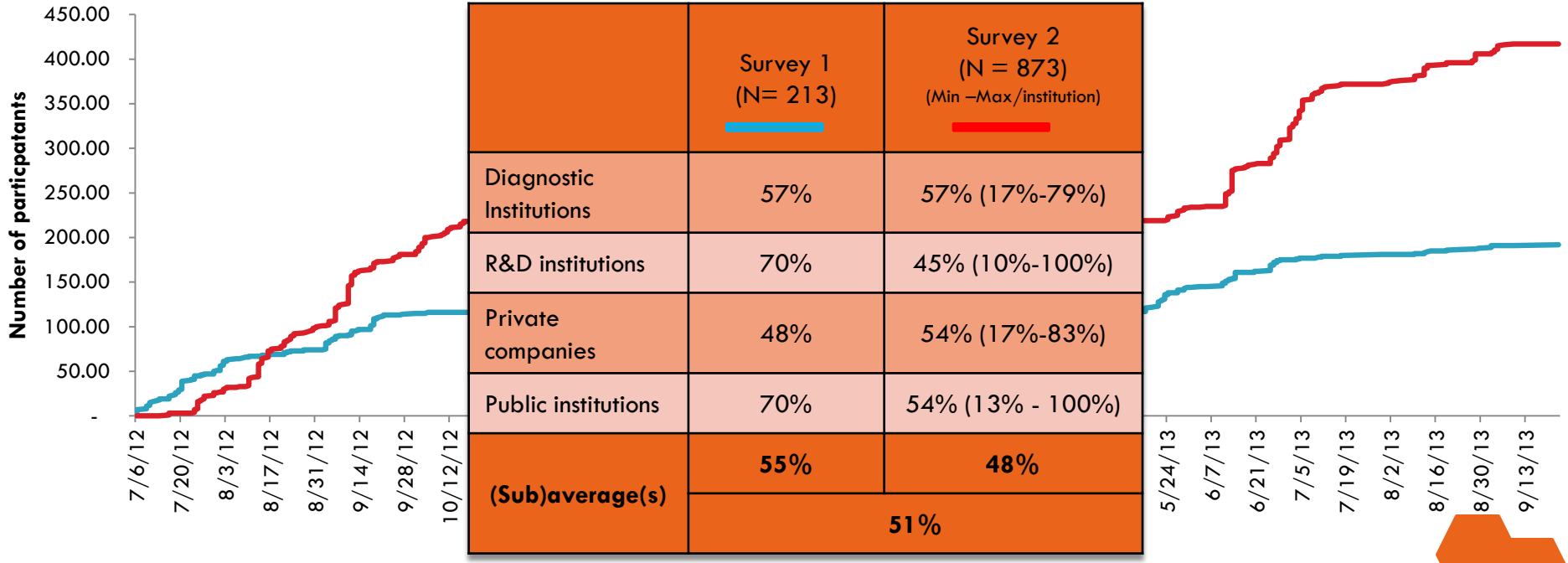
    Invitation addressed to the biosafety officer provided a web link (URL) and a unique token which granted access to the survey
  - **In Dutch, French and English**
  - **~50 questions and sub questions**

    Single-answer questions, multiple question and open questions

    Most of the question were mandatory

# Participation
# Belgian LAI Survey 2007-2012



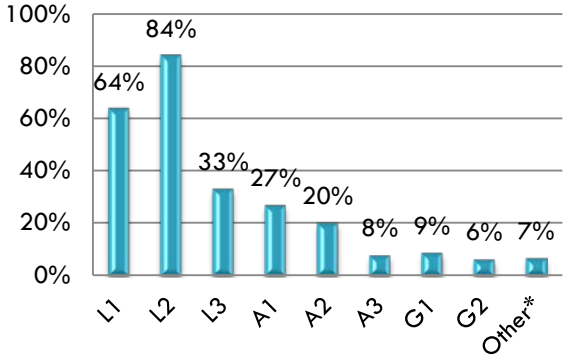



| | Survey 1 (N= 213) | Survey 2 (N = 873) (Min –Max/institution) |
|---|---|---|
| Diagnostic Institutions | 57% | 57% (17%-79%) |
| R&D institutions | 70% | 45% (10%-100%) |
| Private companies | 48% | 54% (17%-83%) |
| Public institutions | 70% | 54% (13% - 100%) |
| **(Sub)average(s)** | **55%** | **48%** |
| | **51%** | |

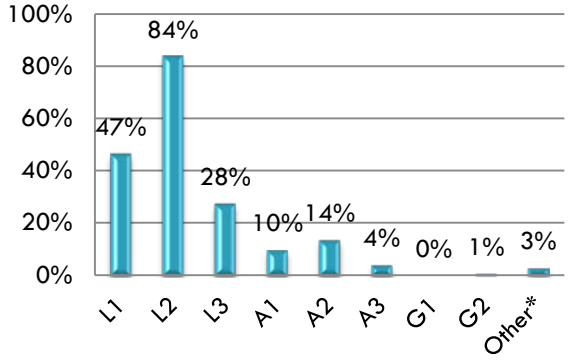
# Participation
# Belgian LAI Survey 2007-2012



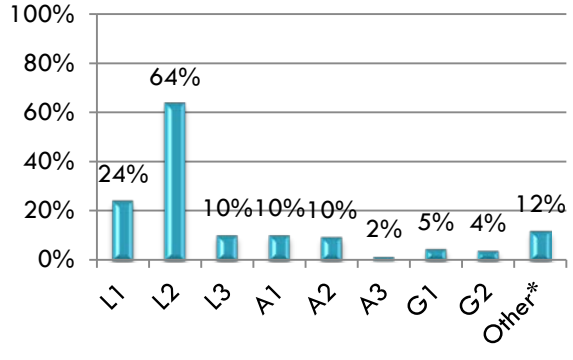
**Containment levels available in the institutions survey 1**




**Containment levels available in the institutions survey 2**




**Containment levels in recent authorizations (n=559)**




* **Other:** HR1 , LS1 , L2/BK, L2/Q, L3/BSE , G1-2/Q

**LEGENDS: L = laboratory ; A = Animal facility; G = Green houses; HR = hospital room ; LS = large scale**

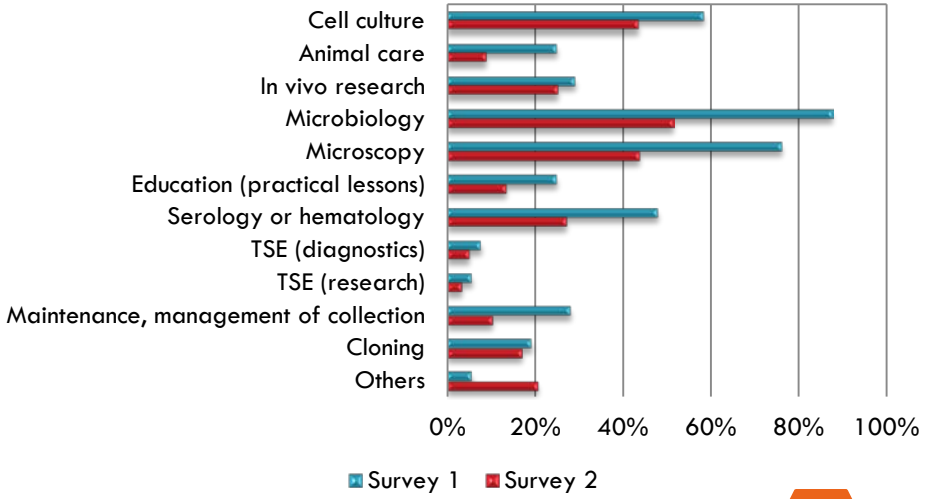
# Participation
# Belgian LAI Survey 2007-2012



## Participation rate in different sectors

| | Survey 1 (N= 213) | Survey 2 (N = 873) |
|---|---|---|
| (Bio)medical (Human) | 75% | 60% |
| Veterinary (Animals) | 9% | 39% |
| Plant research | 15% | 1% |

## Different types of activities



# Participation
# Belgian LAI Survey 2007-2012



- **Conclusion:**
  - The distribution pattern of the type of installations in survey 1 is similar to the requested containment levels in recent authorizations
  - Similar patterns are observed in survey 2 for the types of activities and installations
  - All types of sectors (except plant research) and activities are represented

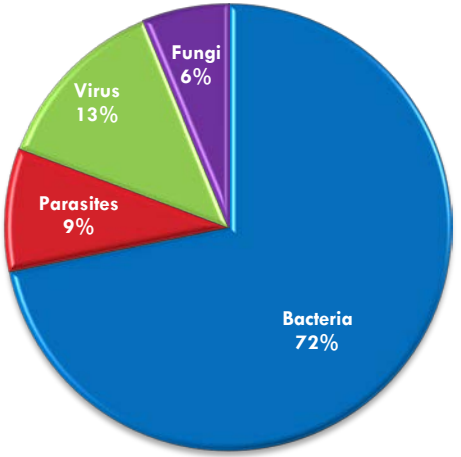
  **>>> REPRESENTATIVE GROUP of participants in both surveys**

# Results

# Belgian LAI Survey 2007-2012



| | Organism | Risk class[1] | Min number of cases (%) (N= 73) | Max number of cases (%) (N= 92.5) |
|---|---|---|---|---|
| 1 | *Salmonella bacteria (*)* | 2-3 | 16 (22%) | 20 (19%) |
| 2 | *Mycobacterium turberculosis complex (*)* | 3 | 12 (16%) | 15 (16%) |
| 3 | *Brucella bacteria (*)* | 3 | 5 (7%) | 10 (11%) |
| 4 | *Trypanosoma brucei gambiense* | 2 | 5 (7%) | 6 (6%) |
| 5 | *Dermatophyte (Microsporuim canis, Trichophyton verrucosum)* | 2 | 4 (5%) | 5 (5%) |
| 6 | *Shigella* bacteria ($) | 2-3 | 4 (5%) | 4 (4%) |
| 7 | *Coxiella burnetii (*)* | 2 | 3 (4%) | 3 (4%) |
| 8 | *Mycoplasma* | 2 | 2 (2%) | 2 (2%) |
| 9 | *Herpes virus* | 2 | 2 (2%) | 2 (2%) |
| 10 | Hepatitis C virus | 3 | 1 (1%) | 2 (2%) |
| 11 | *Campylobacter* ($) | 2 | 1 (1%) | 1.5 (2%) |
| 12 | *BCG (Bacillus Calmette Guérin)* | 2 | 1 (1%) | 1 (1%) |
| 13 | *Parvovirus B19* | 2 | 1 (1%) | 1 (1%) |
| 14 | *Avian Influenza (*)* | 2 | 1 (1%) | 1 (1%) |
| 15 | *HIV* | 3 | 1 (1%) | 1 (1%) |
| 16 | *Toxoplasma gondii* | 2 | 1 (1%) | 1 (1%) |
| 17 | *Bartonella bacteria* | 2-3 | 1 (1%) | 1 (1%) |
| 18 | *Rabies virus (*)* | 3 | 1 (1%) | 1 (1%) |
| 19 | *Recombinant viral vector* | 2-3 | 1 (1%) | 1 (1%) |
| 20 | *Rubella virus* | 2 | 1 (1%) | 1 (1%) |
| 21 | *Listeria bacteria* | 2 | 1 (1%) | 1 (1%) |
| | Unknown | | 7 (11%) | 12 (13%) |



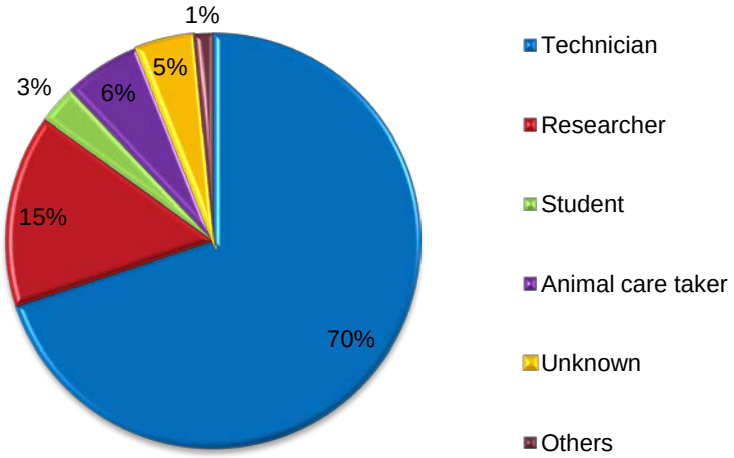

[1] Risk classes for human as based on the Belgian risk classifications of micro-organisms, http://www.biosafety.be/RA/Class/ClassBEL.html; * notifiable infectious disease ($ only in case of collective outbreak)

# Results

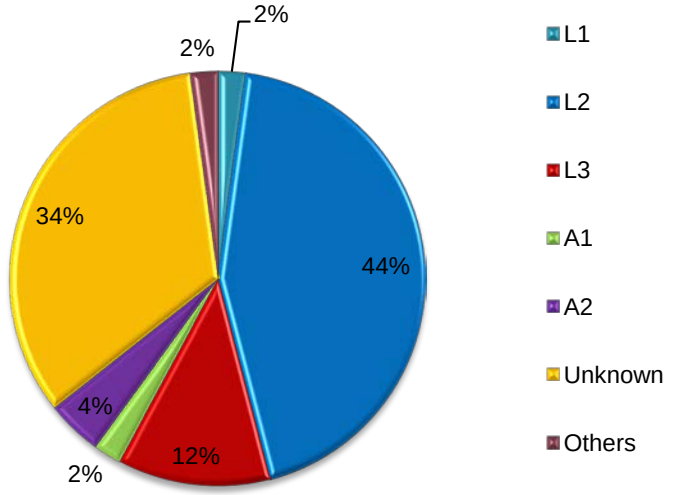
# Belgian LAI Survey 2007-2012



## Who was infected?




## Where did the infection happen?

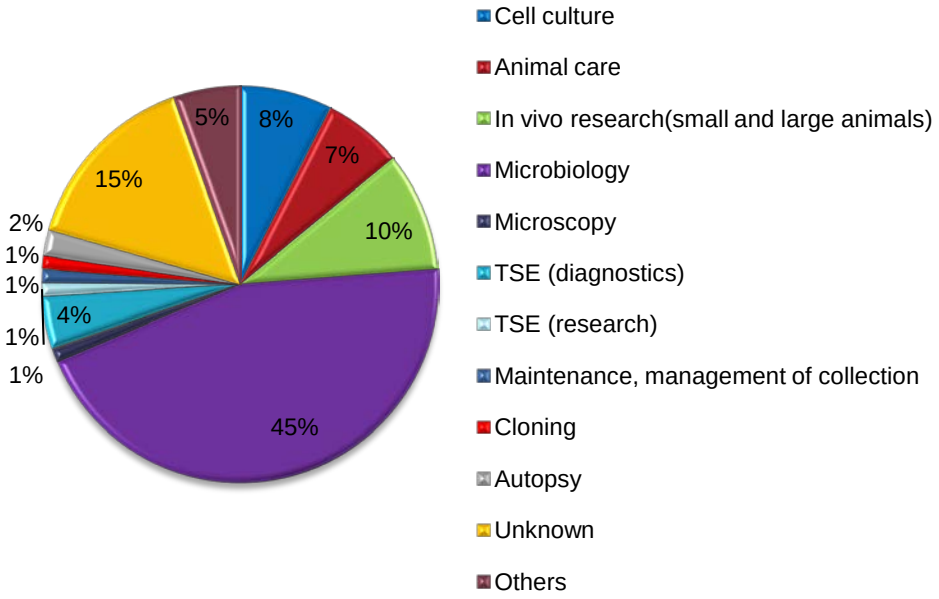


# Results

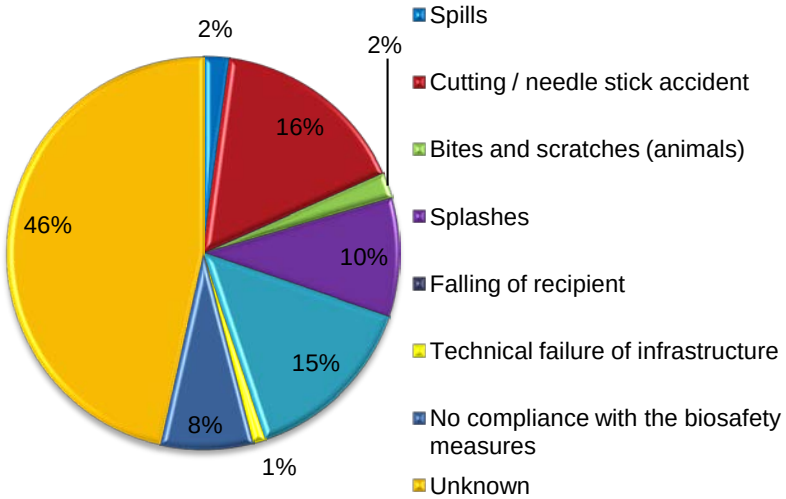
# Belgian LAI Survey 2007-2012



## In which context did the infection happen?




## Type of incident involved in the infection?

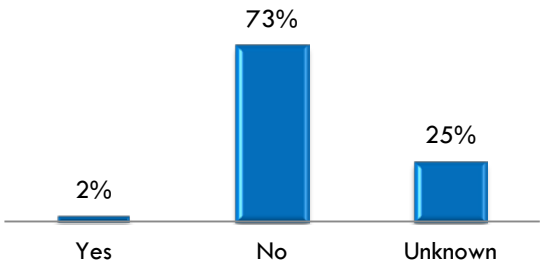


# Results

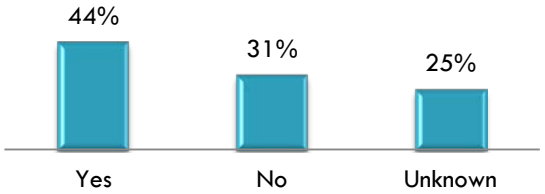
# Belgian LAI Survey 2007-2012



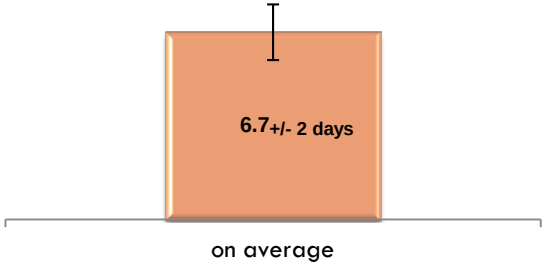
**Was it transmitted to another person?**




**Is it proven that the infection is work related?**




**Days of disability (n=16)**



# Results
# Belgian LAI Survey 2007-2012



## Conclusion

"The most common LAI in Belgium is an enterobacterial infection of a technician during microbiologal activities in a BSL-2 lab without clear origin"

# Results

# Belgian LAI Survey 2007-2012



## Conclusion

"The most common LAI in … is an enterobacterial infecti… … technician during microbiolo… …ities in a BSL-2 lab without cl… …gin"

Absolute numbers >< relative risks

# Analysis

# Belgian LAI Survey 2007-2012



| | Organism | Risk class[1] | Survey 1 (N= 26) | Survey 2 (N= 66.5) |
|---|---|---|---|---|
| 1 | *Salmonella bacteria (*)* | 2-3 | 4 (15%) | 16 (24%) |
| 2 | *Mycobacterium turberculosis complex (*)* | 3 | 3 (12%) | 12 (18%) |
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- 25 of the 26 invited institutions in survey 2 also participated in survey 1
- 9 other organisms are mentioned in survey 2
- In 4 out of the 13 institutions participating in survey 1, more than one person responded. However, these multiple responses from the same institutions did not refer to the same LAI.

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# Analysis
# Belgian LAI Survey 2007-2012



- **Differences between survey 1 & 2**

- **Possible causes of the identified LAIs**

  *"the knowledge (risks, potential route of transmission), the techniques, and the equipment to prevent most laboratory infections are available"* dixit Robert M. Pike (1979)

  - Rationale of bio-incidents
  - Compliance with biosafety measures
  - Awareness of occupational biological risks

# Recommendations
# Belgian LAI Survey 2007-2012



## Recommendations:

- Close monitoring of the compliance with the required biosafety measures (when more specific personal protection equipment has to be adopted to ensure (bio)safety)
- Bio-incident monitoring, follow-up, internal communication and (external) reporting (role of occupational health practitioner)
- Evaluation and the control of adopted biosafety measures
- Increase personnels'awareness of occupational biological risks with regards to common transmission routes and symptoms (+ evaluate)
- Do not underestimate impact of occupational and human factors (stress, absent mindedness,…)


Belgian Biosafety Server

www.biosafety.be

LAI Report for Flanders available online:
http://www.biosafety.be/CU/LAI/Intro_LAI.html

Belgian LAI report available soon (spring 2014)

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**Laboratory-Acquired Infections in Belgium (2007-2012)**
**An online Survey**