# Grain dust (oats, wheat, barley)

| CAS number: | — |
| --- | --- |
| Synonyms: | — |
| Chemical formula: | — |
| Structural formula: | — |

Workplace exposure standard (amended)

| TWA: | **1.5 mg/m3** |
| --- | --- |
| STEL: | — |
| Peak limitation: | — |
| Notations: | — |
| IDLH: | — |
| **Sampling and analysis:** The recommended value is quantifiable through available sampling and analysis techniques. | |

## Recommendation and basis for workplace exposure standard

A TWA of 1.5 mg/m3 is recommended to protect for changes in lung function and bronchitis in exposed workers.

## Discussion and conclusions

The recommended TWA is for exposure to the total dust produced during harvesting and handling activities of whole grain of oat, wheat and barley prior to the milling operation. Grain dust consists of 60 to 75 per cent organic material and 25 to 40 per cent inorganic material.

Critical effects of exposure include irritation of the upper respiratory tract, eyes and skin, bronchitis and decreased pulmonary function. Barley, wheat and oat dusts all cause similar respiratory distress symptoms.

ACGIH (2018) reported that acute bronchitis symptoms did not appear in workers exposed at or below 4 mg/m3 based on two studies for prevalence of respiratory symptoms and their association with grain dust concentrations. In a separate study, there was no increased risk of rapid decline in pulmonary function in workers exposed at concentrations less than 5 mg/m3 (ACGIH, 2018). HCOTN (2011) estimated a LOAEC of 4 mg/m3 based on acute bronchitis outcomes in two short-term studies in workers from which it derived their recommended TWA of 1.5 mg/m3.

HCOTN (2011) reported that the average forced expiratory volume (FEV1) decline over a 40-year period is approximately 1 L in the general non-smoking population and estimated that exposure to a TWA of 1.5 mg/m3 for 40 years leads to an additional loss in FEV1 of 45 mL. The results of a study in workers suggest that a mean FEV1 decline of 120 mL is not statistically significant with respect to cardiovascular mortality. Therefore, HCOTN (2011) concluded an average loss of FEV1 of 45 mL is not considered an adverse effect.

Based on the evidence presented, a TWA of 1.5 mg/m3 is recommended as derived by HCOTN (2011) and is considered to provide a sufficient margin of protection against adverse effects in the respiratory tract and changes in lung function.

## Recommendation for notations

Not classified as a carcinogen according to the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Not classified as a skin sensitiser or respiratory sensitiser according to the GHS. Asthma and allergy effects are noted in the primary sources and it is recommended that a further review of sensitiser potential is undertaken.

There are insufficient data to recommend a skin notation.

# Appendix

### Primary sources with reports

| Source Year set Standard |
| --- |
| SWA 1991 TWA: 4 mg/m3 | |
|  |
| ACGIH 2001 TLV-TWA: 4 mg/m3 |
| TLV-TWA recommended to minimise the potential for acute irritation of the upper respiratory tract, eyes and skin, bronchitis and decreased pulmonary function. Applies to exposure to the total dust from whole grain before the milling operation.  Summary of data:  Human data:   * Barley, wheat and oat dusts all cause similar respiratory distress; available evidence indicates that grain dust is not merely a nuisance * Pulmonary effects reported in grain workers include wheezing, cough, chronic bronchitis, dyspnoea, asthma, farmer's lung, chronic airway obstruction, mycotoxicosis and allergic alveolitis * Non-pulmonary effects include rhinitis, conjunctivitis, grain fever and dermatitis * Exposure measurements from 85 samples taken at 8 terminal elevators in the United States during October 1975, a peak season for shipping newly harvested grain; the geometric means varied between elevators from 2.57 to 8.86 mg/m3; the fraction of samples expected to be below 4 mg/m3 varied from 73% to only 5% * Used to determine the prevalence of respiratory symptoms and correlated them with dust concentrations by Rankin *et al* (1986) and DoPico *et al* (1983) * The two studies for prevalence of respiratory symptoms and their association with dust concentration showed that acute bronchitis symptoms did not appear in workers exposed at ≤4 mg/m3 * Little to no correlation in pulmonary function across one day in workers exposed at an average dust concentration of 6.6 mg/m3 * No increased risk of rapid decline in pulmonary function in workers exposed <5 mg/m3.   No animal data reported.  No specific derivation of the TWA is provided.  Insufficient data to recommended sensitisation, skin or carcinogenicity notations. |
| DFG NA NA |
| No report. |
| SCOEL NA NA |
| No report. |
| OARS/AIHA NA NA |
| No report. |
| HCOTN 2011 TWA: 1.5 mg/m3 |
| Summary of additional data:   * Heterogeneous composition; components of plants and components of microbial origin such as endotoxins; endotoxin content extremely variable. Two acute and short term exposure studies on grain workers were selected as critical studies for the derivation of a health-based recommended OEL * Corey *et al* (1982) studied 47 grain workers during 1 wk; mean exposure levels were approximately 1 mg/m3 respirable dust and 6 mg/m3 non-respirable dust; compared to a control group of outside labourers, FEV1 and FVC decreased during the week (from Monday morning to Friday morning); correlation between exposure and cross-shift decreases of MEF50 and MEF25 was found * DoPico *et al* (1983) studied 248 grain handlers before and after an 8-h work shift compared to 192 controls; grain workers were exposed to a mean personal total dust concentration of 3.3 mg/m3; corrected for effects of age, height and smoking habits, the increase of total dust concentration correlated significantly (p< 0.05) with the decrease in FVC, MEF50 and MEF75 and the increase in leukocyte count; different study to that cited in ACGIH (2018) * from these studies the HCOTN estimated a LOAEC of 4 mg/m3; applied a safety factor of 3 for no NOAEC to arrive at 1.5 mg/m3 * Supporting information: * average FEV1 decline during 40 yr is ≈1 L in the general non-smoking population * data from endotoxin TWA allows prediction of additional loss of FEV1 in time (no further information provided) * exposure to the proposed TWA of 1.5 mg/m3 for 40 yr leads to an additional loss in FEV1 of 45 mL (no further information); average loss of FEV1 of 45 mL not considered an adverse effect * study in workers suggests that a mean FEV1 decline of 120 mL is not statistically significantly associated with cardiovascular mortality. |

### Secondary source reports relied upon

NIL.

### Carcinogenicity — non-threshold based genotoxic carcinogens

| Is the chemical mutagenic? | No |
| --- | --- |
| **The chemical is not a non-threshold based genotoxic carcinogen.** |  |

## Notations

| Source | Notations |
| --- | --- |
| SWA | — |
| HCIS | NA |
| NICNAS | NA |
| EU Annex | NA |
| ECHA | NA |
| ACGIH | — |
| DFG | NA |
| SCOEL | NA |
| HCOTN | — |
| IARC | NA |
| US NIOSH | NA |

NA = not applicable (a recommendation has not been made by this Agency); — = the Agency has assessed available data for this chemical but has not recommended any notations

### Skin notation assessment

| Calculation |
| --- |
| Insufficient data to assign a skin notation. |

### IDLH

| Is there a suitable IDLH value available? | No |
| --- | --- |

## Additional information

| Molecular weight: | N/A |
| --- | --- |
| Conversion factors at 25°C and 101.3 kPa: | 1 ppm = Number mg/m3; 1 mg/m3 = Number ppm |
| This chemical is used as a pesticide: |  |
| This chemical is a biological product: |  |
| This chemical is a by-product of a process: |  |
| A biological exposure index has been recommended by these agencies: | ACGIH  DFG  SCOEL |

## Workplace exposure standard history

| Year | Standard |
| --- | --- |
| Click here to enter year |  |

## References

American Conference of Industrial Hygienists (ACGIH®) (2018) TLVs® and BEIs® with 7th Edition Documentation, CD-ROM, Single User Version. Copyright 2018. Reprinted with permission. See the [*TLVs® and BEIs® Guidelines section*](http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations) on the ACGIH website.

Health Council of the Netherlands (HCOTN) (2011) Grain dust. Health-based calculated occupational cancer risk values. The Hague: Health Council of the Netherlands; publication no. 2011/13.