Occupational health and safety in the South African seafood industry - a developing country perspective

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Allergy to bony fish among consumers

Reactions: gastro-intestinal (56%), cutaneous (51%), respiratory (36%)

“for this reason patients who suffer from fish asthma will rarely discover for themselves the connection between fish and their malady, and as it seldom occurs to their medical advisors, the patients continue to… suffer from asthma throughout their lives, whereas an investigation which revealed the real cause of the disease would have relieved them of it…”

From boat to plate – linking the seafood consumer to the supply chain …..focus is generally on food safety
World fish supply and utilisation

Global seafood working population

• Seafood industry employs over 56.6 mill. workers (2014) worldwide - **fishing** (67%), **aqua-culture** production (33%)
• 98% of fishers/farmers - **developing countries** (Asia, Africa, Latin America/Caribbean)
• Women – primary sector (19%), **processing** (50%)
• Processing activities aboard vessels or on land involve either **manual** handling or highly **automated** activities

Distribution of main commercial fisheries in South African waters - main fishing ports

Pilchard (*Sardinops sagax*)

Cape anchovy (*Engraulis capensis*)

Cape Hake (*Merluccius capensis*)

Seafood working population in South Africa

• Seafood industry employs 50,000 workers in capture, production and processing sectors (2010)
• Small scale fishers (90%)
• Transformation of ownership challenges - increasing commercialisation and declining opportunities for artisanal fishing
• Gendered distribution of work – men: primary capture (85%), women: processing (66%)
Work processes (at-sea) generate hazards

Kenyon et al. Hydrogen sulphide poisoning aboard a fishing trawler, Occ Health SA 2008

Legal Resources Centre, T. Kekana and M. Kala vs. The Owners of "Hsin ho Chun 201" (1990)

https://aneskey.com/frostbite-2/
Work processes (land-based) generate multiple hazards

- Noise (fishmeal bagging)
- Ergonomics/safety (canning)
- Bioaerosols (fish heading/degutting)
- Humid/wet environments (cooking)

Seafood allergies under-detected and under-reported by workplace-based health services

<table>
<thead>
<tr>
<th>Prevalence (%)</th>
<th>Skin rash</th>
<th>Asthma symptoms</th>
<th>Other allergic symptoms (e.g. rhinitis, conjunctivitis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>22 (58%)</td>
<td>31 (81%)</td>
<td>32 (84%)</td>
</tr>
<tr>
<td>1 - 5</td>
<td>11 (29%)</td>
<td>7 (19%)</td>
<td>3 (8%)</td>
</tr>
<tr>
<td>6 - 10</td>
<td>1 (3%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>≥ 11</td>
<td>4 (10%)</td>
<td>0</td>
<td>3 (8%)</td>
</tr>
<tr>
<td>Total</td>
<td>38 (100%)</td>
<td>38 (100%)</td>
<td>38 (100%)</td>
</tr>
</tbody>
</table>

Jeebhay et al. Seafood processing in South Africa: a study of working practices, occupational health services and allergic health problems in the industry, Occup Med 2000
Skin and respiratory disease associated with seafood processing

<table>
<thead>
<tr>
<th>Adverse health outcomes</th>
<th>n</th>
<th>Prevalence (n=594)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traumatic skin lesions</td>
<td>241</td>
<td>173 (72%)</td>
</tr>
<tr>
<td>Contact dermatitis</td>
<td>241</td>
<td>140 (58%)</td>
</tr>
<tr>
<td>Wet work skin sequelae (web space dermatitis, paronychia)</td>
<td>241</td>
<td>85 (35%)</td>
</tr>
<tr>
<td>Infection (warts, sepsis)</td>
<td>241</td>
<td>21 (8%)</td>
</tr>
<tr>
<td>Sensitisation to any fish species</td>
<td>575</td>
<td>36 (6%)</td>
</tr>
<tr>
<td>Work-related ocular-nasal symptoms</td>
<td>594</td>
<td>157 (26%)</td>
</tr>
<tr>
<td>Work-related chest symptoms (tight chest/wheeze)</td>
<td>594</td>
<td>93 (16%)</td>
</tr>
<tr>
<td>Non-specific bronchial hyperresponsiveness (MCT &lt; 8mg/ml)</td>
<td>510</td>
<td>123 (24%)</td>
</tr>
<tr>
<td>Probable occupational asthma</td>
<td>507</td>
<td>9 (2%)</td>
</tr>
</tbody>
</table>

- Burdzik A. Predictors of occupational skin disease among seafood processing workers in the Western Cape, MMed (UCT), 2012
## Risk factors for work-related skin disease in seafood processors

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Fish sensitisation</th>
<th>Wet fish work (jetty, canning) vs low fish exposure</th>
<th>Infrequent (monthly glove changes) vs no glove use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin Outcome</td>
<td>OR (Confidence Interval)</td>
<td>OR (Confidence Interval)</td>
<td>OR (Confidence Interval)</td>
</tr>
<tr>
<td>Frequent skin symptoms (&gt;2 episodes past year)</td>
<td>3.50 (1.23-9.92)</td>
<td>0.81 (0.43-1.51)</td>
<td>1.50 (0.64-3.51)</td>
</tr>
<tr>
<td>Wet-work skin sequelae</td>
<td>0.81 (0.43-1.51)</td>
<td>2.09 (1.03-4.25)</td>
<td>1.34 (0.56-3.19)</td>
</tr>
<tr>
<td>Contact dermatitis – rubber additives (carbamix)</td>
<td>0.90 (0.19-4.36)</td>
<td>0.68 (0.20-2.35)</td>
<td>4.79 (1.32-17.31)</td>
</tr>
<tr>
<td>Contact dermatitis – chlorhexidine disinfectant</td>
<td>0.94 (0.19-4.67)</td>
<td>0.71 (0.23-2.17)</td>
<td>3.93 (1.05-14.71)</td>
</tr>
</tbody>
</table>

Models adjusted for age, gender, atopy, fish intake, factory

Burdzik A. Predictors of occupational skin disease among seafood processing workers in the Western Cape, MMed (UCT), 2012
Risk factors for work-related asthma in seafood processors

Exposures >30 ng/m³ (fishmeal, canning) at symptom onset associated with 2-fold increased asthma risk (OR = 2.25, CI: 1.06-4.75)

Jeebhay MF. Occupational allergy associated with salt water bony fish processing in South Africa, PhD (Michigan), 2012
No association between seafood consumption and allergic sensitisation to fish in processors (n=578)

<table>
<thead>
<tr>
<th>Allergen</th>
<th>Prevalence of sensitisation (%)</th>
<th>Seafood intake as predictor High vs Low (OR, Confidence Interval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anisakis</td>
<td>8%</td>
<td>2.24 (1.01 – 4.97)*</td>
</tr>
<tr>
<td>Fish</td>
<td>6%</td>
<td>1.22 (0.50 – 3.00)</td>
</tr>
</tbody>
</table>

Seafood intake: Eicosapentaenoic acid - EPA categories - low: ≤1.28; high: >2.23 weight % of 20:5n-3 omega fatty acid
Models adjusted for factory and atopy
Level of significance: * p<0.05

Nieuwenhuizen et al. Exposure to the fish parasite Anisakis causes allergic airway hyperreactivity and dermatitis, J All Clin Immunol 2006
Workplace organisational factors mediate exposure to occupational hazards

- Seasonal workers (70%), mostly women - twice as likely to report work-related asthma symptoms
- Gendered distribution of work - women worked in canning / processing with exposure to high bioaerosols, noise, ergonomic hazards
- Rural and remote fishing villages - workers remained in jobs due to lack of other job alternatives
- Poor access to healthcare / occupational health services (50% of workplaces)

Approaches and challenges for prevention strategies
Legislation, policies and exposure standards

  - employer to provide a healthy and safe working environment
  - various regulations: Environmental (noise, temperature), Hazardous biological agents, Ergonomics – recent draft

- **Compensation for Occupational Injuries and Diseases Act, 1993**
  - provides health care, loss of wages, permanent disablement
  - under-detection and poor reporting – new amended regulations proposed with employers facing stiff fines

- **Foodstuffs, Cosmetics and Disinfectants Act (1972)**
  - health and safety of consumers (improved allergen labelling)

Poor enforcement – a key challenge (self-regulation, inspectorate not technically competent, weakened workers/unions)
Workplace control measures to reduce environmental exposures

Unenclosed degutting machine / High noise levels

Enclosed machine / Hearing protection
## Occupational health service provision, health risk assessment and surveillance programmes

<table>
<thead>
<tr>
<th>Occupational health activity</th>
<th>Total no. of workplaces (N=38)</th>
<th>Number of workplaces by workforce size (%)</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Small (%) (n=18)</td>
<td>Medium (%) (n=9)</td>
<td>Large (%) (n=11)</td>
<td>*p-value</td>
<td></td>
</tr>
<tr>
<td>Occupational health service on-site</td>
<td>17 (45%)</td>
<td>4 (22%)</td>
<td>4 (44%)</td>
<td>9 (82%)</td>
<td>0.002</td>
<td></td>
</tr>
<tr>
<td>Medical surveillance programme</td>
<td>22 (58%)</td>
<td>8 (44%)</td>
<td>5 (56%)</td>
<td>9 (82%)</td>
<td>0.055</td>
<td></td>
</tr>
<tr>
<td>Industrial hygiene programme</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Work-related symptoms/ailments reported in the past year</td>
<td>19 (50%)</td>
<td>5 (28%)</td>
<td>5 (56%)</td>
<td>9 (82%)</td>
<td>0.016</td>
<td></td>
</tr>
</tbody>
</table>

Note: small=5-49 workers; medium=50-199 workers; large=>200 workers

* Mantel Haenszel Chi-square test

Jeebhay et al. Seafood processing in South Africa: a study of working practices, occupational health services and allergic health problems in the industry, Occup Med 2000
Worker and supervisor information, education and training
Back to the plate again….

Allergen identification – *contributed towards developing more specific diagnostic tests and immunotherapy treatment for patients*…

- Beale J et al. Characterisation of purified parvalbumin from five fish species and nucleotide sequencing of the major allergen from Pacific pilchard, *Sardionops sagax*, Molec Immunol 2009
- van der Ventel et al. Differential responses to natural and recombinant allergens in a murine model of fish allergy, Molec Immunol 2011
Thank you

Derived from a painting titled *The Snoek Seller*. The original appeared in “Sketches of various types of the Cape of Good Hope”, London, 1851, which is now in the Pretoria National Library.