Serogroup W in Africa & travellers

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FOR RESEARCH, FOR HEALTH,
FOR OUR FUTURE

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PREVALENCE OF MENINGOCOCCAL SEROGROUPS AND DESCRIPTION OF THREE NEW GROUPS[1]

JIMMY R. EVANS, MALCOLM S. ARTENSTEIN
AND DONALD H. HUNTER

2 childhood meningococcal meningitis caused by this serogroup.

JOURNAL OF [illegible]MICROBIOLOGY, Nov. 1978, p. 621–622
0095-1137/78/[illegible]
Copyright © 1978 Americ[illegible]iology
Vol. 8, No. 5
Printed in U.S.A.

Meningitis Caused by *Neisseri[illegible]gitidis* Serogroup 135

MARTIN B. KLEIMAN,[1]* JANET REYNOLDS,[2] JEANNE STEINFEL[illegible]. ALLEN,[2] AND JAMES W. SMITH[2]

Three infants, two with bacteremia and one with septic arthritis

J Pediatr. 19[illegible]

Infections in childr[illegible]Neisseria meningitidis serogroup 135.

Hammerschlag MR, Baltimore RS.

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Serogroup W in Africa: Early days

1981-1982: Dakar (Senegal), Niamey (Niger) 11 of 349 isolates NmW

Denis et al., 1982

dec1983-nov1985: Gambia (3/41; 7% NmW)

Greenwood *et al.* 1986

1989-1994: Niger, Sudan, Chad, Mali, Guinea, Uganda, Burundi, Rwanda, Zambia (2 isolates of 51 Nm W ET37 from Mali; MLEE analysis)

Guibourdenche et al., 1996

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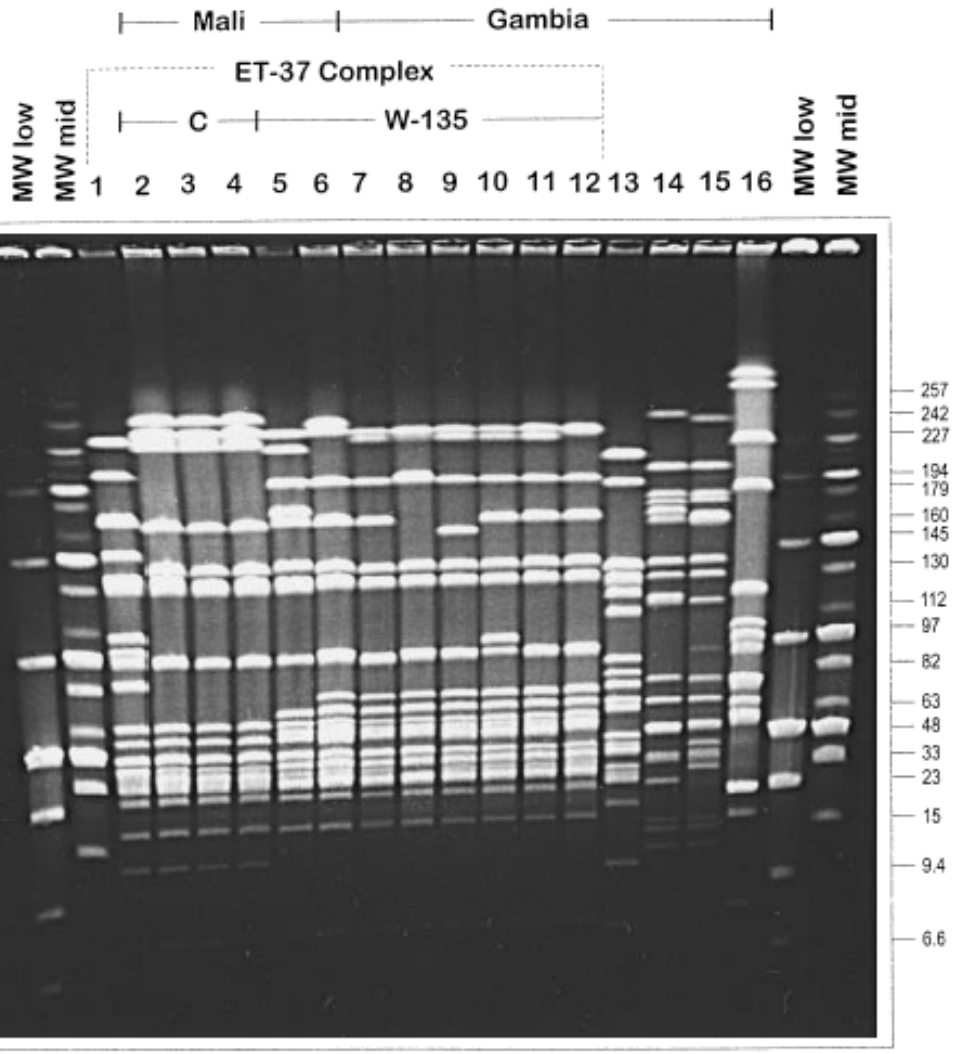
Meningitis caused by a serogroup W135 clone of the ET-37 complex of *Neisseria meningitidis* in West Africa

A. Kwara[1], R. A. Adegbola[1], P. T. Corrah[1], M. Weber[1], M. Achtman[2], G. Morelli[2], D. A. Caugant[3] & B. M. Greenwood[1]

Tropical Medicine and International Health
VOLUME 3 NO 9 PP 742–746 SEPTEMBER 1998



The origin of the African W135 clone described in this paper is unclear. However, meningococci belonging to serogroup W135 have been isolated from African patients with meningococcal disease since the early 1980s and the subclone described here may have caused some of these earlier cases. Meningococci belonging to serogroup W135 now account for a significiant proportion of cases of meningococcal disease in Saudi Arabia (A. Meshkas, personal communication). The annual *haj*, during which large numbers of pilgrims from the meningitis belt of Africa congregate in the holy places, offers an opportunity for spread of meningococci.

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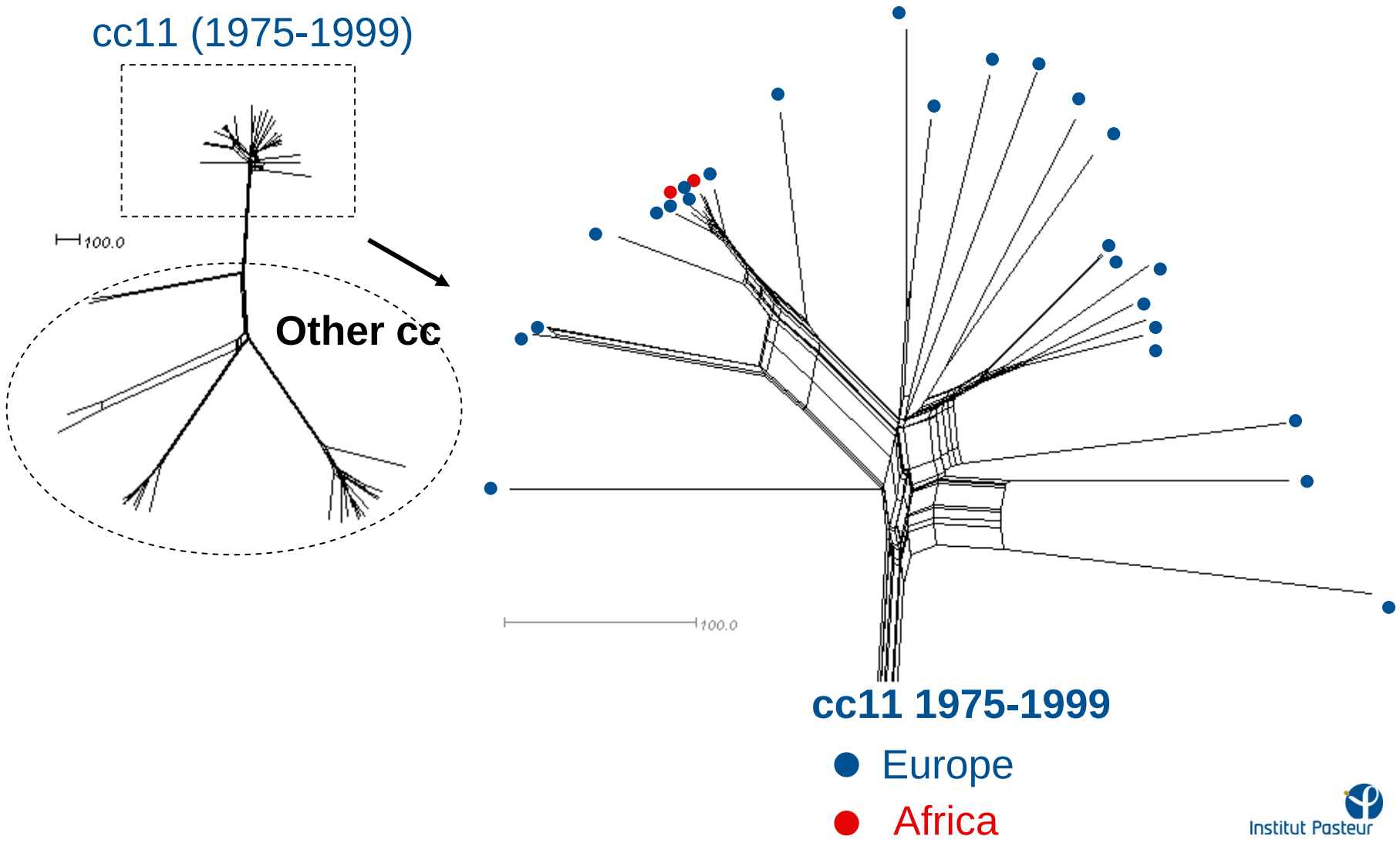
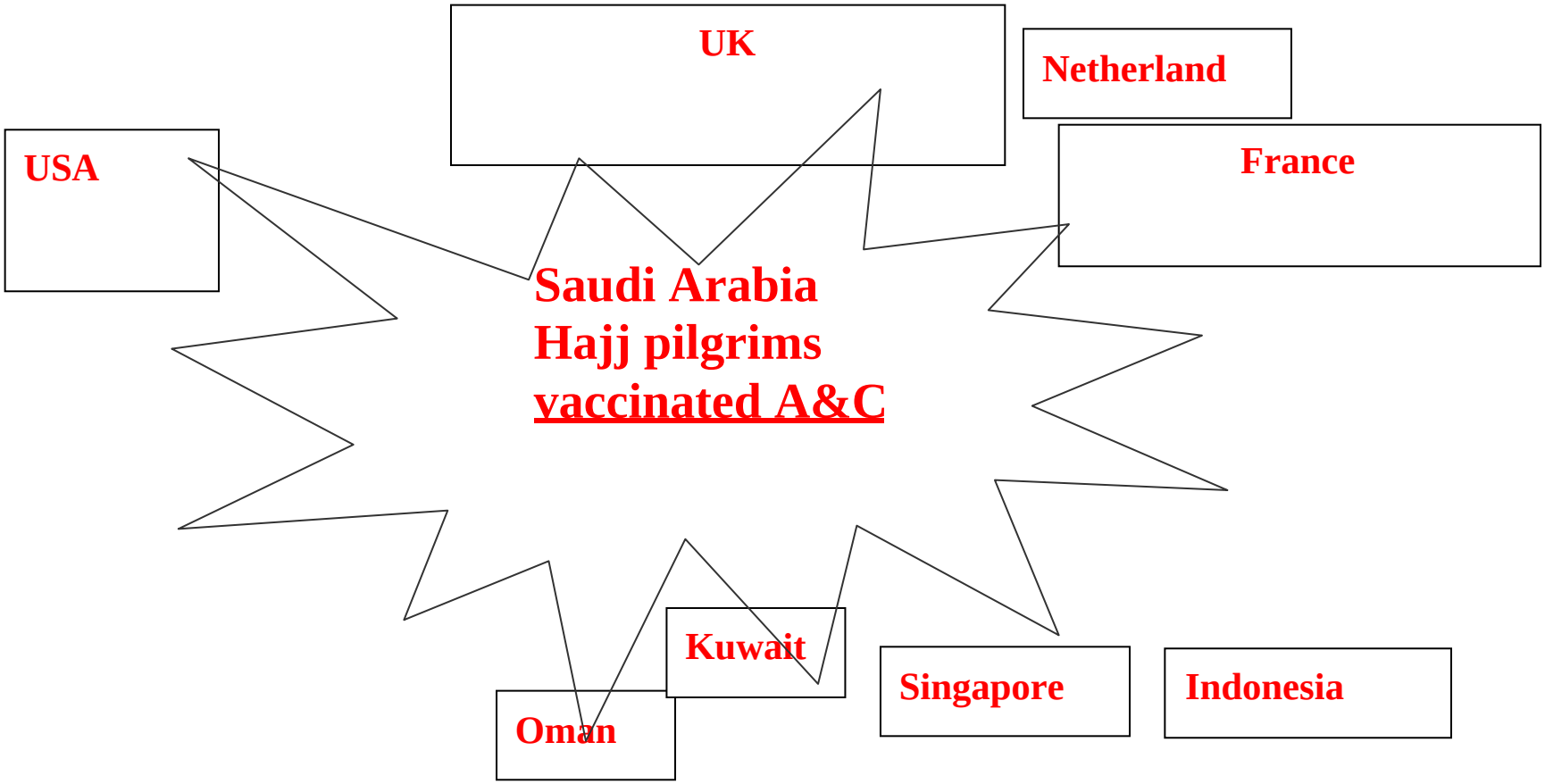
WGS: Before 2000

Lucidarme et al.. *J Infect* 2015



Global emergence of serogroup W135 of the clonal complex ET-37/ST-11 in 2000



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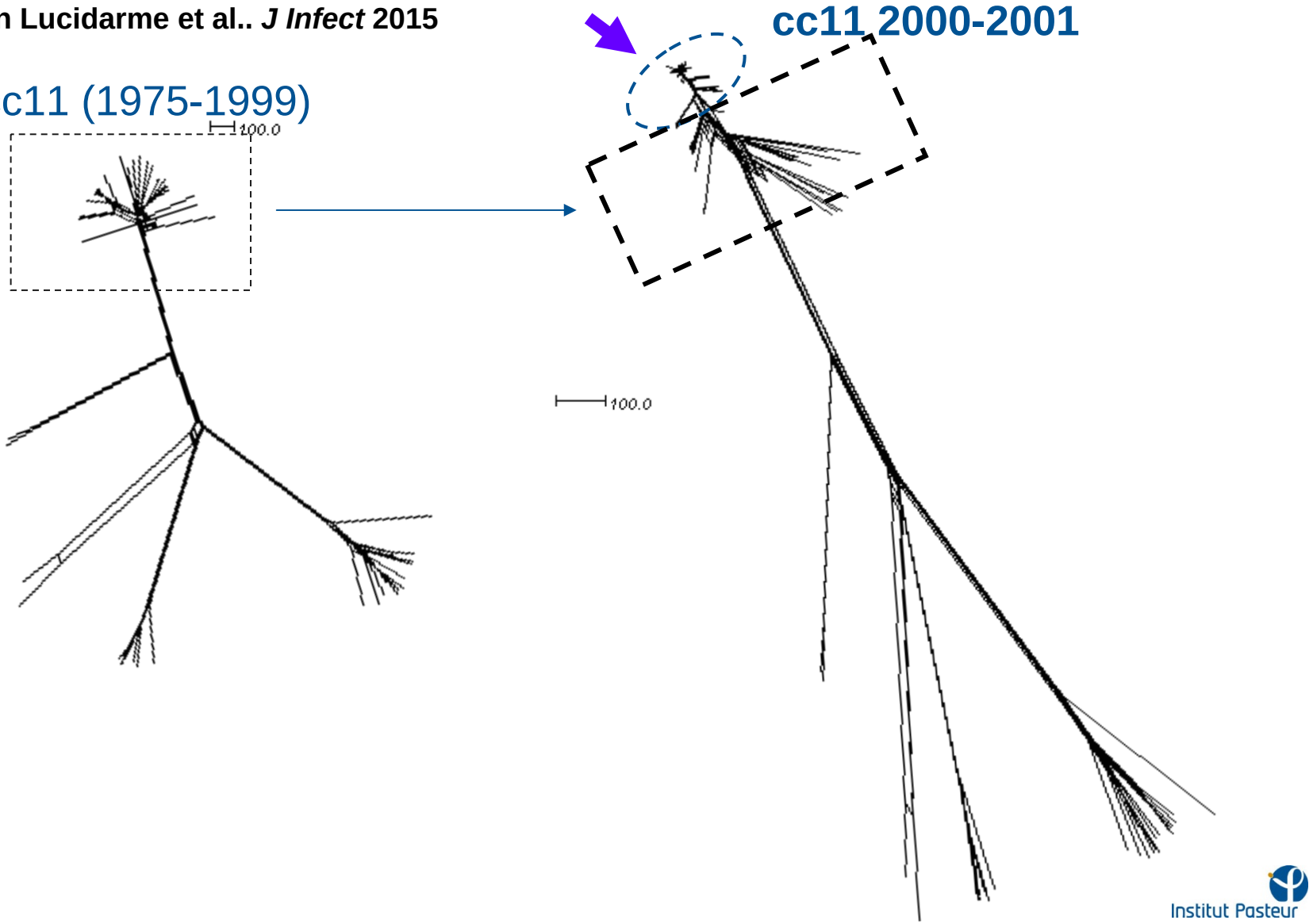
WGS to 2001: The Anglo French Hajj cluster

Based on Lucidarme et al.. *J Infect* 2015



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Worldwide tracking of NmW isolates

The Journal of Infectious Diseases 2002;185:1596–605

Outbreak of W135 Meningococcal Disease in 2000: Not Emergence of a New W135 Strain but Clonal Expansion within the Electophoretic Type–37 Complex

Leonard W. Mayer,[1] Michael W. Reeves,[1]
Nasser Al-Hamdan,[4] Claudio T. Sacchi,[1]
Muhamed-Kheir Taha,[3] Gloria W. Ajello,[1]
Susanna E. Schmink,[1] Corie A. Noble,[1]
Maria Lucia C. Tondella,[2] Anne M. Whitney,[1]
Yagoub Al-Mazrou,[5] Mohammed Al-Jefri,[6]
Amin Mishkhis,[7] Sameer Sabban,[8]
Dominique A. Caugant,[9] Jairam Lingappa,[1]
Nancy E. Rosenstein,[1] and Tanja Popovic[1]

Quality	16S	PFGE	MEE	PorA	Type and subtype	MLST	MLDF
Sensitivity	100 (87–100)	100 (87–100)	100 (87–100)	100 (87–100)	100 (87–100)	100 (87–100)	100 (85–100)
Specificity	98 (89–100)	86 (73–94)	80 (66–90)	64 (49–77)	64 (49–77)	62 (47–75)	47 (28–66)
PPV	96 (81–100)	79 (61–91)	72 (55–86)	59 (43–74)	59 (43–74)	58 (42–72)	58 (41–74)
NPV	100 (93–100)	100 (92–100)	100 (91–100)	100 (89–100)	100 (89–100)	100 (89–100)	100 (77–100)

The 2000 Hajj was the first large worldwide NmW outbreak
The outbreak was caused by one clone within the ST-11/ET-37 complex
Members of this complex have been circulating worldwide

The Authors conclude:"We predict outbreaks caused by the ST-11/ET-37 isolates will continue to occur"

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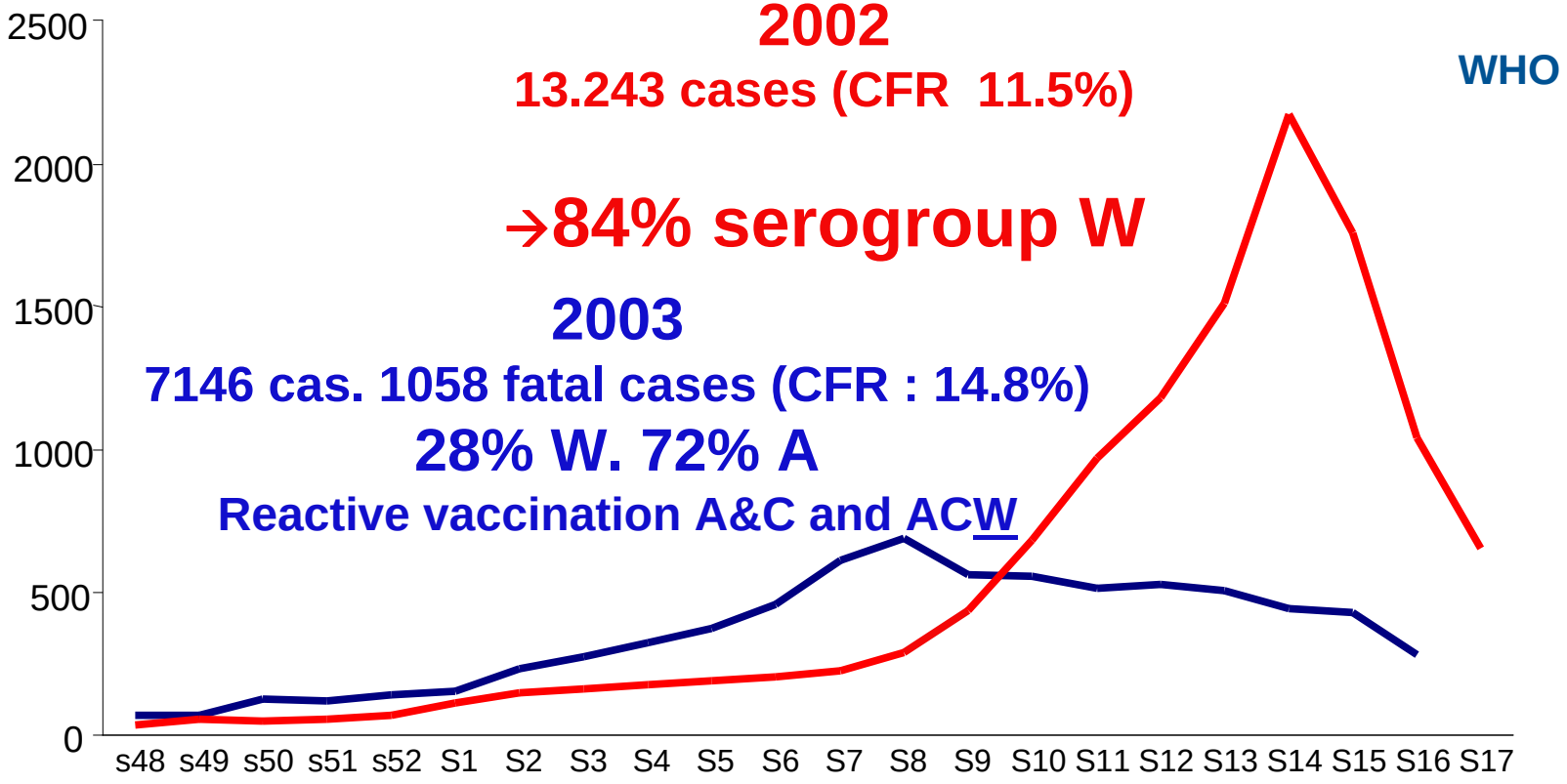
Burkina Faso (2002-2003)



The Rise and Fall of Epidemic *Neisseria meningitidis* Serogroup W135 Meningitis in Burkina Faso, 2002—2005

Yves Traoré,[1] Berthe-Marie Njanpop-Lafourcade,[6] Kokou-Louis-Sewonou Adjogble,[5] Mathilde Lourd,[6] Seydou Yaro,[2] Boubacar Nacro,[3] Aly Drabo,[2] Isabelle Parent du Châtelet,[6] Judith E. Mueller,[6] Muhamed-Kheir Taha,[7] Ray Borrow,[9] Pierre Nicolas,[8] Jean-Michel Alonso,[7] and Bradford D. Gessner[6]

Clinical Infectious Diseases 2006; 43:817–22

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High levels of carriage and high acquisition rate of the NmW/cc11

MacLennan et al., 2000, The Lancet, 356:1078

- High levels of carriage of a hyperinvasive NmW/ET-37 carriage among 5 -year-old Gambian children in 1996
  - 43 carried meningococci among 510 children (8.4%)
  - 27/43 carried meningococci NmW/ET-37

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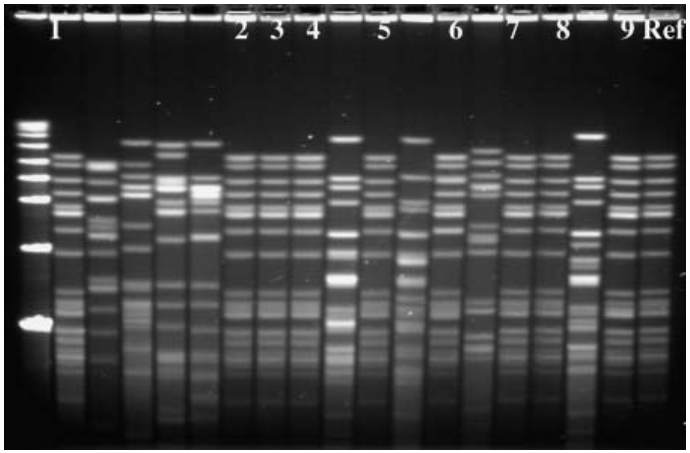
High levels of carriage and high acquisition rate of the NmW/cc11



Nicolas et al., 2005 APMIS, 113:182-186

- Carriage study in in pilgrim families (Morocco) 3 to 12 months after the Hajj 2000 (N=1186 persons 3 swabs).
- Nm was detected in 2.7% of the specimens (n=95).
- 31/95 were serogroup W.
- 28/31 were identical to the Hajj strain by PFGE

Wilder-Smith et al., BMJ, 325:365-366

Meningococcal carriage in Hajj pilgrims and their household contacts. Values are numbers (percentages) unless stated otherwise

		After Hajj	
	Pilgrims before Hajj (n=204)	Pilgrims (n=171)	Household contacts (n=233)
All isolates	1 (0.5)*†	29 (17)*	19 (8.2)
W135 clone	0	26 (15)	8 (3.4)

*P<0.001 between pre-Hajj and post-Hajj pilgrims (McNemar test).
†Prevalence of pre-Hajj meningococcal carriage in the 171 pilgrims who returned for the post-Hajj swab was 0.6%.

Meningococcal Carriage, Burkina Faso, 2003

152 Nm detected in 2389 orophaeyngeal swabs

Table 1. Characterization of 152 meningococcal isolates, Bobo-Dioulasso, Burkina Faso, 2003*

Sequence type (ST)	No. isolates (% ST)	No. tested by MLST	Phenotype	No. (%) ST isolates with phenotype
ST-192	96 (63)	40	NG:NT:NST	95 (63)
			W135:NT:NST	1 (1)
ST-11	19 (13)	5	W135:2a:P1.5,2	16 (11)
			W135:NT:P1.5,2	2 (1)
			NG:2a:P1.5,2	1 (1)
ST-198	13 (9)	3	NG:15:P1.6	12 (8)
			W135:15:P1.6	1 (1)
ST-4426 (clonal complex ST-198)	2 (1)	2	NG:15:P1.6	2 (1)
ST-2881	8 (5)	2	W135:NT:P1.5,2	8 (5)
ST-4151 (single locus variant of ST-2881)	1 (1)	1	W135:NT:P1.5,2	1 (1)
ST-751	5 (3)	3	X:NT:P1.5	5 (3)
ST-4376 (single locus variant of ST-751)	1 (1)	1	NG:NT:P1.5	1 (1)
ST-4375 (clonal complex ST-23)	3 (2)	1	Y:14:P1.5,2	3 (2)
ST-2049	1 (1)	1	NG:15:P1.6	1 (1)
ST-4377	2 (1)	2	NG:NT:NST	2 (1)
Not tested	1 (1)	–	NG: Not determined	1 (1)
Total	152 (100)	61		152 (100)

Mueller et al, Emerg Infect Dis; 13:847-54 (2007).

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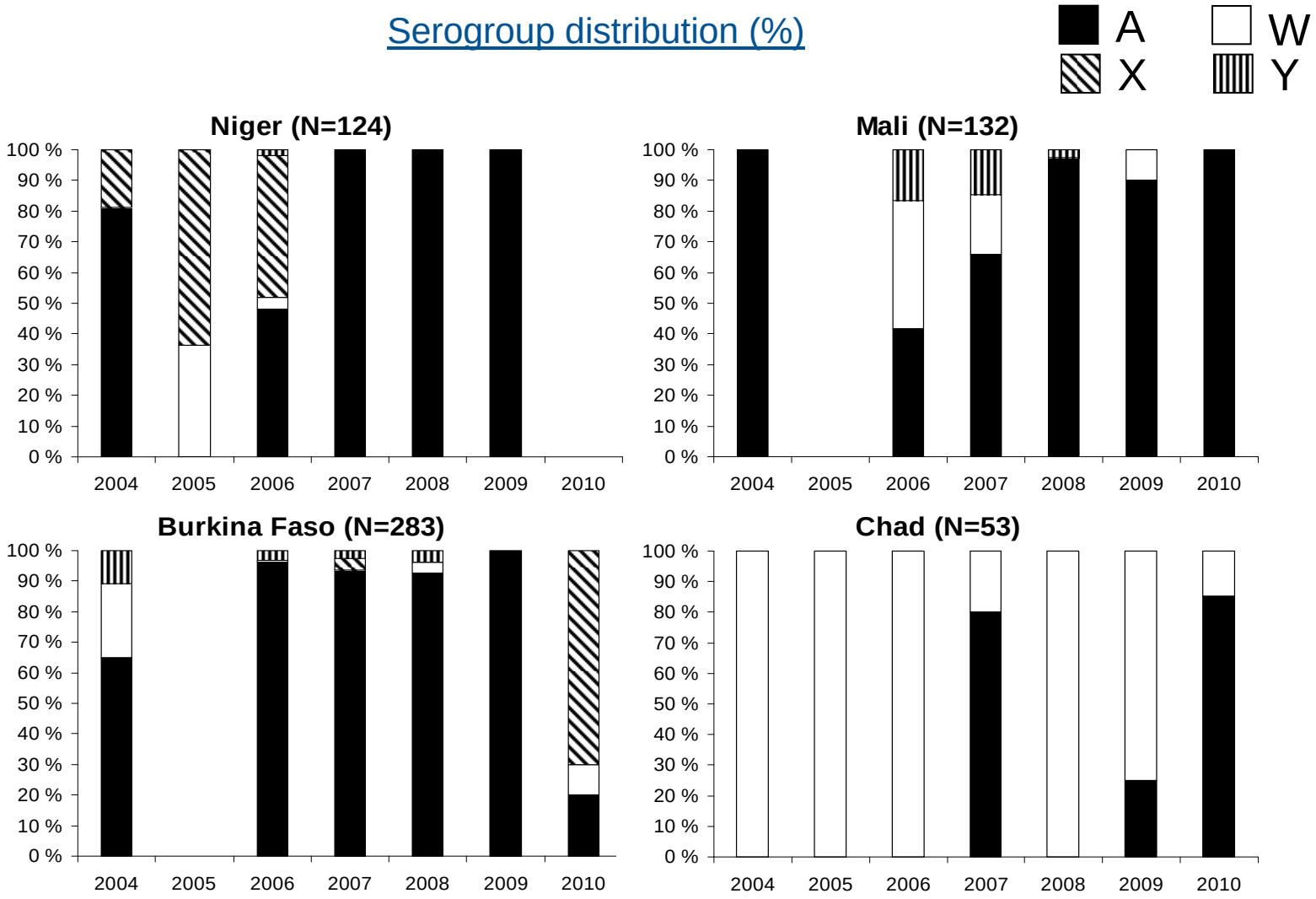
Meningococcal Isolates from Countries in the African Meningitis Belt

Serogroup distribution (%)



773 isolates (2004 and 2010)
13 sub-Saharan countries

Caugant et al.. PLoSONE *2012*

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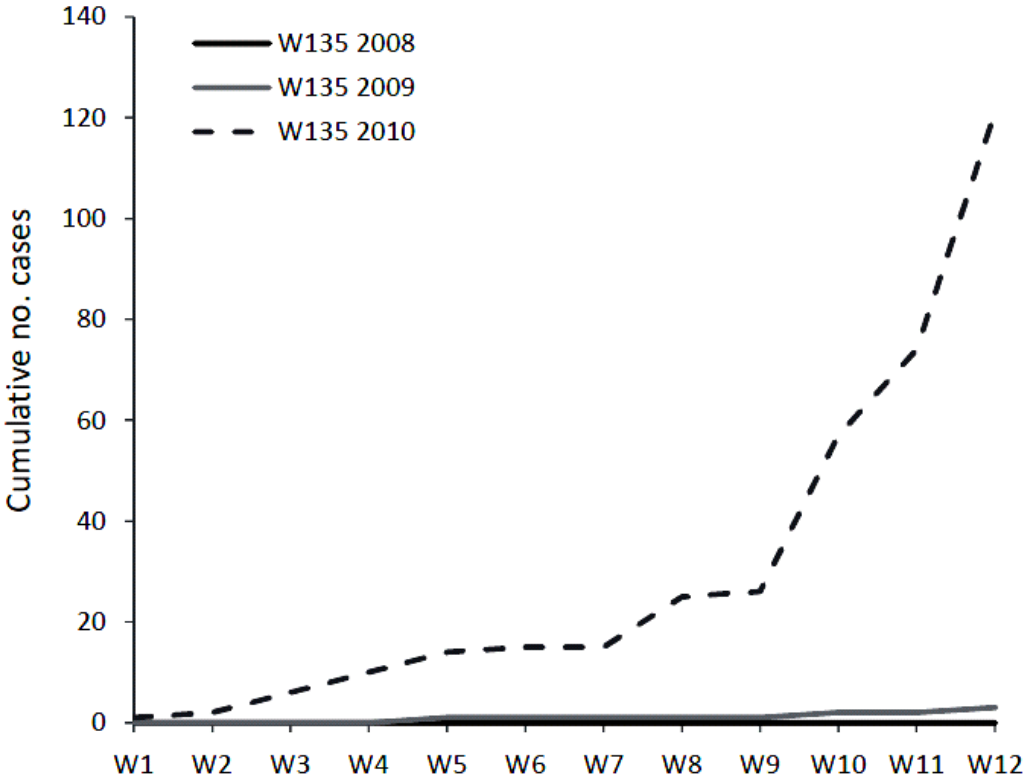
Increase in *Neisseria meningitidis* serogroup W, Niger, since 2010



Nm W in Niamey showed two STs,
ST-11
ST-2881(local isolates)

Year	Nm A	Nm W
2008	1067 (98.6%)	0
2009	1654 (97.5%)	11
2010	243 (26.4%)	665 (72.2%)
2011	5	402 (98.1%)
Total	**2969**	**1078**

Collard et al.. EID 2010; Collard et al. BMC Infect Dis 2013

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CSF and identified agents (2014)

WHO Wkly Epidemiol Rec, No. 13, 2015, 90, 121-132

Country – Pays	No. CFS samples – Nombre d'échantillons de LCR	No. CSF positive fluid samples – Nombre d'échantillons de LCR positifs	*Neisseria meningitidis* serogroup A – *Neisseria meningitidis* sérogroupe A	*Neisseria meningitidis* serogroup B – *Neisseria meningitidis* sérogroupe B	*Neisseria meningitidis* serogroup C – *Neisseria meningitidis* sérogroupe C	*Neisseria meningitidis* serogroup X – *Neisseria meningitidis* sérogroupe X	*Neisseria meningitidis* serogroup Y – *Neisseria meningitidis* sérogroupe Y	*Neisseria meningitidis* serogroup W135 – *Neisseria meningitidis* sérogroupe W135	Other *Neisseria meningitidis* – Autres *Neisseria meningitidis*	*Streptococcus pneumoniae*	*Haemophilus influenzae* type b – *Haemophilus influenzae* type b	Other pathogens – Autres pathogènes
Benin – Bénin	79	8	0	0	0	0	0	4	0	3	0	1
Burkina Faso	1895	587	0	0	0	2	0	157	15	404	9	0
Cameroon – Cameroun	136	21	0	0	0	0	0	0	0	11	0	10
Democratic Republic of the Congo* – République démocratique du Congo*	201	35	0	0	1	0	0	0	0	6	1	27
Gambia – Gambie	88	4	0	0	0	0	0	2	0	2	0	0
Ghana	330	82	0	2	0	0	1	41	9	27	0	2
Guinée	156	16	5	0	0	0	0	8	0	0	3	0
Mali	112	27	0	0	0	3	0	2	0	20	2	0
Mauritania – Mauritanie	–	0	–	–	–	–	–	–	–	–	–	–
Niger	169	49	0	0	8	0	0	14	0	20	3	4
Nigeria – Nigéria	3	3	0	0	3	0	0	0	0	0	0	0
Senegal – Sénégal	125	8	0	0	0	0	0	2	0	1	1	4
Sudan – Soudan	49	4	0	0	0	0	0	0	0	2	1	1
Togo	44	16	0	0	0	0	0	1	4	9	2	0
Total	**3387**	**860**	**5**	**2**	**12**	**5**	**1**	**231**	**28**	**505**	**22**	**49**

* Data for epidemic season (weeks 1–26). – Données pour la saison épidémique (semaines 1-26).

Travel-related meningococci W Infection, France 2012 (1/1/2012 to1-4-2012)

Total N° cases	Recent travel*	Family travel**	Mean age (range)	Clinical manifestation	Typing	Death
8	4 Senegal and Mali	4 Benin, Senegal and Mali	20.9y (4 mo-62 y)	Meningitis (4) Invasive pneumonia (2) Arthritis (1) Pericarditis (1)	W P1.5,2 F1-1 cc11	0

***Sub-Saharan Africa (<2 weeks prio the onset)**
****Sub-Saharan Africa(<3 weeks prior to the onset)**

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MenW disease and arthritis

Ladhani *et al.*, *Clin Infect Dis* 2015, 60, 578.

- **Among 129 MenW cases diagnosed in England and Wales during the three epidemic years 2010–2013, 9 (7%), presented with septic arthritis.**

Gaschignard *et al.*, *Pediatr Infect Dis J* 2013 32, 798

- **Among 119 pediatric MenW cases diagnosed in France during 2001–2008, 10 (8%) presented with septic arthritis.**

Vienne *et al.*, *Clin Infect Dis* 2003, 37, 1639

- **Another French study reported higher prevalence of arthritis with MenW (3.3%) than MenB (0.6%) or MenC (1.1%) disease.**

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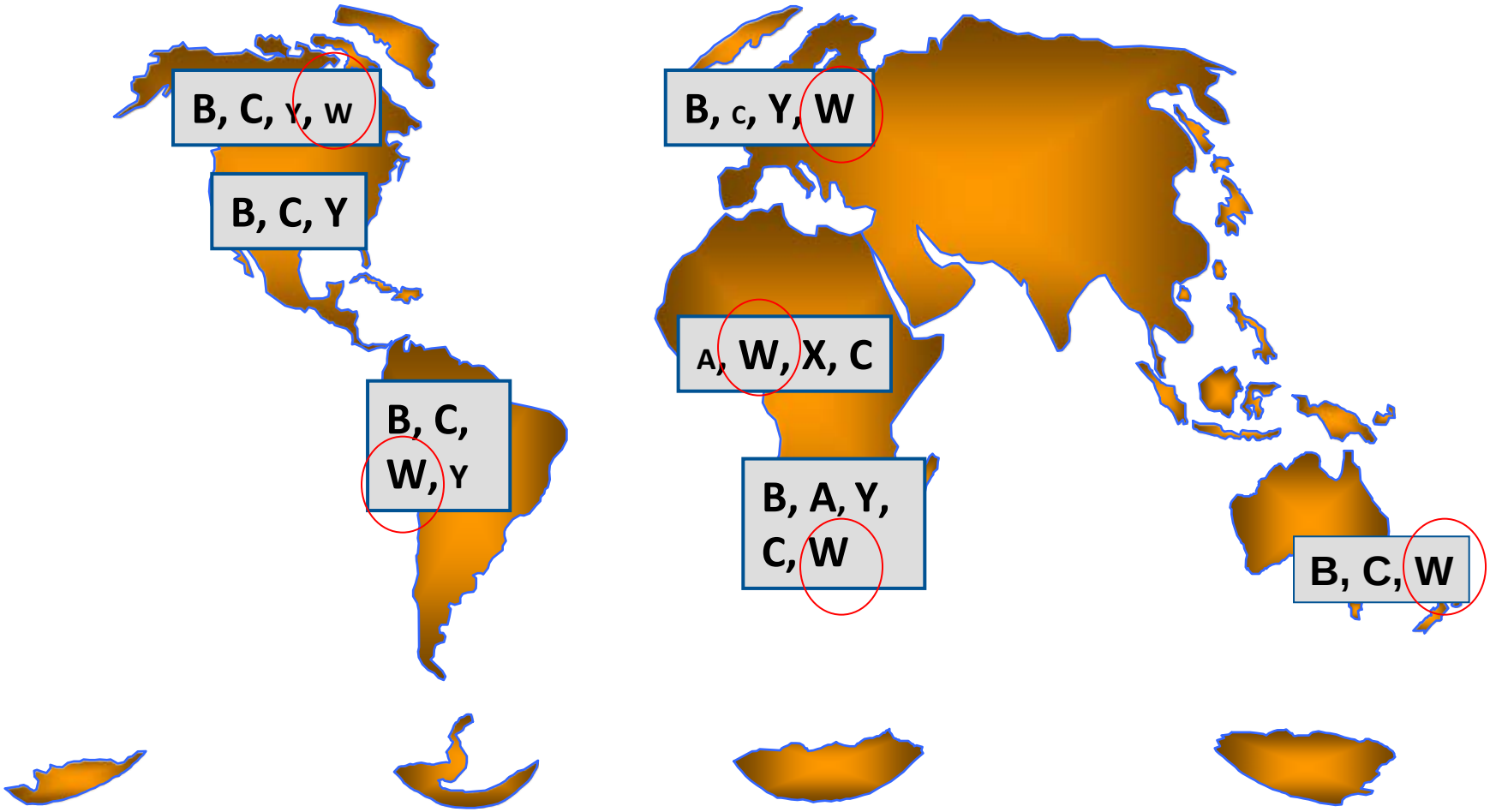
Global serogroup distribution since 2000



Global spread of NmW

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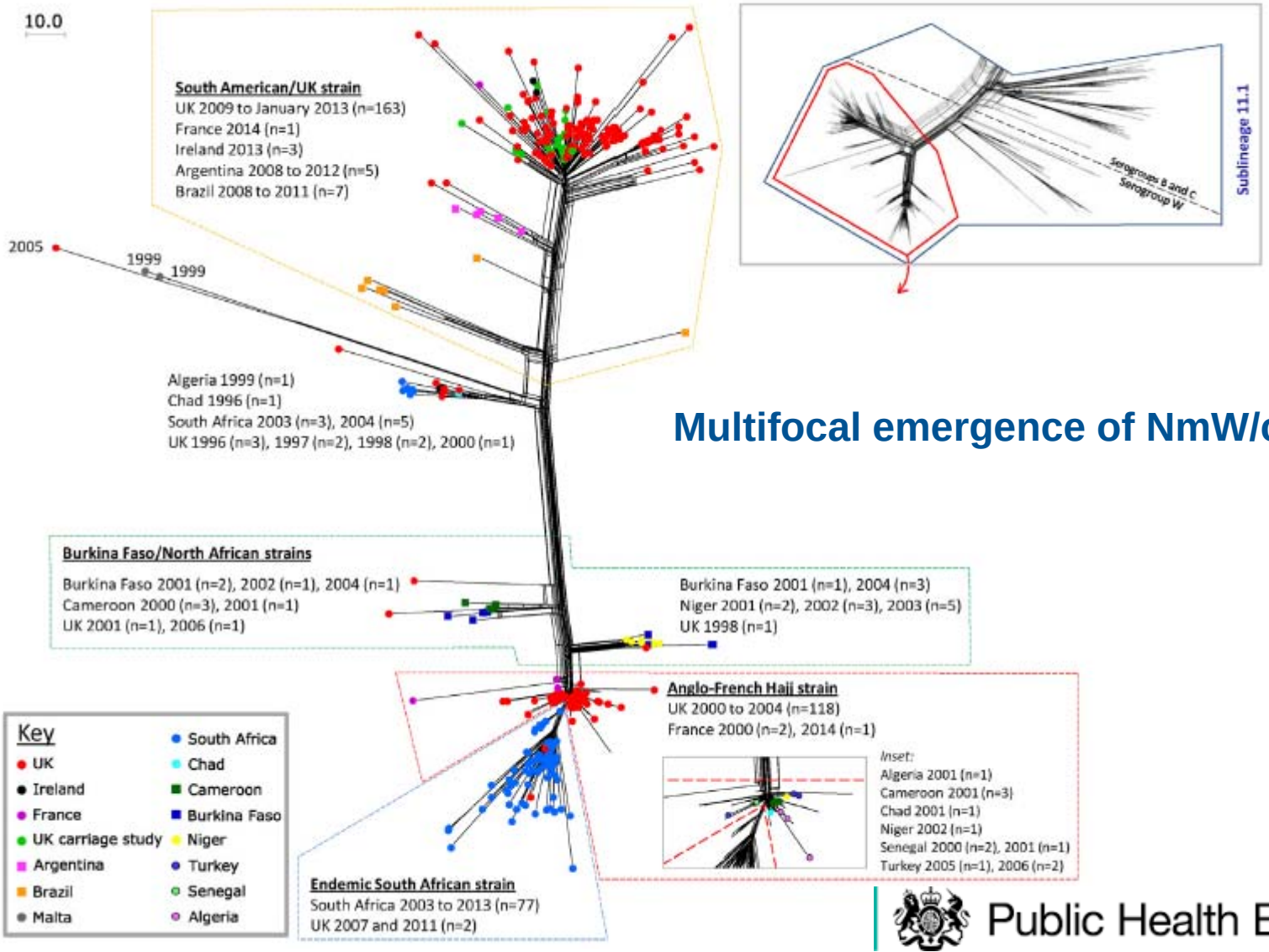
Genomic resolution of an aggressive, widespread, diverse and expanding meningococcal serogroup B, C and W lineage

- **Lucidarme et al.. *J Infect* 2015**



Multifocal emergence of NmW/cc11

Public Health England

NmW Outbreak of among Scouts returning from the World Scout Jamboree, Japan, 2015

- On 13 August 2015, 3 confirmed cases of IMD among Scottish scouts
- the UK reported through the European Early Warning and Response System (EWRS), two confirmed cases of invasive meningococcal disease (IMD)
- As of 19 August 2015, two countries, the UK and Sweden, have reported eight cases (five confirmed and three suspected cases).

ECDC. Outbreak of invasive meningococcal disease in the EU associated with a mass gathering event, the 23rd World Scout Jamboree, in Japan. 21 August 2015. Stockholm: ECDC, 2015. http://ecdc.europa.eu/en/publications/publications/meningococcal-disease-scouts-eu-august-2015.pdf

WGS of invasive isolates(4 Scottish and one Swedish) and 11 carriage isolates from Swedish scouts :

A genuine outbreak due to isolates of the UK-South America W:cc11 strain

A distinct sub-cluster within the rapidly new expanding 2013 UK cluster

Lucidarme et al., 20th IPNC Manchester 4-9 September 2016

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Conclusions

- Multifocal emergence of serogroup W of old capsule switching
- Several clusters of W/cc11 isolates contribute to the global burden of the Menw disease worldwide
- Unusual clinical forms
- MenW is the most frequent serogroup in the meningitis belt as well as other countries in Africa
- MenW/cc11 disease is associated with travel that include the Hajj but not only: Mass gathering and high acquisition of carriage
- Previous genotyping studies were unable to reliably discriminate sporadic and epidemic NmW isolates
- WGS should can be the standard typing scheme for NmW isolates

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