Coalfields remain a distinctive part of the UK (Box 1), despite the fact that the coal industry has almost entirely disappeared. The last deep coal mine closed in December 2015 and, today, only 26 open-cast mines remain. However, there are still negative effects of mining on physical health that need to be addressed (Chaderton et al, 2011).

Miners are exposed to a variety of potentially harmful agents, including fuels, chemicals, dusts, fumes and asbestos. These may be inhaled, ingested or absorbed through the skin, eyes, mucous membranes or ears. Miners are often exposed to them for decades before any adverse effects are noticed. In the past, they may not always have been adequately instructed about the health risks involved and the safety precautions required (Scott and Grayson, 2003).

Skin conditions

In the 1950s, the hazards of coal mining were due more to physical work conditions than exposure to chemicals. Miners were exposed to trauma, coal and stone dust, sweating and humidity. They sustained injuries from falling stones or coal blocks, or from working in awkward places (Hodgson, 1955).

Coal tattooing, also known as ‘colliers’ stripes’, was their occupational mark (Hodgson, 1955). It resulted from scratches and small injuries that healed without scarring, in which coal dust was deposited before healing was complete. Commonly found on the face, forearms and hands, they presented as light greyish-blue linear or angular markings, measuring up to 1 inch in length (Bettley, 1940).

Occupational dermatitis is a major cause of disability in miners. Mining exposes workers to a variety of potentially harmful agents, including fuels, reagents, solvents, detergents, chemicals, coal dust, silica dust, diesel particulate matter, asbestos, welding fumes, poisonous plants and metal dust. This puts them and their relatives at increased risk of developing certain skin and lung conditions (malignant and non-malignant). This article provides an overview of occupation-related diseases that may affect people in coalfields communities.

Citation


Key points

- Miners are exposed to many potentially harmful agents such as fuels, chemicals, dusts, fumes and asbestos
- Occupational dermatitis is a major cause of disability in miners
- Over time, miners can develop interstitial lung disease, pleural disease, chronic obstructive pulmonary disease or asthma
- Mining is also a risk factor in skin cancer, mesothelioma and lung cancer
- Careful occupational history taking is vital in the diagnostic process

Abstract

Although deep mining is no longer undertaken in the UK, there is still a population affected by the consequences of the occupational hazards of mining. Miners are exposed to many potentially harmful agents, including fuels, reagents, solvents, detergents, chemicals, coal dust, silica dust, diesel particulate matter, asbestos, welding fumes, poisonous plants and metal dust. This puts them and their relatives at increased risk of developing certain skin and lung conditions (malignant and non-malignant). This article provides an overview of occupation-related diseases that may affect people in coalfields communities.

Occupational skin and lung disease in coalfield communities

In this article...

- Harmful effects of mining on the lungs and skin
- Types of lung and skin diseases typically found in miners
- Importance of taking a detailed occupational history

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Coalfields remain a distinctive part of the UK (Box 1), despite the fact that the coal industry has almost entirely disappeared. The last deep coal mine closed in December 2015 and, today, only 26 open-cast mines remain. However, there are still negative effects of mining on physical health that need to be addressed (Chaderton et al, 2011).

The average life expectancy of the population living in coalfields areas is around one year shorter than the national average. The difference is almost certainly larger for the ex-miners themselves, but specific figures are not available (Foden et al, 2014).

Skin conditions

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Occupational dermatitis is a major cause of disability in miners. The work conditions, the mine’s geographical
location, depth, temperature, humidity and ventilation, and the physical and chemical properties of the extracted mineral can all have a role in its aetiology (Williamson, 1981).

The words ‘eczema’ and ‘dermatitis’ are used synonymously to describe a polymorphic pattern of cutaneous inflammation characterised by:

- Erythema and vesiculation in the acute phase;
- Dryness, lichenification and fissuring in the chronic phase.

Contact dermatitis is classified according to the type of reaction (Box 2).

Chronic (cumulative) irritant contact dermatitis used to be commonly seen in miners. Allergic contact dermatitis became more prevalent with changes in working practices and the use of mechanical aids and allergenic materials, such as explosives and their sheaths, hydraulic and flushing oils, electric cables, rubber gloves and boots, certain resins and plastics, chromates used in tanning and chemicals used to fireproof timber (Williamson, 1981). In patients presenting with irritant or allergic contact dermatitis, it is important to determine whether there has been exposure to occupational hazards (Johnston et al, 2017).

Miners also used to develop skin conditions associated with communal bathing, prolonged and profuse sweating, friction and dirty clothing – for example, tinea pedis (athletes’ foot), folliculitis and miliaria rubra (prickly heat). However, dermatitis was the cause of the most days lost, with 2.9 days person per year, compared with 1.5 days for bacterial infections and 1.7 days for fungal infections (Puttick, 1990). Furthermore, exposure to fossil fuels (such as mineral oils, coal products, benzene and diesel engine exhaust) or excessive sun exposure increased miners’ risk of skin cancer.

**Lung diseases**

The inhalation of fine particles of coal dust and silica exposed miners to the risk of developing malignant or non-malignant lung diseases, which would continue to progress even after exposure had stopped (Petsonk et al, 2013). Breathing in dust particles containing toxins would cause an inflammatory reaction in the airways and lung parenchyma, leading over time to conditions such as chronic obstructive pulmonary disease and interstitial lung diseases. Table 1 gives a more comprehensive list of the lung diseases associated with mining.

Miners’ risk of lung and pleural cancers was increased by exposure to respirable carcinogens such as radon progeny, diesel exhaust, asbestos and silica (Graber et al, 2014). The same miners who may have had atopic skin conditions may also have developed asthma, exacerbated by the inhalation of inflammatory substances.

It was not only miners, but also their spouses and children, who were exposed to high levels of environmental air pollution. Wives of men working with asbestos

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**Box 1. Areas of the UK with coalfields**

- **North East**: Northumberland, Durham
- **North West**: Lancashire, West Cumbria
- **Yorkshire and the Humber**: Yorkshire
- **East Midlands**: Nottinghamshire, North Derbyshire, South Derbyshire/North West Leicestershire
- **West Midlands**: South Staffordshire, North Staffordshire, North Warwickshire
- **South East**: Kent
- **Wales**: South Wales
- **Scotland**: Fife, Lothian, Ayrshire/Lanarkshire

Source: Adapted from Foden et al (2014)

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**Box 2. Contact dermatitis classification**

- **Subjective irritancy**: idiosyncratic stinging and smarting occurring within minutes of contact, usually on the face, in the absence of visible changes; cosmetic or sunscreen constituents are common precipitants
- **Acute irritant contact dermatitis**: often occurs after a single overwhelming exposure or a few brief exposures to strong irritants or caustic agents
- **Chronic (cumulative) irritant contact dermatitis**: occurs after repetitive exposure to weaker irritants that may be either ‘wet’ (detergents, organic solvents, soaps, weak acids, alkalis) or ‘dry’ (low-humidity air, heat, powders, paper, cardboard, dusts)
- **Allergic contact dermatitis**: involves sensitisation of the immune system to one or more specific allergens
- **Phototoxic, photo-allergic and photo-aggravated contact dermatitis**: occurs on exposure to sunlight, which activates the allergen or irritant
- **Systemic contact dermatitis (systemic allergic dermatitis)**: occurs after the administration of a chemical (usually a drug) to which topical sensitisation has previously occurred
- **Protein contact dermatitis**: occurs when repetitive handling of proteins (usually in foods) leads to urticarial signs and symptoms, which then progress to a dermatitic reaction

Source: Adapted from Johnston et al (2017)
would inhale asbestos fibres when washing their husbands’ clothes and, years later, present with respiratory symptoms (Goswami et al, 2013). In a study by Brabin et al (1994), children in coalfields communities were shown to have higher levels of absenteeism from school due to respiratory symptoms, compared with controls.

Smoking is always a relevant risk factor in lung disease, but the focus on smoking as the main reason for developing lung disease can mask the significance of dust exposure in the workplace. The combination of smoking and mining would appear to have presented an even bigger risk, so neither can be considered in isolation in the mining population.

Miners and heavy smokers are exposed to the same hazards – that is, nitrous fumes and particulate matter. It is thought that particulate matter such as coal dust absorbs and concentrates nitrous fumes, resulting in more-severe damage to the lungs (Kennedy, 1987). This gave rise to a diagnostic challenge in determining the cause of a reduction in lung function in miners who smoked (Kuemppel et al, 2009). In addition, the signs and symptoms of many respiratory conditions overlap – as can be seen in Table 1 – so careful medical and occupational history taking is vital in the diagnostic process.

### Implications for practice

When obtaining a clinical history from patients with lung and/or skin disease, it is crucial to take a comprehensive history of their occupation(s) since leaving school. Box 3 lists questions to ask. If a link between occupation and ill health is suspected, the next step is to investigate work practices, products handled at work, and health and safety data; referral to an occupational health specialist is recommended.

Nurses need to be particularly aware of mining-related health risks if their patients live in, or come from, coalfields communities. Exploring the effects of mining on health can give us insight into the potential harm caused by exposure to toxic substances and ultraviolet radiation in all walks of modern life.

### References


### Table 1. Lung diseases associated with mining

<table>
<thead>
<tr>
<th>Disease type</th>
<th>Disease</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interstitial lung diseases</td>
<td>Pneumoconiosis or coal worker’s pneumoconiosis; can develop into progressive massive fibrosis</td>
<td>Intractable, often dry cough, Shortness of breath, Finger clubbing</td>
</tr>
<tr>
<td>Pleural diseases</td>
<td>Mesothelioma (cancer of the pleura), Pleural thickening, Pleural plaques</td>
<td>Pain in the chest and/or back, Cough, Shortness of breath, Weight loss, Night sweats and/or fever</td>
</tr>
<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>Emphysema (destruction of alveoli), Chronic bronchitis (inflammation of the large airways with mucus production)</td>
<td>Productive cough, Wheeze, Shortness of breath</td>
</tr>
<tr>
<td>Asthma</td>
<td>Variable inflammation of the airways in response to identifiable trigger, often linked to other atopic conditions such as eczema, hay fever and rhinitis</td>
<td>Cough (usually dry), Wheeze, Shortness of breath</td>
</tr>
</tbody>
</table>

### Box 3. Questions to ask when taking an occupational history

A full occupational history includes asking the patient:

- What jobs have you had since leaving school?
- With what materials do you work/have you worked?
- With what materials do you work?
- Is there a temporal relationship between symptoms and work?
- Are/were symptoms related to exposure to a particular product or activity?
- If you have a rash, where is it located?
- Are/were measures taken at work to protect the skin? For example, are gloves or barrier creams applied before work? Are/were emollients used?
- Are measures – for example, protective masks – taken at work to protect the lungs?