The Zamfara Lead Poisoning Incident
Clinical and Environmental Aspects

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Zamfara State, Northern Nigeria
Rural, traditional communities
- Village chiefs, Imam and Emir influential

Very poor communities with little infrastructure
- Villages are very remote with poor (or no) roads
- Subsistence farming
- Little education
- No formal healthcare

February – April 2010

Médecins Sans Frontières (MSF) team in Zamfara for a measles and meningitis response
- Reports of increased deaths in children < 5 years
- 1 village: numerous fresh graves of children, multiple deaths in past month
- Clinical features: vomiting, abdominal pain, altered mental status, convulsions
- Treatment for malaria, meningitis, other common local infections no effect
April – June 2010

- Reports of increased small-scale gold extraction
  - 8 children BLL in the 150-300μg/dL range
- Multi-agency effort: MSF, US CDC, WHO, international experts, Nigerian Federal/State Authorities
- Initial survey:
  ≈ 25% <5yrs died in last year, 400++ deaths
  - (At least) 7 villages involved
- Blood lead concentrations in children <5yr:
  - All > 10μg/dL,
  - >95% were > 45μg/dL
  - Significant proportion >80-100μg/dL

Significant logistical difficulties

- Transport – no roads, large distances, rainy season
- Sample collection / storage / transport
- Challenging discussions at local, state and federal levels
- Training of local staff
- Need for interpreters
- Development of Lead-CareII dilution methodology
Pathways of Exposure

- Processing and ore storage in residential compounds
- Dust contamination of soil
  - Children inhaling/ingesting dust/soil
  - Dabas and in village
- 2° exposure
  - Dust carried home on clothes
  - Dust contamination of food: mango trees for shade, food sold at dabas, food preparation equipment ...
- (Water contamination)
- Other: e.g. sacks used to store ore used for bedding and food storage, crops, meat, milk

May 2010

- MSF commenced chelation therapy
- Problems:
  i) >>1000 children, 90% BLL > 80μg/dL
  ii) No health infrastructure, affected villages very remote
  iii) No chelation available in country
- Pragmatic decision to focus on children <5y
  - Fatalities in this age group
  - Greatest exposure
  - No current activity in other potential risk groups e.g. pregnant women
May 2010

- MSF commenced chelation therapy
- Problems:
  i) $\geq 1000$ children, 90% BLL $> 80 \mu g/dL$
  ii) No health infrastructure, affected villages very remote
  iii) No chelation available in country
- Initially all inpatient chelation until remediation
  - ‘Hospital’ in non-affected village
  - DMSA (initially WHO Kosovo 28 day regime)
    - Not possible to use IV CaNa$_2$EDTA
    - Encephalopathic children managed with DMSA

June 2010: Environmental Remediation
July 2010 – date

- Remediation of further 5 villages
- Institution of outpatient DMSA therapy by MSF
  - clinics set up in villages
- Chelation protocol review
  - PD visit Sept 2010, July 2011, May 2012
    - Variable 5 / 19 days course DMSA based on BLL
    - CaNa$_2$EDTA for those with encephalopathy
- Ongoing discussions regarding safer mining
  - Simple measures but a considerable challenge

Ongoing Progress ... and Set Backs

- Increase in BLL in some children
  - Anecdotal evidence of increased processing activity
  - XRF: moderate recontamination of dabas & villages
- Clinical challenge:
  - recontamination vs compliance vs remobilisation
- Ongoing advocacy work ... difficult engagement
  - Safer mining, federal/state engagement
- Need for funding for remediation of ‘Bagega’
  - Further 1500 children < 5 years, larger mining sites
Summary of DMSA in Zamfara

- 1st June 2010 - 28th March 2012
  - >1500 children treated with >11,000 DMSA courses
  - No documented ADRs (all children have WCC, ALT)

- DMSA well tolerated, large amount of data on efficacy
  - Ongoing data analysis:
    - comparison of protocols, DOTs frequency, malaria, outcome in encephalopathy etc ...

Data available on request from the presenter (paul.dargan@gstt.nhs.uk)
Summary

- Lead poisoning outbreak: unprecedented scale and severity
- Significant logistical challenges
  - Geographical, political, clinical, analytical, environmental ...
- Safer mining and prevention initiatives proving difficult to implement
- Large scale remediation and clinical management efforts ongoing

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