

## รายงานผู้ป่วยโรคปอดนิวมโคโคนีโอสิสจากอาชีพเกษตรกรรม จังหวัดมหาสารคาม

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### A Case Report of Agriculture Occupational Pneumoconiosis in Maha Sarakham Province

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**หลักการและวัตถุประสงค์:** โรคปอดนิวมโคโคนีโอสิสเป็นโรคที่พบได้บ่อยในกลุ่มโรคปอด จากการประกอบอาชีพในประเทศไทยที่กำลังพัฒนาเกษตรกรรมเป็นอาชีพหลักในประเทศไทยประชากรกว่า 24.1 ล้านคนประกอบอาชีพเกษตรกรรม ซึ่งส่วนใหญ่เป็นแรงงานนอกระบบซึ่งไม่ได้รับความคุ้มครองในการดูแลสุขภาพเฝ้าระวังตามความเสี่ยงและการรับเงินชดเชยตามกฎหมาย การประกอบอาชีพเกษตรกรรมนั้นต้องสัมผัสกับสิ่งคุกคามมากมายโดยเฉพาะฝุ่นอนินทรีย์เคยมีการศึกษาพบว่าในเกษตรกรที่สัมผัสฝุ่นพบผลตรวจชิ้นเนื้อจากปอดเป็นนิวมโคโคนีโอสิสถึงร้อยละ 20.9 การป้องกันจึงเป็นสิ่งที่สำคัญและควรดำเนินการรายงานผู้ป่วยฉบับนี้เป็นการนำเสนอผู้ป่วยชายอายุ 47 ปี ที่สงสัยว่าเป็นโรคปอดนิวมโคโคนีโอสิสจากการสัมผัสฝุ่นดินเป็นเวลานานในการประกอบอาชีพ

**วิธีการศึกษา:** จากประวัติการเจ็บป่วยและประวัติการประกอบอาชีพในอดีตของผู้ป่วยได้จากการซักประวัติระหว่างที่ผู้ป่วยเข้ามารับการรักษาในโรงพยาบาล มีการเก็บข้อมูลผลตรวจทางห้องปฏิบัติการ เช่น ผลตรวจเลือด ผลย้อมเชื้อเสมหะ ผลเพาะเชื้อเสมหะ ผลตรวจ AFB เสมหะ และผลตรวจเซลล์ในเสมหะผลตรวจภาพท่ายรังสีได้แก่ภาพท่ายเอ็กซเรย์ทรวงอกและภาพท่ายรังสีคอมพิวเตอร์ทรวงอก ได้รับการอ่านโดยระบบ International Labour Organization classification (ILO classification) โดยรังสีแพทย์ ที่ได้รับการรับรองระดับ The Asian Intensive Reader of Pneumoconiosis (AIR Pneumo)

**Background and objective:** Pneumoconiosis is common occupational lung disease in many developing countries. The agriculture is the main occupation of workers in Thailand, estimated 24.1 million workers are agriculturist. Almost agriculturists are informal workers so they are not covered by the legal medical surveillance and occupational compensation. The agriculturists exposed to occupational hazardous espacially inorganic dusts. There is the study about the relationship between agriculture mineral dust and occupational pneumoconiosis among the young farm workers. The result shows pneumoconiosis 20.9% among farm workers. Prevention is most important and needs to be implemented. This report presents a case of suspected occupational pneumoconiosis in a 47-year-old male due to prolonged occupational soil dust exposure.

**Method:** The clinical symptoms and occupational history were taken from the patient during admission period. The laboratory data such as blood test, sputum gram stain, sputum AFB and sputum cytology were assessed. The chest x-ray and Computed tomography (CT) of the chest were read by radiologist certificated AIR Pneumo (The Asian Intensive Reader of Pneumoconiosis) according to International Labour Organization classification (ILO classification) system.

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**ผลการศึกษา:** พบว่า ผู้ป่วยชายอายุ 47 ปี มาด้วยอาการหายใจเหนื่อยมากขึ้น น้ำหนักลด 5 กิโลกรัมใน 1 เดือน ไม่มีไข้ มีก้อนที่ต่อมไทรอยด์ข้างซ้าย ภาพถ่ายรังสีทรวงอกพบ reticulonodular infiltration ของปอดทั้ง 2 ข้าง ผลตรวจเสมหะ AFB เป็นลบผู้ป่วยมีประวัติสัมผัสฝุ่นดิน จากการประกอบอาชีพมาเป็นเวลานาน โดยอาชีพเก็บและขนถ่ายมันสำปะหลังดิบ สัมผัสฝุ่นดินและทรายโดยตรงและปริมาณมาก ภาพถ่ายรังสีทรวงอกที่พบ perfusion 3/3+, bilateral mixed irregular linear and small nodular opacities, large opacity type A and emphysematous change เข้าได้กับโรคปอดนิวโมโคนิโอสิส ภาพถ่ายรังสีคอมพิวเตอร์ ทรวงอกพบ multiple pulmonary nodules in both lungs with small mediastinal adenopathy, multiple subpleural blebs in both lungs and pulmonary emphysema in both lower lobes. ผลตรวจเสมหะเซลล์วิทยา พบ a few squamous epithelials and inflammatory cells การตัดชิ้นเนื้อปอด เพื่อตรวจทางพยาธิวิทยาไม่สามารถทำได้ เนื่องจากผู้ป่วยมีภาวะหายใจหอบเหนื่อย แต่จากผลภาพถ่ายรังสีและภาพถ่ายรังสีคอมพิวเตอร์ทรวงอกที่ไม่เข้าได้กับลักษณะมะเร็งกระจายมาที่ปอด ร่วมกับประวัติการทำงานสัมผัสฝุ่นดิน/ฝุ่นทรายมาเป็นเวลานานและในปริมาณมาก การวินิจฉัยจากแพทย์ผู้เชี่ยวชาญจึงน่าจะเป็นโรคปอดนิวโมโคนิโอสิสจากการประกอบอาชีพมากที่สุด

**สรุป:** จากการศึกษาพบผู้ป่วยประกอบอาชีพเกษตรกรรมที่มีโรคปอดเรื้อรัง ซึ่งสงสัยว่าเป็นโรคปอดนิวโมโคนิโอสิสจากการสัมผัสฝุ่นดินเป็นระยะเวลานาน ซึ่งอาจจะมีผู้ป่วยหลายรายที่มีลักษณะเดียวกันขาดการซักประวัติอาชีพซึ่งอาจทำให้มีการรายงานผู้ป่วยน้อยกว่าความเป็นจริง การป้องกันและแจ้งเตือนถึงสิ่งคุกคามจากการประกอบอาชีพเกษตรกรรมควรได้รับดำเนินการ เพื่อป้องกันการเกิดโรคจากการประกอบอาชีพ และควรมีการดำเนินการเฝ้าระวังทางสุขภาพรวมถึงการใช้อุปกรณ์ป้องกันอันตรายส่วนบุคคลที่เหมาะสม

**คำสำคัญ:** โรคปอดนิวโมโคนิโอสิส, ฝุ่นอนินทรีย์, เกษตรกรรม

**Result:** A 47-year-old male visited the hospital with clinical presentation included progressive dyspnea, 5 kg weight loss within 1 month, no fever and left thyroid gland nodule. A chest X-ray revealed bilateral reticulonodular infiltration but sputum specimens for acid-fast bacilli stain were negative. The patient had a history of prolonged occupational soil-dust exposure from his job harvesting cassava using a backhoe and transferring them to a truck. He was therefore heavily and directly exposed to soil/sand-dust. His chest X-ray revealed perfusion 3/3+, bilateral mixed irregular linear and small nodular opacities, large opacity type A and emphysematous change compatible with pneumoconiosis. Computed tomography (CT) of the chest revealed multiple pulmonary nodules in both lungs with small mediastinal adenopathy, multiple subpleural blebs in both lungs and pulmonary emphysema in both lower lobes. The sputum cytology revealed a few squamous epithelials and inflammatory cells. A lung biopsy was not performed due to the patient's failing respiratory condition. According to the chest CT and chest X-ray together with exclusion of metastatic lungs and the history of prolonged and heavy exposure to soil/sand-dust, the diagnosis from expert opinion is probable case of occupational pneumoconiosis.

**Conclusion:** An agriculture worker presented with chronic interstitial lung disease; for which a diagnosis of pneumoconiosis was probable, due to prolonged occupational exposure to soil/sand-dust. Similar cases might have occurred but lack of awareness of occupational history-taking may be the cause of under-reporting. A prevention program and hazard notification is therefore needed for agriculture workers in order to prevent this type of occupational disease. A medical surveillance program and proper personal protective equipment needs to be formalized and implemented.

**Keywords** pneumoconiosis, inorganic dust, agriculture

## Introduction

Interstitial lung disease comprises all diseases of the tissue and space around the alveoli. Most interstitial lung disease is characterized by four manifestations: respiratory symptoms, specific chest radiographic abnormalities, typical changes on pulmonary function tests in which lung volume decreases and the pathology report indicates inflammation and fibrosis. According to the American Thoracic Society, the most prevalent cause of interstitial lung disease in males is occupational or environmental vs. pulmonary fibrosis in females. Pneumoconiosis is the most common occupational lung disease in many developing countries. Pneumoconiosis is associated with inorganic dust exposure at work: different exposures result in different diseases. The common types of pneumoconiosis are silicosis, asbestosis and coal workers' pneumoconiosis<sup>1</sup>.

Pneumoconiosis is an occupational lung disease caused by prolonged occupational crystalline and nonsiliceous particle exposure<sup>2</sup>. The minimum intensity of exposure is usually  $>50 \mu\text{g}/\text{m}^3$  with a minimum duration of 2-5 years<sup>3</sup>. This is a case report of probable case of occupational pneumoconiosis due to agricultural dust in Thailand.

## Case report

A 47-year-old male presented with productive cough for two months, progressive dyspnea, 5 kg weight loss within one month, no chest pain, no fever, no edema, no history of contact with any pulmonary tuberculosis patients and a history of only 5 pack-year smoking. The patient went to see a physician at Mahasarakham hospital and his chest X-ray revealed bilateral reticulonodular infiltration. His sputum examination was negative for acid-fast bacilli. However, the patient was treated with anti-TB drugs for a period of two months but the clinical symptoms and chest X-ray were not improved.

Then, the patient was referred to Srinagarind hospital (a 1200-bed teaching hospital). The chest physician suggested that the chest X-ray showed chronic interstitial lung disease rather than metastatic lung disease. An occupational physician was consulted and

a history of occupational exposure obtained. The patient indeed had a history of prolonged occupational soil/sand-dust exposure. His former occupation as a backhoe driver on a cassava farm digging up and transferring the harvested cassava. The patient was chronically, exposed to soil/sand-dust by inhaling. He did not wear any personnel protective breathing equipment and he worked 10 h/day and 7 days/week for 8 years. He was not provided any working environment surveillance program.

The patient had dyspnea at rest, a productive cough, no orthopnea, no edema and his  $\text{O}_2$  saturation was 90%. A physical examination revealed: trachea in midline, no engorged neck vein, no heaving, no thrill, fine crepitation in both lungs, normal heart sounds, left thyroid gland nodule size 1 cm, movable with hard consistency and left cervical lymph node was also palpated 1 cm in diameter.

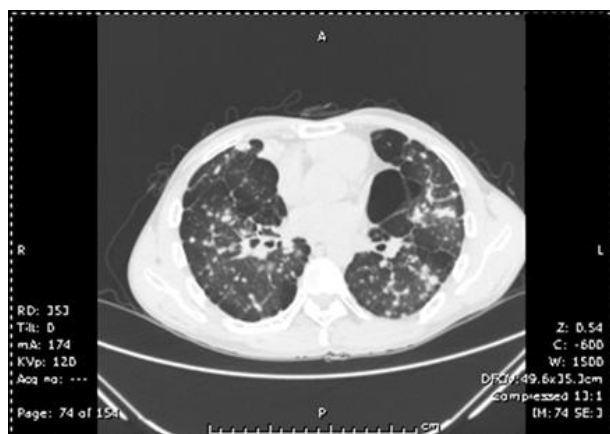
The chest X-ray—according to the *International Labour Organization (ILO) classification assessed by reader AIR Pneumo*—revealed perfusion 3/3+, bilateral mixed irregular linear and small nodular opacities, large opacity type A and emphysematous change (Figure 1). Computed tomography (CT) of the chest showed multiple pulmonary nodules in both lungs with small mediastinal adenopathy, multiple subpleural blebs in both lungs and pulmonary emphysema in both lower lobes (Figure 2).

Sputum specimens for AFB staining were repeated and the result was negative as was the sputum culture for *M. tuberculosis*. Sputum was collected for a cytology study, which revealed a few squamous epithelial and inflammatory cells. Needle aspiration was performed at left thyroid nodule and the tissue pathological result was papillary thyroid carcinoma.

The patient had underlying papillary cell carcinoma of thyroid. After the pathological result of thyroid gland from needle aspiration was reported, the patient underwent a total thyroidectomy with bilateral selective neck dissection II-V. The pathology report on the thyroid tissue was papillary thyroid carcinoma, the right and left cervical lymph nodes presented metastatic papillary carcinoma. The patient had post-operative



**Figure 1** Chest X-ray of a 47-year-old male, revealing perfusion 3/3+, bilateral mixed irregular linear and small nodular opacities, large opacity type A and emphysematous change (as per ILO classification).



**Figure 2** Computed tomography (CT) of the chest showed multiple pulmonary nodules in both lungs with small mediastinal adenopathy, multiple subpleural blebs in both lungs and pulmonary emphysema in both lower lobes.

hypocalcemia, which was resolved by medication and no other complications were reported. The patient was hospitalized for 10 days after the surgery and was

considered for radiotherapy. A biopsy of the lungs for assessing tissue pathology was not performed because the patient had severe clinical dyspnea and low oxygen saturation.

## Discussion

The clinical symptoms of our patient included: chronic productive cough without fever, significant weight loss, no orthopnea, heavy and prolonged organic dust exposure, no history of contact with pulmonary tuberculosis, history of 5 pack-year smoking, no edema, fine crepitation in both lungs, oxygen desaturation, no signs of congestive heart failure, palpable left thyroid gland nodule and left cervical lymph node. The radiography showed bilateral diffuse, small nodular, irregular linear opacities and a large opacity. The differential diagnoses included: miliary tuberculosis, pneumoconiosis and pulmonary metastasis. The differential diagnosis of pulmonary tuberculosis was excluded after negative results were returned for sputum AFB staining and culture for TB.

The patient showed no clinical improvement after two months of treatment. The diagnosis of pulmonary metastasis was not then suspected. Pulmonary metastasis from a papillary thyroid carcinoma was considered unlikely. Since lymphatic metastasis is the most common in papillary thyroid carcinoma, hematogenous metastasis was usually unlikely. In addition, the classic radiographic appearance of pulmonary metastasis is that of a cotton ball, which was not seen on the chest radiograph of our patient.<sup>4</sup>

History of heavy occupational exposure to soil/sand-dust and the appearance of the chest radiograph are usually sufficient indicators of some kinds of occupational lung disease. According to the occupational exposure history of our patient, his job was transferring unearthed cassava roots by backhoe for eight years. He worked without personal protective equipment, resulting in direct exposure to soil- and sand-dust.

Paleustulsts and Quartzipsamment are the main soil types on which cassava is cultivated in Mahasarakham province<sup>5</sup>. The most common type of crystalline silica is quartz, which is a defining feature of Paleustulsts and

Quartzipsamment.<sup>6</sup> The main crop of the region is cassava so agriculturists who grow and harvest this root are exposed to between 2-20 mg/m<sup>3</sup> quartz dust.<sup>5</sup> The OSHA permissible exposure limit for all types of dust is 15 mg/m<sup>3</sup>. Most agricultural dust is under 10 µm, which is respirable and can cause occupational lung disease.<sup>7</sup> The patient was directly exposed to soil-dust inhalation for years; so it is likely this prolonged exposure to crystalline silica was the cause of pneumoconiosis, which is an occupational lung disease.

According to the ILO classification, the classical chest radiograph is irregular with small round opacities. Computed tomography of the pneumoconiosis reveals reticular, reticulolinar, or reticulonodular opacities,<sup>8</sup> which were all found in our patient. According to his history of crystalline silica exposure and the appearance of the radiographs, a diagnosis of pneumoconiosis was highly probable.

The diagnosis of pneumoconiosis depends on the following supportive evidence (a) evidence of crystalline silica exposure, (b) a chest X-radiograph fitting the ILO classification, (c) congruent tissue pathology.<sup>3</sup>

Pneumoconiosis occurs among 20.9% of farm workers, according to the pathology of lung autopsies among 122 young farm workers in California.<sup>6</sup> In addition, several case reports have documented pneumoconiosis among farmers from silica or silicate exposure and analyses of lung particles have confirmed a similar composition to the soil they worked with.<sup>9</sup> Diagnosis depends on occupational exposure history, clinical symptoms, chest X-radiography and computed tomography. The diagnosis of mixed dust pneumoconiosis in our patient, however, had limited confirming data and confounding clinical symptoms. Nevertheless, there was strong evidence in favor of an occupational disease due to his prolonged exposure to sand/soil-dust.

The air quality of any occupational environment should be monitored. The factory where our patient worked had, however, already been closed and there was no way to take any meaningful measurements. Even though agriculture remains a main occupation of an estimated 24.1 million workers in Thailand, most are not

covered by any legal medical surveillance nor do they have access to occupational compensation.<sup>10</sup> Agriculture workers are exposed to occupational hazards, including: inorganic dusts, organic dusts, bioaerosol and chemical toxicants.<sup>11</sup> These types of aerosol hazards must be included in national standards for air quality and occupational health standards; in order to protect workers from contracting occupational lung disease.

## Conclusion

An agriculture worker presented with chronic interstitial lung disease; for which a diagnosis of pneumoconiosis was probable, due to prolonged occupational exposure to soil/sand-dust. Similar cases might have occurred but lack of awareness of occupational history-taking may be the cause of under-reporting. Agriculture work is the main occupation of the Thai population so the numbers of persons exposed to inhaled soil/sand-dust is likely underreported. A prevention program and hazard notification is therefore needed for agriculture workers in order to prevent this type of occupational disease or some other related lung disorders (i.e., chronic bronchitis). A medical surveillance program and proper personal protective equipment needs to be formalized and implemented. Healthcare professionals need to be conducting and recording thorough occupational history of patients admitted with respiratory symptoms.

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## Declaration of conflicting interest

The authors declare that there are no conflicts of interest.

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