

Supplemental material

Fungal Bioaerosol Exposure and Its Effects on the Health of Mushroom and Vegetable Farm Workers in Taiwan

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Supplemental material, Table S1. Worker demographic characteristics and personal protection use (n = 53)

| Demographic Data | <i>n</i> (%) |
|---------------------------------------|---------------------|
| Sex | |
| Men | 11 (20.75) |
| Women | 42 (79.25) |
| Age (years; Mean \pm SD) | |
| All | 45 \pm 13.67 |
| Men | 42 \pm 12.86 |
| Women | 46 \pm 13.78 |
| Ethnicity | |
| Hokkien | 29 (54.72) |
| Hakka | 12 (22.64) |
| Aborigine | 4 (7.55) |
| Chinese | 4 (7.55) |
| Immigrant | 4 (7.55) |
| Education | |
| Illiterate | 4 (7.55) |
| Elementary school | 9 (16.98) |
| Junior high school | 13 (24.53) |
| Senior high school | 21(39.62) |
| College | 4 (7.55) |
| Graduate school | 2 (3.77) |
| Job category | |
| Workers | 40 (75.47) |
| Technicians | 3 (5.66) |
| Part-time workers | 3 (5.66) |
| Office workers | 3 (5.66) |
| Other | 4 (7.55) |
| Working years (Mean \pm SD) | 6.77 \pm 8.24 |
| Working hours per day (Mean \pm SD) | 8.37 \pm 0.97 |
| Smoking status | |
| Never | 45 (84.91) |
| At least once | 8 (15.09) |
| Wore working clothes | |
| No | 10 (18.87) |
| Yes | 43 (81.13) |
| Wore mask | |
| No | 42 (79.25) |
| Yes | 11 (20.75) |

| | | |
|-----------------------------------|--|------------|
| Wore goggles | | |
| No | | 51 (96.23) |
| Yes | | 2 (3.77) |
| Wore gloves | | |
| No | | 10 (18.87) |
| Yes | | 43 (81.13) |
| Wore working shoes | | |
| No | | 8 (15.09) |
| Yes | | 45 (84.91) |
| Washed hands after work | | |
| No | | 2 (3.77) |
| Yes | | 51 (96.23) |
| Washed hands with soap after work | | |
| No | | 32 (60.38) |
| Yes | | 21 (39.62) |

Approximately 80% of the workers were women, and 77% of the participants were ethnically Hokkien or Hakka, the main ethnic groups in Taiwan. The workers had been working on the mushroom and vegetable farms for approximately 7 years, generally for 8 h per day. Few of the workers wore masks (20.75%) or goggles (3.77%) at work, and most wore gloves (81.13%) and working shoes (84.91%). Most of the workers washed their hands after work (96.23%), and few used soap (39.62%).

Supplemental material, Table S2. Fungal bioaerosol concentrations at different area sampling sites on the five study farms

| Farm type | Fungal Spores (spores m⁻³) | Culturable Fungi (CFU m⁻³) |
|--------------------------|--|--|
| First mushroom | | |
| Compost preparation | 8,794 | 4,759 |
| Harvesting | 2,009 | 2,511 |
| Packaging | 2.8×10 ⁴ | 1,963 |
| Outdoor | 510 | 49 |
| Second mushroom | | |
| Compost preparation | 1.1×10 ⁵ | 3.1×10 ⁴ |
| Harvesting | 1.7×10 ⁵ | 5,496 |
| Packaging | 2.6×10 ⁴ | 8,928 |
| Outdoor | 5,159 | 749 |
| First vegetable (fall) | | |
| Uncultivated field | 4,357 | 1,240 |
| Cultivated field | 5,363 | 988 |
| Packaging | 5,346 | 3,663 |
| Outdoor | 3,333 | 1,025 |
| First vegetable (winter) | | |
| Uncultivated field | 4.2×10 ⁴ | 6,567 |
| Cultivated field | 1,653 | 402 |
| Packaging | 1,962 | 1,323 |
| Outdoor | 681 | 745 |
| Second vegetable | | |
| Uncultivated field | 2,809 | 1,706 |
| Cultivated field | 857 | 1,007 |
| Packaging | 568 | 296 |
| Outdoor | 1,138 | 669 |
| Third vegetable | | |
| Uncultivated field | 3.1×10 ⁵ | 5.1×10 ⁴ |
| Lettuce cultivation | 2,803 | 960 |
| Courgette cultivation | 3,105 | 1,073 |
| Outdoor | 3,908 | <LOD ^a |

^a LOD: Limit of detection

Supplemental material, Table S3. Distributions of worker lung function measurements on the five study farms ^a

| Farm type | Measurement time | FEV ₁ (L) | | FVC (L) | | PEF (L s ⁻¹) | | FEV ₁ /FVC (FEV1%) | | FEF ₂₅ (L s ⁻¹) | | FEF ₅₀ (L s ⁻¹) | | FEF ₇₅ (L s ⁻¹) | |
|--------------------------------|------------------|----------------------|------|---------|------|--------------------------|------|-------------------------------|-------|--|------|--|------|--|------|
| | | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| First mushroom (n=24) | Before work | 1.95 | 0.49 | 2.13 | 0.56 | 4.19 | 1.64 | 91.95 | 6.67 | 4.12 | 1.64 | 2.98 | 1.30 | 1.63 | 0.98 |
| | After work | 1.99 | 0.57 | 2.23 | 0.67 | 4.09 | 1.48 | 90.04 | 7.40 | 3.92 | 1.48 | 2.99 | 1.29 | 1.48 | 0.86 |
| Second mushroom (n=8) | Before work | 2.04 | 0.47 | 2.09 | 0.48 | 5.15 | 1.83 | 97.78 | 2.27 | 4.70 | 1.67 | 3.89 | 1.65 | 2.11 | 1.19 |
| | After work | 2.00 | 0.85 | 2.28 | 0.95 | 4.00 | 1.97 | 87.44 | 14.71 | 3.54 | 2.15 | 3.00 | 1.60 | 1.91 | 1.09 |
| First vegetable (fall) (n=7) | Before work | 2.43 | 1.05 | 2.65 | 1.08 | 4.94 | 2.92 | 91.71 | 15.70 | 4.61 | 2.31 | 3.61 | 1.60 | 1.99 | 0.79 |
| | After work | 2.31 | 0.56 | 2.39 | 0.57 | 4.60 | 1.39 | 96.71 | 2.56 | 4.54 | 1.29 | 3.69 | 1.02 | 1.99 | 0.60 |
| First vegetable (winter) (n=6) | Before work | 2.30 | 0.47 | 2.37 | 0.43 | 4.94 | 1.34 | 96.83 | 3.54 | 4.82 | 1.26 | 4.37 | 1.47 | 2.32 | 0.80 |
| | After work | 2.16 | 0.52 | 2.24 | 0.50 | 4.33 | 1.68 | 96.17 | 4.49 | 4.15 | 1.50 | 3.70 | 1.68 | 2.09 | 0.91 |
| Second vegetable (n=5) | Before work | 2.12 | 0.33 | 2.25 | 0.18 | 5.06 | 1.65 | 94.20 | 7.91 | 4.99 | 1.79 | 3.55 | 1.18 | 1.68 | 0.78 |
| | After work | 2.14 | 0.33 | 2.23 | 0.25 | 5.71 | 1.55 | 95.60 | 5.31 | 5.57 | 1.63 | 3.84 | 1.33 | 1.73 | 0.65 |
| Third vegetable (n=5) | Before work | 2.77 | 0.57 | 3.20 | 0.78 | 5.69 | 1.77 | 87.40 | 7.63 | 5.27 | 2.03 | 3.51 | 0.73 | 1.61 | 0.27 |
| | After work | 2.88 | 0.53 | 3.59 | 1.09 | 5.16 | 0.95 | 85.00 | 9.92 | 5.00 | 1.03 | 3.78 | 0.31 | 1.38 | 0.27 |

^a FEV₁: Forced Expiratory Volume in 1 second; FVC: Forced Vital Capacity; PEF: Peak Expiratory Flow; FEF_{25, 50, 75}: Forced Expiratory Flow at 25%, 50%, and 75% of expired volume.