Infection prevention in dental practice

Andrew Smith
Professor of Clinical Bacteriology
Tulsa oral surgeon 'who used rusty instruments and reused needles' is responsible for nation's first transmission of hepatitis C between patients at a dental office

- There is at least one instance in which Dr. Harrington's practice spread an infectious disease
- Genetic testing is still ongoing to find out how many patients were infected
- Of those tested, more than half were positive for hep C, five for hep B and four for AIDS

AIDS FEARS AS DENTIST JAILED FOR 3 YEARS

American Dental Association Issues Statement on Infection Control in Dental Settings

September 19, 2013

Posted in News, Infection Control

The American Dental Association (ADA) says it is deeply concerned about the first confirmed report of patient to patient transmission of hepatitis C in a dental practice setting linked to improper infection control practices.
'Casual attitude' to vCJD warning

The government has developed a "casual attitude" to the human form of "mad cow disease", MPs have warned.

The Science and Technology Committee said the low incidence of variant Creutzfeldt-Jakob disease (vCJD) was being "used as justification for inaction".

The committee highlighted concerns around the risk of contamination in blood donation and during surgery.
Range of dental treatment expanding

doi:10.1038/sj.bdj.4800325
Number of dental treatment episodes in Europe?

2007: 65-73 million dental interventions in UK (pop. 60 million)

2014: 802-901 million dental interventions in Europe (pop. 741 million)

So where are the cross-infections?
The plan - Critical control points

History & examination

At all stages SICP's

Dental treatment

Surgery decontamination

Instrument decontamination cycle
Resistance anywhere is resistance everywhere

Spread of New Delhi metallo-beta-lactamase from India 2010-2011
A Community Outbreak of New Delhi Metallo-beta-lactamase-1 (NDM-1) Escherichia coli in Scotland: Implications for Antimicrobial Stewardship

Presenting Author: Dr Nigel Calvert FFPH FRCP, Consultant in Public Health Medicine, NHS Dumfries and Galloway.

Co-authors: Dr Linsey Batchelor* Dr Martin Connor* Josie Murray** Elaine Ross* Andrea Whelan**

*Dumfries and Galloway Royal Infirmary, Bankend Rd, Dumfries DG14AP
**Department of Public Health, Health Protection Team, Ryan South, Crichton Hall, Dumfries DG14TG
Crimean-Congo Viral Haemorrhagic Fever case in Glasgow

The patient is being treated at the specialist Brownlee unit at Gartnavel General Hospital.

A man is being treated in complete isolation in Glasgow after being confirmed as having Crimean-Congo Viral Haemorrhagic Fever.
Presentation of a case of variant CJD in general dental practice

A. J. Smith¹, D. I. Russell², J. Greene³, A. Lowman⁴ and J. W. Ironside⁵

vCJD can present with atypical facial symptoms.

The case highlights the importance of medical history taking at each visit.

Prompt referral of any patients with atypical signs & symptoms.
'Casual attitude' to vCJD warning

N patients

![Bar chart showing vCJD and sCJD cases from 1995 to 2014](chart.png)
<table>
<thead>
<tr>
<th>Country</th>
<th>Total Number</th>
<th>Residence in UK (&gt;6 months) 1980-1996</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>177</td>
<td>177</td>
</tr>
<tr>
<td>France</td>
<td>27</td>
<td>1</td>
</tr>
<tr>
<td>Spain</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Republic of Ireland</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>USA</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>Italy</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Canada</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Portugal</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Japan</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Saudi Arabia</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Taiwan</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>
Estimate doubled

By Michelle Roberts
Health editor, BBC News online

Twice as many Britons as previously thought could be carrying the human variant of "mad cow" disease, variant CJD.

Researchers believe one in 2,000 people in the UK is a carrier of the disease linked to consumption of contaminated beef.
Codon 129 Results

- N: 32,441 appendix
- 16 +ve
- = 493 per million (95% CI 281-801/million)
- Or 1 in 2,000
“The focus of the Risk Assessment is thus on the possible scale of transmission within the UK population as a whole, rather than the risks that might attach to any one specific procedure.”
Risk factors for variant Creutzfeldt-Jakob disease in dental practice: a case-control study


- **Aims**

- is there any evidence of more than one vCJD case having treatment recorded at the same dental practice within a given time frame?

- Is there an excess of dental treatment in vCJD cases compared with a sample of general population controls?
Results

- 165 cases & 851 control subject eligible for inclusion.
- Consent obtained from 160 cases & 584 controls
- Records available from 78 of 160 cases (49%)
- Records available from 457 of 584 controls (78%)
Participants with records available by time BEFORE onset (cases)/Interview (controls)
Conclusions

- Dental records were available for fewer cases (49%, 78 of 160) than control subjects (78%, 457 of 584).
- Majority of data was < 5 yrs prior to onset/interview.
- Highest rates of record retrieval in late 1990s for cases and the early 2000s in control subjects.
- Prior to 1990 fewer than 15% of cases and control subjects had GDP records for any single year.
- No record of implantable material used.
Oral infection with Staphylococci

- Angular cheilitis (63% - Ohman et al 1986)
- Staphylococcal mucositis – geriatric and Oral Crohns (Bagg et al 1995; Gibson et al 2000).
- Parotitis (Lamey et al 1987)
- Endodontic & implant infections (Wyman et al 1978; Slots et al 1990)
- Osteomyelitis (Koorbusch et al 1992)
- Systemic spread from the oral cavity (Kralovic et al 1995; Kennedy et al 2000)
S. aureus carriage

- Persistent carriers 20% (12-30%)
- Intermittent 30% (16-70%)
- Non-carriers 50% (16-69%)

(Wertheim et al LID 2005)
Staphylococcus aureus
Colonisation sites commonly investigated

<table>
<thead>
<tr>
<th>Colonisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nose</td>
</tr>
<tr>
<td>Throat</td>
</tr>
<tr>
<td>Axilla</td>
</tr>
<tr>
<td>Groin</td>
</tr>
</tbody>
</table>
Oral carriage of Staphylococci

- Yellow = *S. aureus*
- Blue = *S. epidermidis*

% carriage rate

- Children
- Adults
- Elderly
- RA patients
- Sick Child

(Jackson et al 1999)
• **Petti et al 2014 (n=97) Healthy children**
• Saliva : nares 42:51
• N= 34 *S. aureus* in saliva & nares
• N=17 *S. aureus* in nares only
• N=8 *S. aureus* in saliva only

( Petti et al New Microbiologica 2014)
Treatment session - aerosols
Microbial aerosols in general dental practice

A. M. Bennett, M. R. Fulford, J. T. Walker, D. J. Bradshaw, M. V. Martin, and P. D. Marsh

![Graph showing microbial aerosols over time]

Time: 10:00, 11:00, 12:00

British Dental Journal 2000; 189: 664–667
S. aureus & the oral cavity

- Periodontal Epithelial Surface Area (PESA)

Nesse et al JCP 2008
• Periodontal Epithelial Surface Area (PESA)
• Healthy = 0.3 cm²
• Periodontitis = 39cm²

Nesse et al JCP 2008
Recovery of *S. aureus* from dental environment

- Motta et al 2007 (ICHE) study: x6 surfaces sampled, before, during & after treatment for *S. aureus*
MRSA in the Dental Environment

• Special dental care & oral surgery dept
• X1 visit & x10 sites sampled for MRSA with swabs
• X2 sites positive (air-water syringe & chair arm)
• Low counts of MRSA detected (1 & 4 cfu)

Kurita et al Br Dent J 2006
MRSA in the Dental Environment

- Special dental care & oral surgery dept
- 8 MRSA +ve patients following treatment (n=140)
- Similar strains to environmental isolates **BUT by antibiogram only**

Nosocomial transmission of methicillin-resistant *Staphylococcus aureus* via the surfaces of the dental operatory

H. Kurita,¹ K. Kurashina² and T. Honda³

Kurita et al Br Dent J 2006
Transmission events
MRSA cross-infection in the Dental Surgery

Martin & Hardy BDJ 63-64, 1991

- Pt A: Abscess following endodontic treatment
  - MRSA isolated
- Pt B: Abscess following attempted extraction
  - MRSA isolated
- GDP: MRSA isolated from fingers and nose
S. aureus & the diagnostic lab
10yrs of dental aspirates

N of aspirates: Total N=1,426

0-4% S. aureus

Graph showing the number of dental aspirates from 1998 to 2007, with a peak in 2001.
An implant periapical lesion leading to acute osteomyelitis with isolation of *Staphylococcus aureus*

S. Rokadiya¹ and N. J. Malden²

Fig. 2. Twenty-eight days post placement, radiolucency indicating osteolysis apicodistally to the implant which was still showing good mechanical retention.
Bone grafting & implant placement
A need for infection surveillance?
Dental handpiece contamination: a proteomics and surface analysis approach

Andrew Smith, Gordon Smith, David F. Lappin, Helen C. Baxter, Anita Jones and Robert L. Baxter

Table 3. Proteins identified from used, unprocessed surgical handpiece samples.

<table>
<thead>
<tr>
<th>Protein recovered</th>
<th>Peptide size (kDa)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50S ribosomal protein</td>
<td>11.5</td>
</tr>
<tr>
<td>Alpha globin</td>
<td>13.5</td>
</tr>
<tr>
<td>Haemoglobin chain D</td>
<td>15.8</td>
</tr>
<tr>
<td>Haemoglobin subunit β</td>
<td>15.8</td>
</tr>
<tr>
<td>Haemoglobin subunit ε</td>
<td>15.8</td>
</tr>
<tr>
<td>Haemoglobin β chain</td>
<td>15.8</td>
</tr>
<tr>
<td>Haemoglobin β</td>
<td>15.8</td>
</tr>
<tr>
<td>Haemoglobin chain B</td>
<td>18</td>
</tr>
<tr>
<td>Serum albumin</td>
<td>67</td>
</tr>
<tr>
<td>Hypothetical protein (Homo sapiens)</td>
<td>69</td>
</tr>
<tr>
<td>Conserved hypothetical protein</td>
<td>119</td>
</tr>
</tbody>
</table>

Biofouling, 2013
http://dx.doi.org/10.1080/08927014.2013.839782
S. aureus from dental equipment

- Dental handpieces – gear blade
• Dental handpieces

![Image of dental handpiece](image)

N=40 *S. aureus*  
median count $5 \times 10^2$ cfu/component

![Image of dental handpiece](image)

N=40 *S. aureus*  
median count $4.6 \times 10^3$ cfu/component

![Image of dental handpiece](image)

N=20 *S. aureus*  
median count $1.2 \times 10^4$ cfu/component
Dental impression gun (Westergard et al JADA 2011)

X4 sites from x4 guns after x3 weeks use (spray-wipe-spray)

S. aureus from dental equipment

- S.aureus 17 cfu/ml
- MRSA 5 CFU/ml
• Sterilized instruments frequently stored in drawers, cupboards, work surfaces and shelves.

(Smith et al BDJ 2007)
Surgery - Decontamination
Surgery - Declutter
The following became infected; x3 patients x2 staff
Hepatitis B virus transmissions associated with a portable dental clinic, West Virginia, 2009

Rachel A. Radcliffe, DVM, MPH; Danae Bixler, MD, MPH; Anne Moorman, BSN, MPH; Vicki A. Hogan, MPH; Vickie S. Greenfield, RN, BSN; Diana M. Gaviria, MD; Priti R. Patel, MD, MPH; Melissa K. Schaefer, MD; Amy S. Collins, BS, BSN, MPH; Yury E. Khudyakov, PhD; Jan Drobeniuc, MD, PhD; Barbara F. Gooch, DMD, MPH; Jennifer L. Cleveland, DDS, MPH

x3 pts +ve for HBsAg before visiting the clinic

Visited clinic on same day as cases

? unknown carrier
LA at “numbing station “ – LA set followed pt
Pts, staff, instruments & equipment (clean & contaminated) in close proximity
U sonic cleaning and type N sterilizer – did not investigate segregation of clean & dirty
No sterilization/sterilizer records
Sterilized instruments placed unwrapped on a clean table to dry in dental operations area
Hepatitis B Transmission
The portal of entry?
Pt 1 = XLA/ S&P
Pt 2 = XLA, restorations
Pt 3 = XLA

Staff 1 = Escorted pts to treatment waiting area
Staff 2 = Logistics; maintenance of clean & dirty dental equipment
Handpieces & disposable mirrors cleaned with disinfectant wipes and re-used without sterilization.

GDP’s & dental students “assumed” to have received training and Hep B vaccination

No written policies, procedures or “training in or oversight for infection control.”
Dental clinic warned over poor hygiene which put patients at risk of HIV

May 23 2012 By Charlotte Thomson

A DENTAL clinic put hundreds of patients at risk of diseases such as HIV and hepatitis because of poor hygiene.

The clinic opened in January and inspectors swooped in March.

They found infection control procedures, including instrument decontamination, did not meet national standards.
Patient Reported Outcome Measures: Their Role in Measuring and Improving Patient Experience

In the past, productivity of NHS services was measured largely by inputs, such as the numbers of procedures carried out, numbers of consultations and admissions, with little thought for how much benefit patients were deriving from these interventions.
• **Aim**

Discover patients’ knowledge of infection control and perceptions of risk of transmission of HIV, hepatitis B and CJD and to compare them to earlier studies.

**Design, sample and setting:** A questionnaire was distributed by hand and completed by an opportunistic sample of fifty members of the public in Glasgow, Scotland.
Table 2. Patient perception as to the means by which dentists should sterilize their instruments

<table>
<thead>
<tr>
<th>Method</th>
<th>General Practice Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Glasgow 1990*</td>
</tr>
<tr>
<td>Autoclave</td>
<td>20 (20)</td>
</tr>
<tr>
<td>Hot air oven</td>
<td>1 (1)</td>
</tr>
<tr>
<td>Boiling Water</td>
<td>16 (16)</td>
</tr>
<tr>
<td>Disinfectants</td>
<td>9 (9)</td>
</tr>
<tr>
<td>Combinations</td>
<td>12 (12)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>43 (43)</td>
</tr>
</tbody>
</table>

*taken from reference 14
Table 3. Patients assessment of the risk of contracting HIV and hepatitis B in general dental practice

<table>
<thead>
<tr>
<th>Response</th>
<th>HIV n %</th>
<th>Hepatitis B n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very likely</td>
<td>5 (5)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Likely</td>
<td>4 (4)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Unlikely</td>
<td>25 (25)</td>
<td>14 (30)</td>
</tr>
<tr>
<td>Extremely unlikely</td>
<td>51 (50)</td>
<td>26 (55)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>16 (16)</td>
<td>3 (6)</td>
</tr>
</tbody>
</table>

*taken from reference 14
Table 4. Patients’ assessment of risk of contracting vCJD in the dental clinic

<table>
<thead>
<tr>
<th>Response</th>
<th>General Practice Patients n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very likely</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Likely</td>
<td>0</td>
</tr>
<tr>
<td>Unlikely</td>
<td>14 (30)</td>
</tr>
<tr>
<td>Extremely Unlikely</td>
<td>24 (51)</td>
</tr>
<tr>
<td>Don’t know</td>
<td>8 (17)</td>
</tr>
</tbody>
</table>
Dentist refuses to treat family of CJD victim

WHEN Kirsty Garven died of the human form of mad cow disease her heartbroken parents thought things could not get any worse.

But now they say they are being stigmatised because their dentist has refused to treat them.

The couple and their other daughter Rachel, 19, have been referred to the Liverpool Dental Hospital, 20

By Sinead McIntyre

same problem as the Garvens. Yesteray they said their treatment only added to the anguish they suffered watching 20-year-old Kirsty deteriorate and eventually die in a hospice two years ago.

Jennifer Garven, 54, said she was especially concerned for Rachel, "Is she going to be stigmatised for life?"

"Stigmatised": Kirsty's parents and her sister Rachel

A Health Department spokesman said: "The guidance does not currently differentiate between types of CJD in this context.

"The guidance is vague and is currently under review. Families with a case of new variant CJD do not pose a risk."

s.mclntyre@dailymail.co.uk

CJDSUPPORT NETWORK

LATEST NEWS HEADLINE: Buy greeting cards and help the CJD Support

Welcome to the CJD Support Network website.

The CJD Support Network is a patient support group providing help and support for people with all strains of Creutzfeldt-Jakob disease, their carers and concerned professionals.
At all stages –

- Standard Infection Control Principle’s
  - Hand hygiene
  - Personal protective equipment
  - Safe management of care equipment
  - Safe management of care environment
  - Safe management of blood & body fluids
  - Safe disposal of waste
  - Occupational safety
At all stages SICP’s