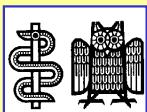


PHOSSY JAWS

An Old Occupational Disease – Up to Date?



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A Historical and Medical Review

Background: recently described necrosis of jawbones associated with a bisphosphonate therapy

Donald Hunter: „the greatest tragedy in the whole story of occupational disease“

Chemical Characteristics of Phosphorus

1674 described by Henning Brandt (Hamburg / Germany), three allotropic modifications
✓ white (yellow) P.: very toxic, self-inflammable
✓ red P.: less toxic, generated by heating white Phosphorus in a vacuum
✓ black P.: similar to red P.



History

- First matchsticks were called *Tunkhölzer* (moistened with sulphuric acid).
- 1832:** J. Siegel (Austria) und C. Kammerer (Germany) contrive at the same time a matchstick with a head made of white Phosphorus.
- Since **1833** matchstick factories and many manufactories in all European countries arise.
- 1839:** first necrosis of the lower jaw (phossy jaw [pj]) seen and reported in Germany.
- 1844:** F. Lorinser reports about 5 cases of phossy jaws of young women, working in the match industry.
- 1845:** A. Oberhofer (Vienna) and J.F. Heyfleder (Erlangen) point out phosphorus as the causing agent of pj.
- 1866-1875:** 126 cases of pj in Vienna's hospitals are reported.
- 1896-1906:** 400 new cases in Austria.
- Match factories: Mostly children, adolescents and women. Phosphoric vapor is generated by heating up phosphoric compounds, also absorbed through the gastro-intestinal tract; daily working hours 16 h!
- After discovery of red phosphorus, successive prohibition of white phosphorus throughout the match industry.
- 1872 Finland, ... 1907 Germany, ... 1912 Austria, ... 1931 United States.



Pathophysiology / Toxicology

- Phosphorus, a strong reducing agent, inhibits the intracellular oxidation process, so acting as a cell-toxin.
- Uptake through aerosols, via GIT (suicide) and dermal absorption.
- Acute:** Skin ulcers, irritation of mucus membranes, suffocation-attacks, coma, death; symptom free interval (6-48 h), followed by vomiting, cephalgia, enteralgia, hematochezia, fever, kidney failure and yellow atrophy of the liver.
- Chronic:** unspecific GI-disorders, anemia, bleeding tendency, weight loss, kidney damage, muscle weakness, periosteal thickening and osteoporosis (even years after the exposure has been terminated).

Phossy Jaws



- Only caused by elementary phosphorus.
- Mostly years after exposure (7-15 years).
- Nutritional disorder of the osteoclasts**, due to **endothelial damage** (thrombosis and consecutive obliteration) of the bone's blood vessels.
- Bone apposition, followed by **osteoporosis**.
- Successive disorder of the immune system, periostitis and osteomyelitis.
- Via caries, injuries of the oral mucous membrane, after tooth extraction: **Bacteria penetrate the jaw**.
- Clinical signs are: Extremely painful osteomyelitis of the jaw bone.
- Mandible more often affected than maxilla (lower perfusion of the mandible, resulting in a lower resistance to infection).
- Pyosis, abscess formation, necrosis, sequestration and sinus formation.
- Destruction of the jaw bone; therefore, disfiguring illness.
- Complications: septicemia, pyogenic meningitis, destruction of the eye bulb; **Lethality formerly up to 40%**.



X-Rays (necrosis *not* caused by Phosphorus)
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Therapy and Prophylaxis

- Surgical removal (sequestrectomy, possibly spongiosa plastic, graft), antibiotic treatment, (cholecalciferol, calcium, hyperbaric oxygen therapy).
- Dental reconstruction, regular dental check-ups.

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