National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

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Part A: Quality assessment of a selection of DNELs

Part B: Discussion paper on the possibilities to improve the overall quality of DN(M)ELs

RIVM Letter report 110001001/2014

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This investigation has been performed by order and for the account of Min SZW, within the framework of the evaluation of worker inhalation DNELs

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General summary

"Evaluation of worker inhalation DNELs" – main findings

RIVM conducted a study on the quality of the industry-derived limit values for the protection of workers against the possible adverse effects of chemicals. Within the limitations of the study we concluded that these REACH-based limit values (so-called DNELs[1]) derived by industry have significantly lower margins of safety - which may negatively affect the level of safety - than the ones derived by RIVM experts. RIVM identifies a number of possible actions to be taken by the various stakeholders involved, which may lead to a better protection level. Acknowledging the fact that DNELs are an important cornerstone of worker-protection policy, RIVM urges stakeholders to take appropriate action.

The system of Occupational Exposure Limits

The need for a well-functioning policy system to ensure safe working with chemicals is underlined by clear evidence that many workers still fall ill from working with substances. In 2005, RIVM investigated the burden of disease for nine diseases to be 46,800 DALYs (Disability Adjusted Life Years') including 1,853 deaths, due to exposure to substances at the workplace (Baars et al., 2005). Comparable results were found when more recent data were used (Eysink, 2007). In addition, still new, previously unknown health risks caused by exposure to substances are reported at NCOD on a regular bases (Occupational diseases are registered and analyzed by the Dutch Centre of Occupational Disease (NCOD), although underreporting is a large problem). Based on these facts we may conclude that workers must be better protected when working with substances.

To protect workers against these possible adverse effects of chemicals they are working with, maximum exposure levels are usually set. These protective limiting values are referred to as occupational exposure limits (OELs). In the Netherlands, when there is no public (legal) OEL, the legal responsibility to derive an OEL is a private responsibility, meaning that OELs need to be set by the individual companies themselves.

Public OELs are set by the Dutch government, i.e. the Ministry of Social Affairs and Employment, for:

1. Substances for which the EU requires limit values (in practice, these are Binding Limit Values and Indicative Limit Values).
2. Substances 'without owners' (that are not intentionally produced in processes that occur in several sectors of industry)
3. Substances with a high chance of causing damage to health (high-risk substances)

(Besides this, the Minister of Social Affairs can also set a public OEL when he has a special reason for it.)

In practice, the number of statutory OELs set by the Dutch authorities is very limited. There are about 150 health based OELs available for more than 150,000 substances on the market (besides the process generated substances).

[1] DNEL=Derived No Effect Level

Consequently, for the majority of substances limit values have to be derived by the companies themselves.

In principle, both private and public OELs are health-based, with the exception of OELs for carcinogenic and mutagenic substances for which by definition no safe health-based OEL can be set. Once an OEL is set, both employers and employees have their own, individual responsibility to ensure safe working with chemicals. Employers must create safe and healthy working conditions and workers must comply with these rules.

Connection with the REACH Regulation
Deriving OELs is a complicated and highly specialized task. Fortunately, within the current REACH regulation, producers and importers of chemical substances are obliged to derive so-called derived no-effect levels (DNELs). These DNELs can be used by the downstream users, i.e. the clients of the producers and importers, where chemicals may be used in formulation or other activities. Employers, producers, importers and their downstream users, can use these DNELs as an OEL to protect their employees against possible adverse effects of working with that specific chemical substance. In this way, the REACH regulation provides a valuable set of specialized data that can be used by employers to evaluate the possible health risks posed by working with chemical substances. The REACH regulation thus adds significantly to the practical functioning of the 'private/public OEL system', that is currently in use in the Netherlands.

In such a system it is of course essential, that the DNELs derived by the producers/importers of chemicals are of adequate quality – that is that they are derived in such a way that they actually do provide the sufficient level of protection for the workers handling these chemicals under the various operational conditions and risk management measures.

In the opinion of RIVM, a DNEL can only be used as a private OEL under the condition that it is derived according to the rules set by ECHA in the guidance document: "information requirements and chemical safety assessment; chapter R.8: Characterisation of dose [concentration]-response for human health". This guidance is conservative enough to set health-based DN(M)ELs, even for data poor substances.

Study into the quality of DNELs
In the two (sub)reports we describe the results of our project "Evaluation of worker inhalation DNELs":

- Part A: Quality assessment of a selection of DNELs
- Part B: Discussion paper on the possibilities to improve the overall quality of DN(M)ELs

To assess the current quality of the DNELs, RIVM selected 18 substances and compared the worker inhalation DNEL derived by the registrant to the ones derived by RIVM experts. The RIVM experts used the toxicological information provided by the registrants in the chemical safety report and derived the DNEL according to the ECHA guidance R.8. The comparison of the two DNELs shows that the registrants' DNELs are a factor 10 or more higher than the RIVM DNEL for 8 out of 15 substances (for 3 substances RIVM did not derive a DNEL

because a DMEL[2] was found to be appropriate). Since a difference of a factor of 10 or more is toxicologically relevant, this may mean that workers are inadequately protected during their work with these substances. Most of the differences can be attributed to the selection of the leading health effect and corresponding key dose descriptor or the application of assessment factors.

Although only a small subset of substances were evaluated, and these results cannot be extrapolated to all DNELs derived by industry, the low quality DNELs as found in this study does give substantial reason for concern. This concern is further underlined by other studies finding comparable results (see Part A of the report).

Next steps

RIVM stresses that DNELs, as derived under REACH, play a crucial role in the overall system of the protection of workers against chemical substances. According to RIVM, a high priority should be given to come to an improvement of the quality of DNELs. In part B of our study we identify and discuss the types of action that can be taken by the different actors. Suggested modes of action include: increased transparency of the DNEL-setting process and improved quality control measures from the side of industry, stricter control and enforcement measures from the side of the authorities and making DNEL quality an element of the regular (institutional) discussions between employers (sector organizations) and employees (trade unions). As a next step, RIVM urges the relevant stakeholders – government (ECHA, member states), representatives of employers (SER[3] , sector organizations) and employees (SER, trade unions) - to discuss and agree on the specific action needed to ensure a sound policy system for the safe working with chemicals.

A.J. Baars, S.M.G.J. Pelgrom, F.H.G.M. Hoeymans, M.T.M. van Raaij (2005) Gezondheidseffecten en ziektelast door blootstelling aan stoffen op de werkplek – een verkennend onderzoek, RIVM rapport 320100001/2005

P.E.D. Eysink, B.M. Blatter, C.H. van Gool, A.M. Gommer, S.N.J. van den Bossche, N. Hoeymans (2007) Ziektelast van ongunstige arbeidsomstandigheden in Nederland, RIVM rapport 270012001/2007

[2] DMEL=Derived Minimal Effect Level; DMELs are similar in concept to DNELs but have a different toxicological background. DMELs were not a part of the study reported here.

[3] As an advisory and consultative body of employers' representatives, union representatives and independent experts, the Social and Economic Council of the Netherlands (SER) aims to help create social consensus on national and international socio-economic issues

Contents

Part A: Quality assessment of a selection of DNELs

L. Schenk | N. Palmen

Publiekssamenvatting

Onderzoek naar de kwaliteit van een aantal werker inhalatie-DNELs

Om een veilige en gezonde werkomgeving te creëren voor werknemers die met gevaarlijke stoffen werken, is het belangrijk dat de blootstelling wordt beperkt. Dit gebeurt op basis van grenswaarden. Van een klein deel van deze stoffen heeft de grenswaarde voor de blootstelling een wettelijke status in Nederland. Voor het merendeel moeten werkgevers deze grenswaarden zelf bepalen.

Het RIVM heeft onderzocht in hoeverre deze wettelijk erkende grenswaarden verschillen van de DNEL's (Derived No Effect Levels) die de industrie voor REACH zelf vaststelt. Deze DNEL's zijn vereist voor stoffen die worden geproduceerd of geïmporteerd in de EU in een volume van 10 ton per jaar of meer. Tussen de waarden blijken verschillen te zitten, die soms zelfs groot zijn. Omdat bij de ene stof de DNEL hoger was en in andere gevallen de wettelijk erkende waarde, kunnen hier nog geen duidelijke lessen uit worden getrokken.

Vervolgens heeft het RIVM de kwaliteit van de door de industrie afgeleide DNEL's beoordeeld. Hiervoor is van 18 geselecteerde stoffen de DNEL bepaald met behulp van de vertrouwelijke gegevens die de industrie gebruikt, en volgens de handleiding van ECHA (**E**uropean **Ch**emical **A**gency). In bijna alle gevallen zijn de door het RIVM afgeleide DNEL's lager dan die door de industrie zijn afgeleid. Dit kan betekenen dat voor deze stoffen onvoldoende bescherming wordt geleverd op de werkplek.

Deze verschillen zijn onder andere een gevolg van de keuze bij welke concentratie gezondheidsschade ontstaat. Daarnaast hanteert de industrie een krappere veiligheidsmarge. Vanwege de gerichte selectie van de stoffen geldt deze conclusie niet voor alle DNEL's van de industrie. Wel betekent het dat de DNEL's die de industrie afleidt, niet zonder meer kunnen worden gebruikt voor risicoschattingen.

Het RIVM pleit voor meer transparantie over de manier waarop de DNEL's worden bepaald, door informatie uit te wisselen en daarover te discussiëren. Daarnaast beveelt het instituut aan om op de website van de ECHA een handzame lijst met de DNEL's voor werkers op te stellen en publiek te maken.

Het RIVM heeft tegelijkertijd onderzocht hoe de DNEL's kunnen worden verbeterd (zie bijlage B van dit rapport).

Abstract

Study on the quality of some worker inhalation DNELs

Limit values are important to control worker exposure to substances in order to create safe and healthy working conditions. For a restricted number of substances, public limit values with a legal status have been derived. For the remaining substances, employers must derive their own private limiting values.

RIVM studied the numeric differences between these legally accepted *public* limiting values and the DNELs (Derived No Effect Levels) which are derived by industry within the framework of REACH. These DNELs are obligatory for substances produced or imported in the EU in an amount of 1 or more tonnes/year. We found (large) differences between the two values. However, no clear conclusions can be drawn on these differences; the DNEL was higher for one substance and the *public* limiting value for another substance.

Subsequently, RIVM evaluated the quality of DNELs that were derived by industry. For that purpose, RIVM scientists derived their own DNEL for 18 substances by using the information that was provided by industry and by following the ECHA guidance (**E**uropean **Ch**emical **A**gency). The DNELs derived by the RIVM experts were lower compared to the DNELs derived by industry in almost all cases. This may indicate that insufficient protection is provided in the workplace for these substances.

One reason for the difference between the two DNELs is the choice of the concentration at which health effects are expected. Next to this, industry uses a smaller safety margin. Because of the targeted selection of the substances studied, the conclusions cannot be simply extrapolated to all DNELs derived by industry. However, it means that DNELs derived by industry cannot be used in risk assessments without further evaluation.

RIVM pleads for more transparency on the derivation of DNELs, by exchanging information and discussing the DNEL. Next to this, the institute advises to ask ECHA to create a list of DNELs and make it publicly available on their website.

RIVM studied simultaneously the way in which the quality of DNELs may be improved (appendix B of this report).

Summary

Workers must be protected against health risks related to exposure to chemicals. Underlying legislations are the EU Chemical Agents Directive (98/24/EG), the Carcinogens and Mutagens Directive (CMD, 2004/37/EC) and the REACH Regulation (Registration, Evaluation, Authorisation and Restriction of Chemicals). In the context of the EU directives (inter)national occupational exposure limits (OELs) are derived by EU-SCOEL or national OEL setters. REACH requires all companies producing or importing chemical substances in the European Union in quantities over ten tonnes per year to derive DNELs (Derived No Effect Levels) in case a substance has a threshold mode of action. For carcinogens without a threshold, the REACH guidance offers the semi-quantitative DMEL (Derived Minimal Effect Level) as alternative to the DNEL. These DN(M)ELs are communicated down-stream in the supply chain via a safety data sheet. Additionally DN(M)ELs are communicated on the ECHA's dissemination website. DN(M)ELs derived in the registration dossiers are not by themselves binding. They are used to derive the Risk Management Measures (RMMs), which do have a binding character in the supply chain. REACH allows registrants to use EU-IOELs, derived by SCOEL, or national health based OELs to be used as a DN(M)EL. However, the number of substances with an OEL is very limited compared to the number of substances used in industry.
Regarding the chemical risk assessment, an employer has to show safe use for every substance workers may be exposed to. If there is no public Dutch OEL available, the employer must derive his own private OEL. The question is whether DN(M)ELs can be used as a private OEL, since the quality of the DN(M)ELs is highly dependent of the toxicological knowledge of the registrants. In this report a numerical comparison between DN(M)ELs and Dutch OELs was made. For a small sample of selected substances, an in depth analysis of the quality of the DNEL was made using the chemical safety report of the registrant.

DN(M)ELs communicated via the ECHA webpage are publicly available. However, ECHA does not provide a compiled list of all DN(M)ELs. A list of DNELs is provided by the German DGUV, but is not updated continuously as the ECHA database is. Downstream users, authorities and risk-assessors would benefit from such a list to be able to check the DN(M)ELs. In our view it is also necessary to be able to check the total derivation of a DN(M)EL. Because of confidentiality issues this information is not available for most substances. So we suggest that ECHA both should compile an up-to-date publicly available list of DN(M)ELs, and disseminate the full DN(M)EL derivation on their webpage.

Comparing the Dutch public OELs with their corresponding DNELs it was found that about 25 percent have identical values, which is not surprising since both the Dutch public OELs and the DNELs use EU-IOELs as limit values for these substances. About 10 percent of the Dutch OELs differ by a factor of 10 or more from the DNEL. Among these, substances with a higher worker DNEL (n=3) the worker DNEL was between 10 and 13 times higher compared to the Dutch health based OEL; for those substances with a lower worker DNEL (n=6) the worker DNEL was between 14 and 96 times lower than the Dutch health- based OEL. For two substances a DMEL was derived, although toxicological data suggest a DNEL is appropriate. For substances without a threshold and for which a DMEL should be derived (n=12), in 3 cases a DNEL was set. Two substances had a DMEL ten times or more lower than the Dutch risk-based OEL (maximum factor 26). Based on the numerical comparison of Dutch OELs and their corresponding DN(M)ELs it may be concluded that there is no general rule for

the difference between the two values. Furthermore it has to be considered that the comparisons were made for a subset of substances; the ones with enough toxicological information to derive a Dutch OEL.

Eighteen substances were selected for an in depth analysis in which the registrant's DNEL was compared to a DNEL derived by RIVM experts using the information in the chemical safety report and the ECHA guidance chapter R.8 ("ECHA method" DNEL). Both the substances for which the Dutch public OEL differs from the DNEL and the substances with a poor toxicological database were included. Comparing long-term DNELs it was found that in eight out of fifteen substances the worker-DNEL was a factor of 10 or more higher than the "ECHA method" DNEL. For two of these substances the registrant's DNEL was 100 and 24600 times higher than the "ECHA method" DNEL. For three substances the RIVM experts concluded there was no threshold effect, and that it was erroneous to derive a DNEL. For eight out of eighteen substances the registrants used an OEL as long-term worker-DNEL. In two cases the source of the OEL was not cited. Three of the six identified OELs were considered outdated by RIVM. The number of acute/short-term DNELs to be compared is limited since an acute/short-term DNEL only has to be derived when both the substance has an acute inhalation effect and peak exposure is possible. For three out of five substances the registrant's DNEL was a factor 10 or more higher than the "ECHA method" DNEL; the highest with a factor of 1665.

The main reasons for these differences between the registrant's DNEL and the "ECHA method" DNEL were differences in the selection of the leading health effect and the choice of the key dose descriptor and application of assessment factors. The most striking difference (a factor of 24600) found in the present study was due to differences in selection of the leading health effect. In this specific case the registrant selected data requiring a route-to-route extrapolation while the "ECHA method" DNEL was based on inhalation data. The differences in assessment factors were mostly due to registrants applying the ECETOC assessment factors instead of ECHA assessment factors. Furthermore, the registrants did not apply any assessment factors for quality of the database when the RIVM experts thought this necessary.

There is no "correct" health based value which is illustrated for instance by the large variety between different OELs for the same substance. However, this study shows that registrants may not comply with the ECHA guidance and that it is necessary to evaluate each DNEL derived by the registrants before adopting it as a private OEL.

To increase the trust within the supply chain in the DN(M)ELs derived by the registrants, more transparency about the derivation of DN(M)ELs may be helpful. By sharing information with stakeholders (DU) and experts without access to the registration dossier, the Registration mechanism that delivers DN(M)ELs becomes subject to scrutiny by third parties with an interest in scientifically robust DNELs. In other words, we expect that increased transparency will lead to better quality DN(M)ELs. This is at the moment not possible because of confidentiality issues. In part B of this report we embark on a discussion on other possible ways to increase the quality of the system of DN(M)ELs production within the Registration process

1 Introduction

1.1 REACH and DNELs

The European Union (EU) chemicals legislation REACH came into force in June 2007. REACH stands for Registration, Evaluation, Authorisation and restriction of Chemicals (European Commission, 2006). The most important aims of the REACH Regulation are to improve protection of human health and the environment from the risks of chemicals, and to enhance innovation and competitiveness of the EU chemicals industry.

The REACH Regulation places greater responsibility on industry to manage the risks from chemicals and to provide safety information on the substances than previous EU chemical legislations. Manufacturers, importers and downstream users should ensure that they manufacture, place on the market or use substances in such a way that they do not adversely affect human health or the environment. To this end, a chemical safety assessment (CSA) has to be performed by registrants for hazardous substances manufactured and/or imported in amounts greater than 10 tons per year, demonstrating that the risks arising from use of the substance are adequately controlled. The amount and type of data required to be included in the CSA increases with the tonnage in which the substances are produced or imported by the registrant per year. The CSA should include a hazard assessment of the substance and, in case the substance is hazardous according to Regulation (EC) No 1272/2008 (European Commission, 2008), also an exposure assessment (for all identified uses) and a risk characterisation. This CSA is to be documented in a chemical safety report (CSR) and submitted to the European Chemicals Agency (ECHA). The agency acts as a central point in the REACH system as it manages the databases necessary to operate the system, co-ordinates the in-depth evaluation of substances of special concern and builds a public database in which consumers and professionals can find hazard information (echa.europa.eu).

An important step in the CSA is the derivation of a so-called Derived No-Effect Level (DNEL) for substances with identifiable threshold effects. The DNEL is an exposure level that represents "the level of exposure above which humans should not be exposed" (REACH, Annex I, 1.0.1). The DNEL must address differences in exposure duration (acute, repeated) and routes (such as inhalation or skin contact), different exposed (sub)populations (e.g. at the workplace, general public) and differentiate between systemic and local effects, as appropriate for the identified use(s). Thus, several DNELs may be needed for each individual substance (REACH, Annex I, 1.4.1).

Serving as a reference value, the DNELs play a crucial role in the demonstration of adequate control throughout the supply chain. In the risk characterisation part of the CSA the estimated exposure for an identified use is to be compared with the appropriate DNEL. In case the exposure does not exceed the DNEL, it is assumed that there is no risk for human health and further risk management measures beyond those already in place, are not necessary. In case the exposure is higher than the DNEL, the risk is not controlled and operational conditions and risk management measures may need to be adjusted to bring the exposure below the appropriate DNEL.

When it is not possible to derive a DNEL (e.g. because there is no safe threshold, like for certain carcinogens), registrants must state and justify this in the CSR (REACH, Annex I, 1.4.2), and carry out a semi-quantitative or qualitative analysis of the likelihood that negative health effects will be avoided at the exposures associated with the use of the substance (REACH, Annex I, 1.1.2 and 6.5). For carcinogens without a threshold, the REACH guidance offers the semi-quantitative DMEL (Derived Minimal Effect Level) as alternative to the DNEL. This DMEL would correspond to an exposure level representing a risk level for adverse effects of very low concern (ECHA, 2012a). For certain substances it is not possible to derive a DNEL or a DMEL, e.g. mutagens not tested for carcinogenicity. These substances require a qualitative risk assessment.

All in all, registrants may need to derive a number of DNELs (or DMELs) for workers (the population targeted at in this report) according to the REACH Guidance chapter R. 8, depending on the properties and the use of a substance (oral exposure is of less importance in the occupational setting):

- Acute – inhalation, systemic effects
- Acute – inhalation, local effects
- Acute – dermal, local effects
- Long-term – inhalation, systemic effects
- Long-term – inhalation, local effects
- Long-term – dermal, systemic effects
- Long-term – dermal, local effects

In addition to the REACH legislation, workers are also protected against health risks related to exposure to chemicals within the framework of the EU Chemical Agents Directive (98/24/EC) and the Carcinogens and Mutagens Directive (CMD, 2004/37/EC). Employers must perform a risk assessment for all workplaces where employees may be exposed to substances. Workers exposure to a substance has to be compared with an occupational limit value (OEL), which is an inhalation limit value. If exposure is higher than the OEL, measures according to the Industrial Hygienic Strategy must be taken until compliance with the OEL is reached. On EU level, two types of OELs are derived by SCOEL (Scientific Committee on Occupational Exposure limits): Indicative Occupational Exposure Levels (EU-IOELs) which are health based, and Binding Occupational Exposure Levels (BOELs) which also take into account socio-economic and technical feasibility factors. Member States must establish a corresponding national BOEL value which can be stricter, but cannot exceed the Community limit value. This is in contrast to EU-IOELs where member states have to set a national limit value that may deviate (either lower or higher) from the EU-IOEL value. In addition to EU-IOELs derived by SCOEL, national health based OELs may be derived (e.g. by the Dutch Health Council). Dermal exposure limit values are not derived by SCOEL.

For a specific substance the values of the DNEL, SCOEL EU-IOELs or OELs derived by national authorities may not be the same, given that the method of deriving DNELs (according to Chapter R.8 of the REACH guidance, ECHA, 2012a) may differ from the general OEL setting procedure by SCOEL or national authorities. The same is true for substances without a threshold, where the DMEL can deviate from the (risk-based) OEL.

Expectations are that worker-DNELs, when derived according to Chapter R.8 of the REACH guidance, would generally be lower than OELs. Earlier investigations (Kreider and Spencer Williams, 2010; Czerczak and Kupczewska Dobecka, 2011; Schenk and Johanson, 2011) indeed noted that adherence to the default

assessment factors (AFs) given in the REACH guidance leads to DNEL values significantly lower than OELs. Schenk and Johanson (2011) compared the SCOEL recommended IOELs for 90 substances with a worker-DNEL for the inhalation route derived using the same toxicological information as available to SCOEL, but applying the ECHA guidance in the extrapolation. This exercise yielded (hypothetical) worker-DNELs that were 0.3 – 60 times (median 5) lower than the corresponding IOELs. Given this, it is expected that registrants for substances for which there is an IOEL available, will use this IOEL as a worker-DNEL for the inhalation route, rather than derive one according to the REACH guidance. This is allowed, under the condition that the registrant does not have access to information indicating that the IOEL would be insufficiently protective (Appendix R.8-13 of the guidance).

By January 2014 more than 47000 registration dossiers on more than 12000 unique substances were submitted to ECHA. Approximately 1800 substances had one or several long-term inhalation DNELs (mid 2012; Nies et al., 2013). For only a part of these substances EU or national OELs are available (e.g. number of health based Dutch public OELs: approximately 150). So, for the greater part, worker-DNELs had to be derived by the registrants. The worker DNEL is communicated through the supply chain and may serve as a reference value in the e-SDS. It would be interesting to know what the quality is of the derived worker-DNELs, and if they would be suitable as Dutch private OELs[4] in case no Dutch public OEL is available. An investigation into the quality of derived DNELs is however not so easy: ECHA is required to make information (such as DNEL values) in their databases publicly available via internet (REACH article 119), but this does not necessarily mean that all details of the derivation are available as well. These can normally be found in the CSR, but this document is considered confidential and therefore not publicly available. Hence, evaluation of the quality of worker-DNELs is largely limited to those having access to the CSRs, i.e. ECHA or the competent authorities under REACH of the member states.

Under REACH, ECHA has to perform a compliance check on at least 5% of the registration dossiers per tonnage band (REACH, article 41). This compliance check is meant to be a verification of whether the submitted information complies with the requirements. Thus, it is not an (in depth) evaluation of the submitted information (e.g. the DNELs). Whereas the absence of a DNEL in a registration dossier can be a reason for non-compliance (in case not properly justified), any irregularities or mistakes observed by ECHA in the derived DNELs are not. In the latter case, ECHA can only make these observations known to the registrant who in turn is not obliged to amend the DNEL in question.

Following an investigation into the quality of submitted registration dossiers, ECHA concluded in 2012 that the quality of the registration dossiers (including the DNELs) is a reason for concern. One of the issues addressed was the fact that registrants often did not make full use of all existing information (ECHA, 2012b).

[4] The Dutch system is primarily based on private health based OELs that have to be derived by the employers. For about 150 substances, health based public OELs are set by the ministry of Social Affairs and the Employment. Public OELs are mainly based on advices of SCOEL and the Dutch Health Council.

An in depth evaluation of DNELs/DMELs can take place in the following REACH processes:

- Substance evaluation
- Restriction
- Authorisation

DN(M)ELs within the scope of a restriction or authorisation dossier will be evaluated by the Risk Assessment Committee (RAC) of ECHA, those within the scope of a substance evaluation by the Member State Committee (MSC) of ECHA. So far (January 2014), for only very few substances DNELs have been evaluated within these committees. Within the scope of restrictions, RAC has evaluated DNELs for the phthalates DEHP, DBP, DIBP and BBP (ECHA, 2012c), for two other phthalates (DINP and DIDP; ECHA, 2013a), and for 1,4-dichlorobenzene (ECHA, 2013b). For the authorisation process, RAC has established reference DNELs for DEHP, DBP and BBP (ECHA, 2013c-e) and reference dose-response relationships for the non-threshold substances chromium VI and inorganic arsenic compounds (ECHA, 2013 f, g). Within substance evaluation, MSC has looked into the DN(M)EL derivations of toluene, m-tolylidene diisocyanate (TDI) and ethylene oxide (ECHA, 2013h-j). From the above it is clear that ECHA will only evaluate DNELs for very few substances (as compared to the large number of substances registered).

1.2 Scope and outline of the report

Generally, whenever an OEL has been established for a substance by either SCOEL or the Dutch Health Council, this OEL will serve as a Dutch public OEL at workplaces in the Netherlands. Because Dutch public OELs are only available for a limited number of substances, and also the number of DNELs evaluated by ECHA will be few, the Ministry of Social Affairs and Employment would like to get an impression of the quality of the worker inhalation DNELs derived in the registration dossiers, in order to see if these can serve as Dutch private OELs in case a Dutch public OEL is not available. Therefore a small investigation was started upon their request, with a limited scope. A definition of the quality of worker DNELs will be discussed in the next paragraph.

First it was explored whether there are already overviews generated of worker-DNELs from the registration dossiers (chapter 2). Then for those threshold substances having a Dutch public OEL, the corresponding worker-DNELs for inhalation were sought in the ECHA database in order to see how they (numerically) compare (chapter 3). The same was done for non-threshold substances in chapter 4, by comparing the Dutch public risk-based OELs with worker inhalation DMELs (or DNELs). To gain more insight in the quality of these registered worker inhalation DNELs, a small subset of them was evaluated in depth (chapter 5). In Chapter 6 the results will be discussed and conclusions will be drawn. The report is accompanied by a part (part B) that elaborates on the possibilities to integrally improve the quality of the DN(M)ELs.

1.3 How to define good quality?

The following conditions can be formulated for the derivation of high-quality DNELs:

1. The DNEL has to be based on the leading health effect;

2. The DNEL derivation follows the ECHA guidance (R.8) and, any deviation from this guidance is based on substance-specific considerations that are properly documented in the registration dossier;

3. The DNEL derivation process occurs in a transparent way and is well documented so that it can be peer-reviewed by actors in the public domain. These are the ones who have to use these values (DU) as well as other stakeholders (branch associations, NGO's, scientists and experts like occupational hygienists and toxicologists).

Although the derivation of DMELs is not a subject of evaluation in part A, the same conditions are expected to apply to DMELs, too. Additional issues relating to the quality of DMELs is the lack of clear guidance on the level of risk that DMELs are supposed to relate to and the method of extrapolation ('linearized approach' or 'large assessment factor approach'). Clearance on these issues is an important condition for the acceptance of DMELs.

1.4 Difference between the number of registrations and the number of DN(M)ELs

An issue not addressed in this report is the number of long-term inhalation DN(M)ELs compared to the overall number of registrations of unique substances. According to Nies et al (2013), a total number of about 5300 substances were registered with ECHA by mid-2012. About 3500 of these substances were fully registered, i.e. not with a limited set of data, as is permitted for isolated intermediates, for instance. Long-term inhalation DNELs were derived for only about 1800 substances, which is about half of the number of DNELs expected on the basis of the REACH requirements. At that time all high production volume chemicals had to be registered, which means that these substances should have a full hazard assessment, including a worker DNEL. We believe that this issue requires a separate investigation in a subsequent study.

2 Overview of worker-DNELs derived by registrants

DNELs are communicated to the Downstream User (the employer) by means of the (extended) Safety Datasheet. DNELs are also communicated via the public ECHA portal (echa.europa.eu). However, the ECHA website only disseminates information per substance registration, and as such, an overview of DNELs for all registered substances is not available on the website. An overview would be informative for employers since the DNEL may be used to seek for less toxic substitutes. An overview of DNELs would also be convenient for authorities and risk assessors.

To our knowledge, the German Institute for Occupational Safety and Health (IFA) of the DGUV (Deutsche Gesetzliche Unfallversicherung) is the only organization at the moment that has compiled an overview of long-term inhalation worker-DNELs. The DGUV DNEL list does not contain the acute/short-term inhalation worker-DNELs, dermal worker-DNELs or any kind of DMEL. The list is publicly available on the DGUV webpage: http://www.dguv.de/ifa/Gefahrstoffdatenbanken/GESTIS-DNEL-Datenbank/index-2.jsp. It is compiled using an automated process with the ECHA public dissemination portal as input, taking over the DNELs therein without checking them for quality. The list is not updated at the same interval as the ECHA public dissemination portal. Hence there can be some discrepancies between the DGUV DNEL list and the information on the ECHA website (Nies et al., 2013). In the future the DGUV also intends to include DNELs which are available in (extended) Safety Data Sheets for substances which are not disseminated via the ECHA website (Nies et al., 2013).

The DGUV DNEL list contains 1889 long-term worker-DNELs (October 2013) for the inhalation route (covering either systemic and local effects or both). This number includes duplicates for those substances that have different DNELs from different registrants or within a joint submission. For instance n-Butyl acetate (CAS number 123-86-4) has one worker-DNEL of 480 mg/m^3 and one of 48 mg/m^3. According to Nies et al. (2013) the DGUV list contains 1781 individual substance entries, which have one or several registered long-term worker-DNELs. Of these, close to 1300 substances are clearly chemically identifiable, whereas nearly 500 are not, such as “reaction mass” or even “none available” (Nies et al., 2013).

Being the only overview available so far, the DGUV DNEL list is certainly useful and valuable, but also not sufficient since it is not continuously updated. Having an up-to-date overview of DNELs is essential for downstream users, authorities, risk assessors, etc. ECHA is most suited to generate this overview since ECHA is the owner of the public portal. For that reason we recommend that a request is made to ECHA to compile a publicly available and easily accessible worker-DNEL database, and to keep this up-to-date.

3 Comparison of Dutch public OELs and worker-DNELs

3.1 Comparison between Dutch public OELs and worker DNELs

For substances having a Dutch public OEL (threshold based), the corresponding worker-DNELs for inhalation were sought in the ECHA database in order to see how they (numerically) compare. Both limits are supposed to be health-based, but the former is derived by an expert committee, the latter by industry.

As the DGUV DNEL list may not be fully up-to-date, the comparison was based on information manually collected from the ECHA dissemination portal. The CAS registry number was used as basis for substance identification. This means that substances not specified with a CAS number in the Dutch list of public OELs (arbeidsomstandighedenregeling, art. 4.19, Bijlage XIII) were not included in the comparison. Hence missing from this overview are groups of substances not specified beyond certain common properties, e.g. water soluble compounds of silver; vanadium oxides; inorganic water soluble fluorides etc. Also, if the list of public OELs contains an OEL for short-term exposure (15 min) and a worker-DNEL was only available for long-term exposure, these limits have not been compared. The information was collected in October 2013. As the ECHA database is continuously updated, some of the selected DNELs may have changed in the meantime.

Four different worker inhalation DNELs may be registered: i.e. for long-term and acute/short-term exposure and for local and systemic effects. In case the registrant derived both a local and systemic worker-DNEL for the same exposure duration, the lower of the two values was used in the comparison. The lower value was selected because under REACH, risk characterisation is to be based on the leading health effect, i.e. the effect with the lowest relevant DNEL. Further, in case there was both a long-term and acute/short-term value derived, both values were used in the comparison, but only the one resulting in the largest difference was taken forward. Finally, in case registrants for the same substance had derived different DNELs, the one most different to the Dutch public OEL was included. This bias was introduced in order to be able to identify the most relevant substances for the in depth evaluation of the quality of registered worker-DNELs later on (see Chapter 5).

So, in summary, the following comparisons were made:

1. Dutch public OEL-short-term vs (the lower one of) acute worker DNEL-local or acute worker DNEL-systemic, and
2. Dutch public OEL-long-term vs (the lower one of) long-term worker DNEL-local or long-term worker DNEL-systemic

The comparison resulting in the biggest difference was taken forward.

The differences between worker-DNELs and Dutch public OELs were categorised in four groups according to the size of the difference: no difference (factor 1), small difference (factor 1 - <2), significant difference (factor 2 - 10) and large difference (factor ≥10). See also Figure1.

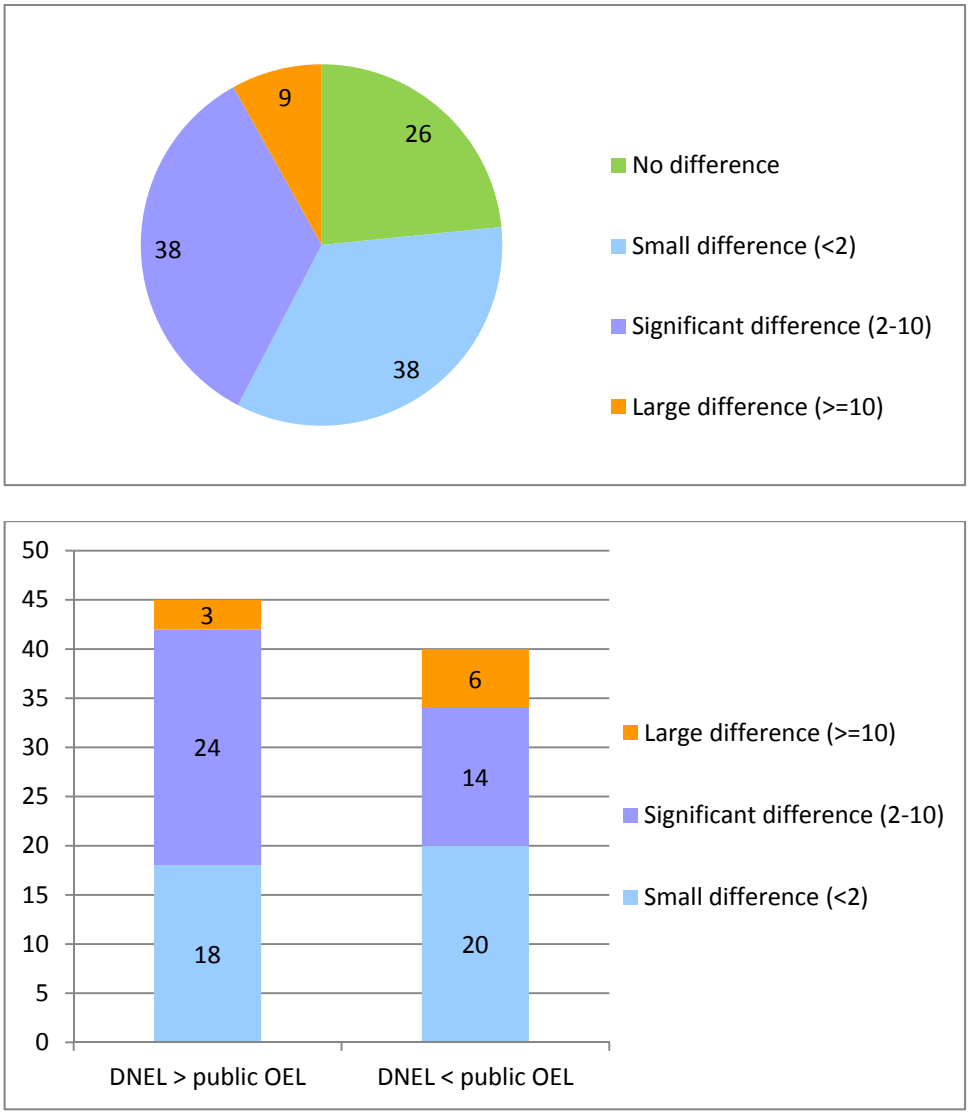


Figure 1:
Comparison of registered worker-DNELs and Dutch public OELs.
The upper figure shows the differences found between the registered worker-DNELs and Dutch public OELs for 111 substances, subdivided according to the magnitude of the difference. For the 85 substances for which there was a difference, the lower figure shows how many substances have a worker-DNEL that is lower (right bar) or higher (left bar) than the public OEL. Numbers in the figures represent number of substances within each plotted category.

About a quarter of the substances investigated have OELs and worker-DNELs at the same level. This may not be surprising, as the Dutch list of public OELs to a large degree consists of EU-IOELs and registrants may, under certain conditions, use these instead of deriving a worker-DNEL themselves. This is supported by the results of Nies et al. (2013) who compared the registered long-term worker-DNELs for the inhalation route with the German statutory OELs (AGW), the German MAK commissions' recommendations and the EU-IOELs. Compared to the EU-IOELs 75% of the worker-DNELs were identical, while compared to the MAK- and AGW-values 39% and 43% were identical, respectively.

For the 85 substances where the OELs and DNELs were not identical, 83 out of 85 showed the largest differences between the long-term limits. For the remaining 2 substances, this was the difference between the acute/short-term limits. It is to be noted that for 2 out of 85 substances a DMEL rather than a DNEL was derived by the registrants.

Figure 1 shows that the Dutch public OELs and worker-DNELs of 9 substances differ by a factor of 10 or more. For those substances with a higher worker DNEL (n=3) the worker DNEL was between 10 and 13 times higher than the OEL; for those substances with a lower worker DNEL (n=6) the worker DNEL was between 14 and 96 times lower than the OEL. The figure also shows that the worker-DNELs are not systematically higher or lower than the public OELs, but that there are examples of both, and in roughly equal amounts and magnitudes. A similar conclusion was reached by Nies et al. (2013), who found that roughly equal shares of the DNELs were lower and higher than the OELs. Compared to EU-IOELs, 15% of the DNELs were lower and 11% were higher, for MAK-values this was 29% and 33%, respectively (Nies et al., 2013). It should be noted that the comparison by Nies et al. (2013) concerns individual DNELs rather than individual substances: in case there were multiple DNELs for a substances, the results of all comparisons were considered. In contrast, in the comparison we made, only one result per substance was taken forward in the end.

3.2 Publicly disseminated information

From the public dissemination database on the ECHA webpage it is difficult to discern the reasons for the observed similarities and differences between the registered worker DNELs and public OELs. For the latter, documents providing insight into their derivation are publicly available, although 'expert judgement' is often used, which may not always provide clarity. The amount of information that is given in connection to each DNEL derivation however varies between registrants, and sometimes also between different DNELs from the same registrant. For the 47 substances with significant or large differences presented in figure 1, there are 51 different long-term worker-inhalation DNELs. The information available for these worker-DNELs is shown in figure 2, with more details presented in Appendix 1. For most of these worker-DNELs (84%) the most sensitive endpoint was disseminated, for about 50% the overall assessment factor was also given. However, only two substances have a fully transparent justification for the worker-DNEL disseminated in the ECHA database (see also Appendix I). For another two substances it is indicated that the worker-DNEL is based on an OEL recommendation[5], and is specified which OEL is taken (from SCOEL or MAK-commission). This also could be considered as offering full transparency as background documents to SCOEL/MAK recommendations are publicly available. Five substances have no DNEL related information at all besides the DNEL-value. So, for most substances investigated the ECHA website provides too limited information for an in depth analysis of registered worker DNELs. Access to the registration dossiers is therefore required to be able to assess the quality of these DNELs.

[5] Since substances were taken forward which Dutch OEL differs from the DNEL, only foreign OELs were mentioned.

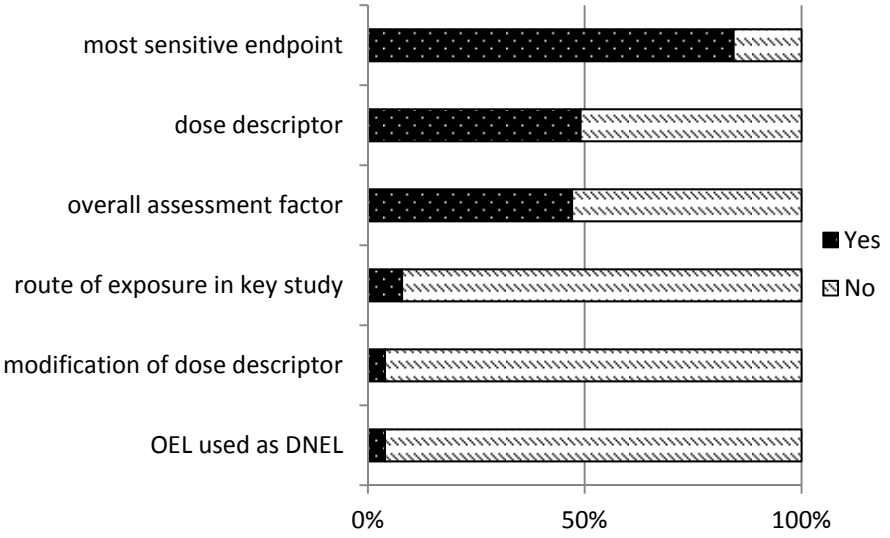


Figure 2 Transparency of DNEL derivation. The kind of DNEL related information given for 51 different long-term worker inhalation DNELs (see also Appendix I).

3.3 Conclusion

For the substances investigated it can be concluded from the comparison between worker-DNELs and Dutch public OELs that for the majority of substances (±75%) these values differ, for ±10% of them (9/85) by more than a factor 10. The differences do not go into one direction, i.e. the registered DNELs are not systematically higher (or lower) than the OELs. It can further be concluded that for about one quarter of the substances the registrants have adopted an existing OEL as worker DNEL. Finally, it became clear that it is not fully transparent from what is disseminated on the ECHA website how the worker DNELs were derived. This makes it difficult to identify the underlying cause(s) of the observed differences.

4 Comparison of *risk-based* Dutch public OELs and worker-DMELs

For substances without a threshold effect, the Dutch public OEL is risk-based. Public OELs for non-threshold carcinogens are based on the calculation of two risk levels: exposures leading to an additional individual risk level of $1x10^{-6}$ (acceptable) and $1x10^{-4}$ (tolerable) per year of exposure. For a full working life of 40 years these risk levels correspond to 4×10^{-5} and 4×10^{-3}, respectively. In principle, the Dutch risk-based OEL is the concentration corresponding to the acceptable risk level. In case this concentration is not feasible a concentration up to the tolerable concentration can be set.

As indicated in chapter 1, the REACH guidance (but not the REACH legislation) defines the concept of a DMEL for e.g. carcinogens without a threshold. This DMEL would correspond to an exposure level representing a risk level for adverse effects of very low concern. The level that is actually considered "of very low concern" is however not defined in the guidance, although some suggestions are provided. This means that the choice for a tolerable risk level for workers is in practice left to manufacturers and distributors who submit DMEL values to ECHA as part of their CSA.

We studied the substances published in the Dutch list of public OELs part B: list of public OELs for carcinogens (arbeidsomstandighedenregeling, art. 4.19, Bijlage XIII). The corresponding long term worker-DMELs were sought on the ECHA dissemination portal in order to see how they (numerically) compare. Differences between worker DMELs and Dutch risk-based OELs are to be expected due to the differences in [policy of] tolerable and acceptable risk levels, in derivation methodology and in the toxicological evaluations (i.e. the interpretation of the science).

4.1 Comparison between risk-based Dutch OELs and DM(N)ELs

As in the previous chapter, the worker-DMELs have been identified using CAS numbers, and hence when an OEL has been set for a group of substances this is not correctly reflected by a comparison of one OEL and one DMEL. Of the 28 substances with a Dutch public risk-based OEL, only for 12 substances long-term worker inhalation values were found. For 9 substances this was a DMEL, but for 3 this was a DNEL. The latter could mean that the registrants have assumed there is a threshold for the leading health effect carcinogenicity. But other options are also possible, e.g. they took another leading health effect than carcinogenicity, or they made a mistake in naming the value a DNEL rather than a DMEL.

Figure 3 shows that the risk-based Dutch OEL and the worker DM(N)EL differ 2 times or more for 9 out of 12 substances, four with higher and five with lower DM(N)ELs than the risk-based Dutch OEL. For 2 of the latter 5 substances the difference was large (factor of 21 and 26).

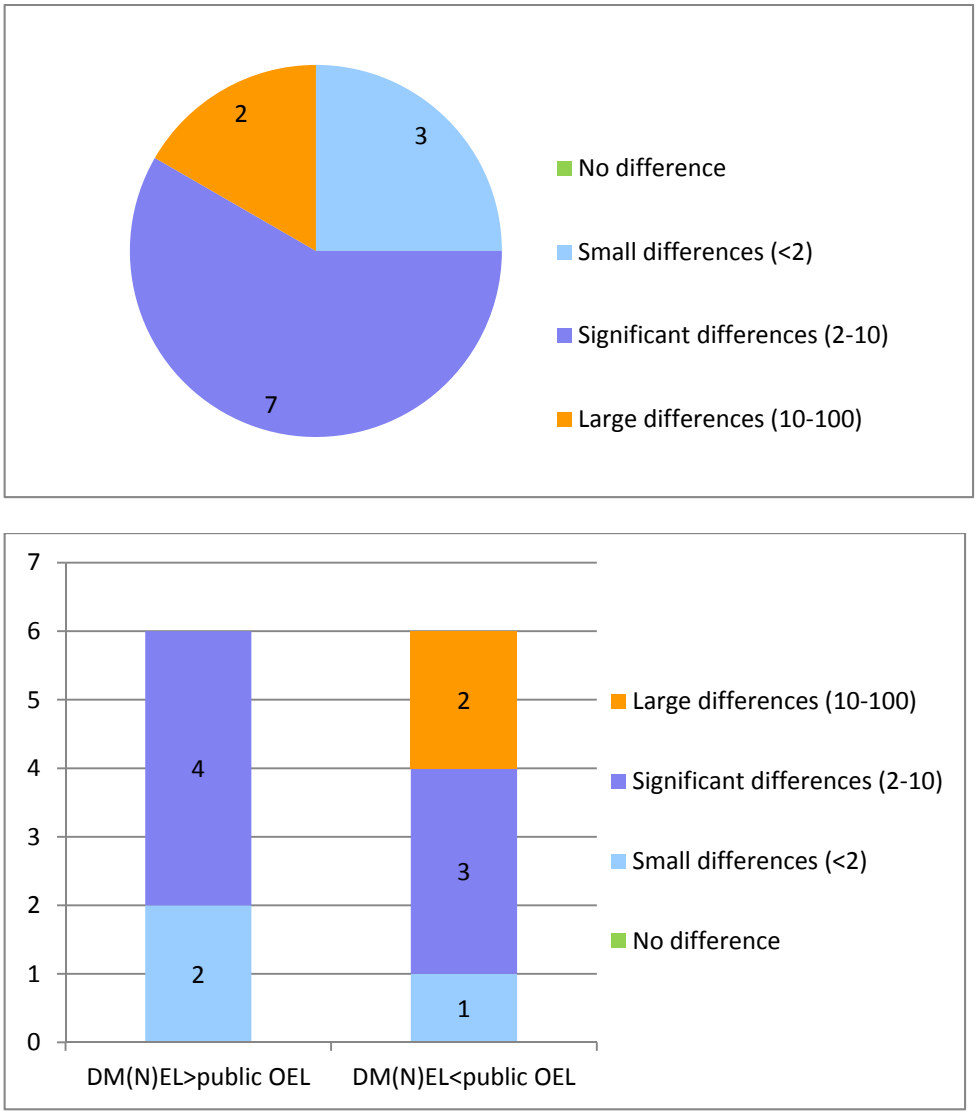


Figure 3:
Comparison of registered worker DMELs and risk – based Dutch public OELs. The upper figure represents the differences found between the registered worker-DMELs and risk - based Dutch OELs for 12 substances, subdivided according to the magnitude of the difference. The lower figure shows how many substances have a worker-DMEL that is lower (right bar) or higher (left bar) than the public OEL. Numbers in the figures represent number of substances within each plotted category. NB: three substances have a worker-DNEL rather than a worker-DMEL.

Looking at the actual values of the registered worker DM(N)ELs, 9 represent a concentration in between the concentrations associated with acceptable and tolerable risks for these substances. For two substances, the DMEL represents a concentration lower than that associated with the acceptable risk, whereas for one substance it represents a concentration higher than that associated with the tolerable risk. The public OELs for these substances were either at the acceptable (6/12) or tolerable risk level (3/12) of in between these two (3/12). For more details, see Ding et. al. (2014).

4.2 Publicly disseminated information

We have accessed the publicly disseminated information about the nine DMELs overlapping with the risk-based Dutch OELs and presented in table 1. Information about the nature of the dose descriptor used as a starting point was available for six of the nine worker-DMELs. For five of these, as well as two additional worker-DMELs, information about the overall assessment factor was also presented. For one DMEL no information at all was disseminated about how it was derived.

4.3 Conclusion

For all 12 substances investigated the comparison between worker DM(N)ELs and Dutch risk-based public OELs revealed differences between the two values, mostly up to a factor of 10, but in two cases more than 20-fold. Also here the differences do not go into one direction, i.e. the registered DM(N)ELs are not systematically higher (or lower) than the OELs. Again, it is not fully transparent from what is disseminated on the ECHA website how the worker DM(N)ELs were derived, making it difficult to identify the underlying cause(s) of the observed differences. It is further not disseminated what risk level was aimed at by the registrants. For 9 out of 12 substances this was apparently somewhere in between the acceptable and tolerable risk level. In two cases the registrants appeared more strict (DMEL below the acceptable risk level), in one case less strict (DMEL higher than tolerable risk level).

5 Quality of worker-DNELs

One of the aims of this study is to gain more insight into the way the registrants derived the worker-DNELs. As is clear from chapters 3 and 4, for most substances investigated this was not very transparent from what is publicly disseminated. One way to investigate this further, is to look into the CSRs for these substances, as in principle full transparency should be given therein. CSRs are not publicly available, but can be made available to member state competent authorities upon special request to ECHA. Given the limited amount of time available for this project, it was not possible to dive into the CSRs of all substances dealt with in chapters 3 and 4. It was therefore decided to restrict the investigation to a small subset of these substances. Aside from getting insight into the DNEL derivation, it was further investigated whether applying the ECHA guidance for deriving DNELs (the "ECHA method") to the available data in the CSRs of the selected substances would result in the same or different DNELs.

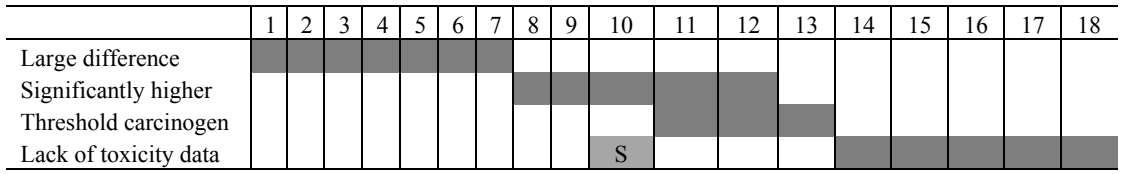
5.1 Substance selection

A targeted selection procedure was performed in order to identify a set of substances that would allow identification of a wide range of potential issues.

We selected:

1. Substances for which Public Dutch OELs differ from the worker-DNELs;
2. Substances for which there is a risk-based public OEL and a worker-DNEL
3. Substances with a poor toxicological database (lack of toxicity data/data-poor substances)

In total, 18 substances fulfilling these criteria were evaluated. An overview of these is presented in table 2.



S- The Dutch Health Council evaluation concluded that the database is insufficient for evaluation of systemic effects, although sufficient for evaluation of local effects.

Table 2 Overview of selected substances and corresponding selection criteria.

Relating to 1:

- Seven substances were chosen due to a large difference (at least a factor of 10) between the worker-DNEL and the Dutch public OEL. The worker-DNELs were both higher and lower than the public OELs. This selection was motivated because a DNEL could be problematic from a quality point of view both if it is too low and too high. Too low may mean that compliance requirements, the RMMs and OCs, are unnecessarily strict and convey unwarranted costs for workplaces. A DNEL that is too high from a toxicological perspective would on the other hand mean that workers' health may not be sufficiently protected by the RMMs and OCs defined using that worker-DNEL.

- From the 38 substances with a significant difference between the worker-DNEL and the Dutch public OEL (factor 2 – 10), 24 had a higher worker DNEL. Five substances out of these 24 were chosen for in-depth evaluation.

Relating to 2:
Two of the five substances mentioned above plus one additional substance were selected since they have a worker-DNEL for which a Dutch risk-based OEL was derived. If a DNEL is set for a substance that truly lacks a threshold for a severe effect such as carcinogenicity, there may be adverse health consequences.

Relating to 3:
Substances with a lack of publicly available toxicity data (poor database) are interesting to evaluate because these are very difficult to establish DNELs for. We consulted all documents for a health-based OEL published by the Health Council in the years 2005 – 2013 (first evaluation as well as re-evaluation of OELs in place). Substances for which the Health Council refrained from making a recommendation for a health-based OEL due to data insufficiency were identified and cross-referenced with the ECHA database on registered DNELs. Six different substances were identified through this exercise; one of these substances was already included due to having a significantly higher worker DNEL compared to the Dutch public OEL.

5.2 DNEL derivation according to the ECHA-guidance

Below a short summary is presented of the step-wise procedure for the derivation of DNELs as described in the ECHA-guidance (ECHA Chapter R.8).

Step 1:
For derivation of DNELs, all available hazard information needs to be evaluated and, where possible, dose descriptors (N(L)OAEL, benchmark dose, etc.) need to be established. In contrast to e.g. the Dutch Health Council and SCOEL, not only publicly available data may be used. Registrants may have additional data relevant for the setting of DNELs. It is to be noted that under REACH the data may originate from experiences from humans (e.g. case reports or epidemiological studies), studies with experimental animals, *in vitro* studies and non-testing sources ((Q)SAR), read across or chemical categories).

In step 1 typical dose descriptors have to be gathered (e.g. N(L)OAEL, BMD, LD50, LC50, T25, BMD(L)10, OR, RR....) from all available and relevant studies on the different human health endpoints and/or other information of the potency when no dose descriptor is available.

The human health endpoints that have to be evaluated cover both local and systemic toxicity, and include acute toxicity, irritation/corrosivity, sensitization, repeated dose toxicity (sub-acute/ sub-chronic/ chronic), mutagenicity (in vivo and in vitro), carcinogenicity, reproductive toxicity (fertility impairment, developmental toxicity). It is to be noted that, as under REACH the data requirements are dependent on the tonnage a substance is produced or imported in, data may not be available for all endpoints.

Step 2:
In step 2 it has to be decided whether the substance has a threshold mode of action. This means that there are no toxicological effects seen below that threshold. A DNEL can only be derived if the substance has a threshold mode of

action. In principle, DNELs must be derived for all human health endpoints with a threshold, based on the most relevant dose descriptors for these endpoints.

Step 3:
In step 3 several choices have to be made:

a) Select the relevant dose-descriptor(s) for each endpoint covered. For each human health threshold endpoint, one or more dose-descriptors from the available data have been compiled in step 1.
b) Modify, when necessary, the relevant dose descriptor(s) for each endpoint as the effects assessment may not directly be comparable to the exposure assessment in terms of exposure route, units and/or dimensions. Modification is necessary if:
    - there are differences in bioavailability between animals and humans for the same route of exposure;
    - for a given human exposure route there is not a dose descriptor for the same route (in experimental animals or humans).
    - there are differences in human and experimental exposure conditions.
    - there are differences in respiratory volumes between experimental animals (at rest) and humans (light activity).
c) Apply, when necessary, assessment factors to the corrected dose descriptors to obtain DNEL(s) for the relevant exposure pattern for each endpoint covered. Assessment factors are applied to address uncertainties in the extrapolation of experimental data to the real human exposure situation, taking into account variability and uncertainty. These uncertainties concern differences between: animals and humans, between human individuals, duration of exposure, as well as issues related to dose-response and to the quality of the whole database. These assessment factors together, result in an overall AF that is applied to the corrected dose descriptor to account for all these uncertainties. Preferably, the value for each individual assessment factor is based on substance-specific information. However, although sound in principle, in practice the approach has limitations (data are often scarce, especially toxicodynamic data, and human data) and, therefore, default assessment factors most often need to be used. Each step in the process, including any choice for an assessment factor value, whether substance-specific or default, should be explained as transparently as possible, with a qualitative narrative in the chemical safety report (CSR).

Step 4:
In step 4 the leading health effect(s) and the corresponding DNEL has to be selected. In principle step 4 should be easy and straightforward when endpoint-specific DNEL values for the different identified hazards have been derived. The lowest DNEL value can then be selected. Note that, depending on the exposure patterns, there may be more than one critical DNEL. For most substances and exposure scenarios, the critical DNELs will be representing repeated exposure (i.e. a long-term DNEL) rather than representing exposure for a short period of time (i.e. a short-term/acute DNEL). In case, however, peak exposure cannot be ruled out and the substance is acutely toxic, the assessment should also include specific assessment of 'acute' exposure, e.g., 15 minutes peak exposures.

5.3 Derivation of worker-DNELs by RIVM risk-assessors

As stated in the introduction to this chapter, the above described "ECHA method" was applied to the data in the CSRs of the selected substances.
A small peer review group of RIVM risk assessment experts discussed the available data. Several substances were up for discussion more than once, due to unclarities in the reported data (see also below), but none more than three times.

Some notes:

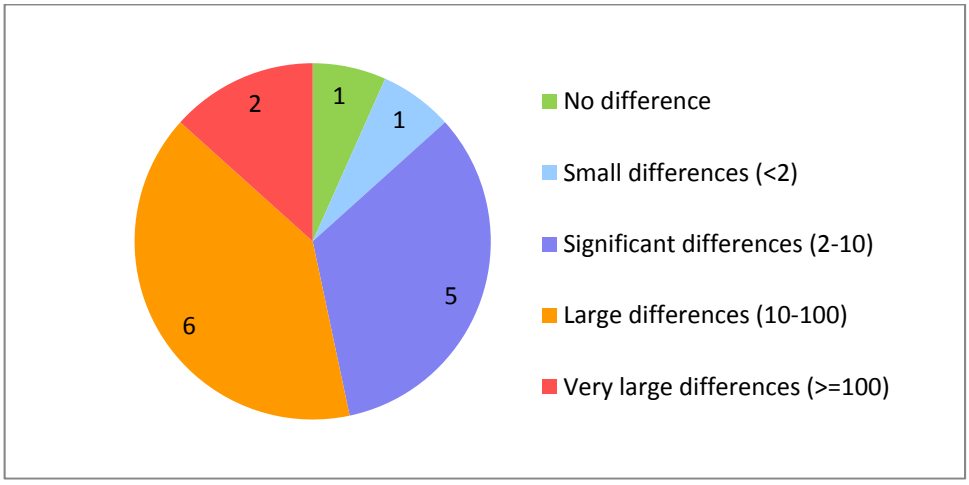
- Study summaries and dose descriptors cited in CSRs were taken at face value, i.e. we did not evaluate if the given summary and stated dose descriptors were a correct interpretation of the original study. Only when very unclear, the original study was consulted (if publicly available).
- For some substances, additional information on the critical effect and the dose descriptor was used, gathered from OEL documents of the Dutch Health Council, SCOEL, the German MAK-commission and the EU Risk Assessment Report. In exceptional cases (2 substances) additional searches were performed.
- For three substances the peer review group came to the conclusion that a DMEL was more appropriate than a DNEL, given indications for non-threshold endpoints for these substances. Although there is also ECHA guidance for the derivation of DMELs, the actual derivation of a DMEL for these substances was not within the scope of this project. This leaves 15 of the 18 selected substances for the comparison.

5.4 Results

The DNELs derived according to the ECHA method were compared to the worker DNELs as derived by the registrants. This comparison was done separately for long-term and for acute DNELs. The differences were categorised in five groups according to the size of the difference: no difference (factor 1), small difference (factor 1 - 2), significant difference (factor 2 - 10), large difference (factor 10 - 100), and very large difference (factor ≥100).

5.4.1 *Comparison of long-term DNELs*

As can be seen from Figure 4, for 14 out of 15 substances application of the "ECHA-method" resulted in a DNEL different than that derived by the registrant, based on the same data. For the exact differences see Table 5. Only in one of these 14 cases the registered worker-DNEL was lower, in the other cases it was higher and in two cases even as much as 100 and 24600 times higher.



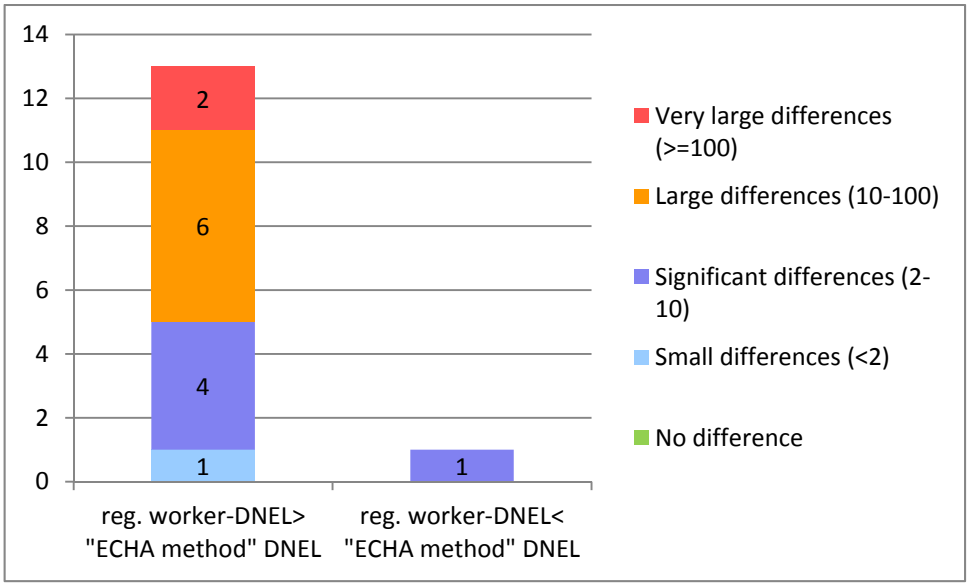
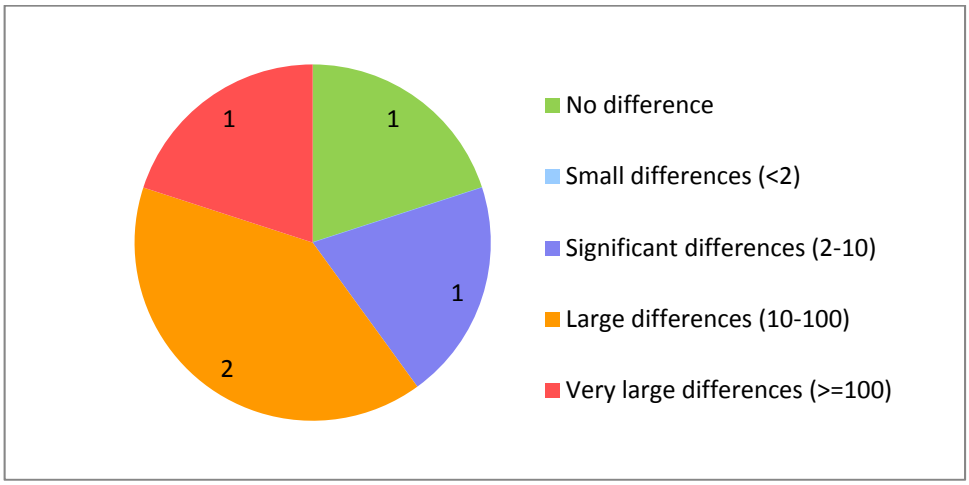


Figure 4;
Comparison of long-term DNELs.
The upper figure represents the differences found between the registered worker-DNELs and the DNELs derived according to the "ECHA method" by the RIVM risk-assessment experts for 15 substances, subdivided according to the magnitude of the difference. The lower figure shows that for all but one substance the registrants' worker DNEL is higher than the "ECHA method" DNEL. Numbers in the figures represent number of substances within each plotted category.

5.4.2 *Comparison of acute [/Short-term] DNELs*

Figure 5 displays the comparison of the acute DNELs for the 5 substances where the available data indicate acute toxicity. From this figure it can be seen that for only one of the five substances the "ECHA-method" yielded the same results as the registered DNEL. For the other four substances, the registered worker acute DNELs were higher (see Table 5), in one case even 1665 times higher.



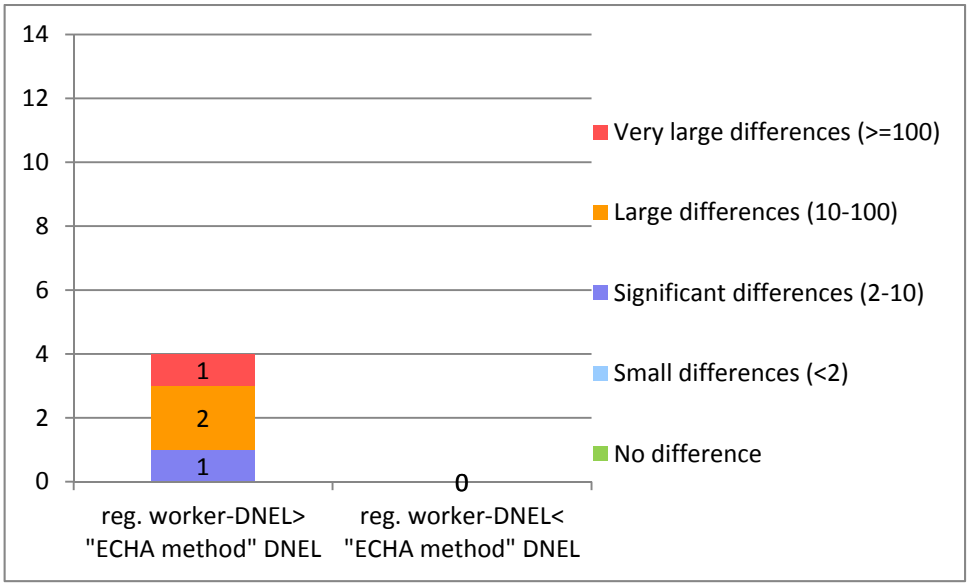


Figure 5;
Comparison of short-term DNELs.
The upper figure represents the differences found between the registered worker-DNELs and the DNELs derived according to the "ECHA method" by the RIVM risk-assessment experts for 5 substances, subdivided according to the magnitude of the difference. The lower figure shows that registered DNELs were always higher than the "ECHA method" DNEL. Numbers in the figures represent number of substances within each plotted category.

Substance	Long-term		Acute	
	Worker-DNEL ≤ "ECHA method DNEL"	Worker-DNEL > "ECHA method DNEL"	Worker-DNEL ≤ "ECHA method DNEL"	Worker-DNEL > "ECHA method DNEL"
1		28		1665
2	4			
3		2	1	
4	1			
5		12		
6		5		27
7		100		
8		1,6		5
9		37		
10		2		
11*				
12*				
13		10		68
14		5		
15		24600		
16		39		
17*				
18		34		

* A DMEL was considered more appropriate than a DNEL because of indications for a non-threshold mode of action

Table 5: Ratios between the worker-DNELs derived by the registrant and the DNELs derived via the ECHA method. Ratios are calculated both for long-term and acute DNELs.

5.4.3 Sources of discrepancies

Following the step-wise procedure in the ECHA guidance it was analysed which factors contributed the most to the observed differences in the DNELs. The main factors were:

1. Difference in choice of the leading health effect and selection of the key dose descriptor. In 14 out of 18 substances the leading health effect and the key dose descriptor differed between the two DNELs, meaning that RIVM experts had another expert judgement compared to the registrants.
   - For 3 substances the RIVM experts decided that it was not possible to derive a DNEL because of lack of a threshold mechanism. In these cases a DMEL could be derived, however this was outside the scope of this study.
   - For one substance the worker-DNEL was based on oral data, while the DNEL via the ECHA method was based on inhalation data. These inhalation data were also reported in the CSR. This difference in selection of leading health effect and key dose descriptor lead to the highest difference (which was a factor of 24600).
2. Difference in the assessment factors applied. Assessment factors used to derive registrants' worker-DNELs differed from the assessment factors used to derive a DNEL via the ECHA method in 8 out of 18 substances. The assessment

factors used when deriving a DNEL via the ECHA method were higher in all but one case.

- ECETOC assessment factors (ECETOC, 2010) for inter- and/or intra-species differences were used for 4 worker-DNELs derived by the registrants. According to the ECHA guidance the higher ECHA assessment factors should be used unless there are reasons to deviate;
- The quality of the database was reason to set an assessment factor between 2 and 5 when deriving a DNEL via the ECHA method for 6 substances. Circumstances that were considered to justify an assessment factor for quality of database in the derivation of DNELs derived via the ECA method are (1) lack of long-term data, (2) lack of inhalation data and/or (3) high reliance on read across data. In only one case, a registrant's worker DNELs applied an assessment factor for quality of the database (factor 2).

Differences in modification of the dose descriptor, which is necessary for e.g. route-to-route extrapolation, did lead to differences between the two DNELs but the differences were normally within a factor of 2, and could go in both ways.

Another issue is non substance-specific hazard information on *low toxicity dusts.* The ECHA guidance document states that when deriving a DNEL for dust, the registrants should consider whether the inhalation DNEL may need to be lowered due to a non-substance specific dust overload of the lung. The guidance document further proposes that the general dust limits of 10 mg/m^3 for the inhalable airborne fraction and 3 mg/m^3 for the respirable airborne fraction should be considered, in combination with nature of the dust (ECHA, 2012a). This general dust limit was not applied by the registrant in one case.

In case acute worker-DNELs were derived, they were based on acute OELs, derived by applying an excursion factor to the long-term worker DNEL, or derived from data of insufficient quality or relevance according to RIVM.

5.4.4 Use of occupational exposure limits as a worker-DNEL

For eight out of eighteen substances the registrants used an OEL as long-term worker-DNEL[6]. This could be a named OEL (i.e. the current EU-IOEL) or unnamed OEL (i.e. "general level of European OELs"). In two cases the source of the OEL was not cited, but these unspecified OELs were supported by the derivation of a worker-DNEL based on their CSRs which was close to the cited general OEL level. However, this similarity was not supported by the derivation of an "ECHA method" DNEL. Three OELs were considered outdated by RIVM, since the information used to derive the OEL was not up-to-date. For one of the eight substances no "ECHA method DNEL" was derived due to lack of an identifiable threshold effect.

A non-OEL default value based on classification, analogous to a hazard banding approach, was used for one substance. The substantiation of this limit is not publicly available, nor was it described in detail in the CSR.

[6] Since substances were taken selected only if the DNEL differs from the Dutch OEL, the mentioned OELs are foreign

5.4.5 *Overview of limit values from different sources*

For the derivation of DNELs derived via the ECHA method, the information of the CSR was supplemented with information from SCOEL, MAK, Dutch Health Council, and EU-RAR (if available). Table 6 illustrates the spread of the limit values derived by these different bodies. For all eighteen substances that were analysed in depth, both the instance(s) that derived the highest and the lowest limit values were reported. In addition, the ratio of the highest and the lowest value is presented.

Table 6 Overview of long term limit values from different sources

	Highest value	Lowest value	Range (max/min)
1	NL public OEL	'ECHA method DNEL', (EU RAR)	56
2	NL Public OEL, MAK, SCOEL	Reg. worker-DNEL	96
3	NL Public OEL, SCOEL	'ECHA method DNEL'	24
4	NL Public OEL, SCOEL	'ECHA method DNEL', EU RAR, reg. worker-DNEL	15
5	MAK, SCOEL, reg. worker-DNEL	NL Public OEL, 'ECHA method DNEL'	13
6	NL Public OEL	'ECHA method DNEL'	222
7	Reg. worker-DNEL	'ECHA method DNEL'	100
8	SCOEL, MAK, reg. worker-DNEL	'ECHA method DNEL'	32
9	SCOEL, MAK, reg. worker-DNEL	'ECHA method DNEL'	37
10	Reg. worker-DNEL	NL Public OEL	13
11	Reg. worker-DNEL, MAK	NL Public OEL	4
12	Reg. worker-DNEL	NL Public OEL	8
13	NL Public OEL	'ECHA method DNEL'	2
14	Reg. worker-DNEL	'ECHA method DNEL'	5
15	Reg. worker-DNEL	'ECHA method DNEL'	24600
16	Reg. worker-DNEL	'ECHA method DNEL'	40
17	Reg. worker-DNEL systemic	-	-
18	MAK	'ECHA method DNEL'	40

Table 6 shows that the limit values derived by the different organisations vary to a great extent. The registrant's worker-DNEL is the lowest value in only one case. For three substances the Dutch Public OEL holds the lowest value. For another substance, the Dutch public OEL and the DNEL derived according to the ECHA method jointly hold the lowest value. For the rest of the substances, if an 'ECHA method DNEL' has been derived, it is the lowest value in the range. Comparing the "ECHA method DNELs" with international derived OELs, it can be seen that in most cases the "ECHA method DNELs" are more than 10 times lower (up to a factor 222).

5.4.6 *Conclusion*

For the 18 substances that were selected for this comparision, both long-term and short-term DNELs derived according to the "ECHA method" are lower than the worker-DNELs derived by the registrants. Most of the difference between the 2 kinds of DNELs can be attributed to the selection of the leading health effect and corresponding key dose descriptor or the application of assessment factors. The most striking difference, a case when the registered DNEL was 24600 times higher than the "ECHA method" DNEL, was because of a difference in selection

of the leading health effect. In this specific case the registrant selected data requiring a route-to-route extrapolation while the "ECHA method" DNEL was based on inhalation data. The differences in assessment factors were mostly due to registrants applying the ECETOC assessment factors instead of ECHA assessment factors. Furthermore, also when warranted according to RIVM experts, the registrants did not apply any assessment factors for quality of the database.

6 Discussion and Conclusions

Workers must be protected against health risks related to exposure to chemicals according to EU legislation Chemical Agents Directive (CAD, 98/24/EG) and Carcinogens and Mutagens Directive (CMD, 2004/37/EC). For this purpose OELs are derived by (inter)national organisations such as SCOEL and the Dutch Health council. Since the introduction of REACH in 2007, registrants must demonstrate adequate control of worker safety for substances manufactured and/or imported in amounts greater than 10 tons per year. DN(M)ELs are means to demonstrate such adequate control. DN(M)ELs are communicated to downstream users via a safety data sheet (SDS) and the ECHA dissemination website. Since there are many more substances with a DN(M)EL than an (inter)national OEL, the question was raised whether a substance DN(M)EL can be used as a substitute for the lacking OEL.

6.1 Setting occupational exposure standards for the workplace

On the EU level there are two legislations that generate health based exposure limits for the occupational setting: CAD/CMD and REACH. OELs are derived by independent experts in an expert committee and are based on publicly available information on the substance. By contrast, DNELs are derived by the registrant and are supposed to be based on all available information on the substance. This means that also confidential information and studies may be used to derive a DNEL. These DNELs are disseminated to the downstream user via the SDS without any quality check by other experts and authorities.

Under certain conditions EU-IOELs or national OELs may be used in REACH. This means that registrants can adopt a health based EU-IOEL or national OEL and communicate it to the downstream user. As the number of EU-IOELs or national OELs is limited, for most substances DNELs have to be derived de novo by the registrant.

Regarding the risk assessment of substances in the occupational setting, the Dutch system is primarily based on private OELs derived by a company. In case there is no national (Dutch) public OEL available, the company must derive its own private OEL. For this, it may use health based OELs derived by SCOEL or other countries. Since the number of (inter)national OELs is much lower than the number of substances used, and a company must assess all substances used, the question was raised whether DNELs may be used as private OELs.

6.2 Quality-aspects of DNELs

The quality of the DNELs derived by the registrants is, among other things, highly dependent on the toxicological expertise available to the registrant. This expertise, in all probability, will be much lower in small and medium enterprises than in large ones. The REACH guidance contains a detailed description how to derive a DNEL, but it remains difficult for registrants with limited expertise. Hence, quality of the DNELs derived by registrants is expected to vary and insight in this variation is necessary for evaluating the usability of DNELs as private OELs.

This study was performed as an initial evaluation of the possible role for DNELs as a limit value for workers exposure in case a Dutch public OEL is missing. It consists of Part A which is a scientific evaluation of the DNELs and Part B, which

examines the possibilities to improve the quality of DN(M)ELs in the Registration dossiers. The results of Part A are presented below.

An up-to-date list of DN(M)ELs would be useful for downstream users, authorities and risk-assessors. Since ECHA is the responsible agency, we suggest that ECHA should be requested to compile such an up-to-date list of DN(M)ELs and make this publicly available on their website

In our view it should be possible to check the registrants DN(M)EL derivation by using the information disseminated on the ECHA website. At this moment however, there is lack of transparency in the DNEL derivation since not all necessary information is publicly available. Only ECHA and competent authorities have access to the chemical safety report that contains this information. In our view the full DN(M)EL derivation should be disseminated on the ECHA website so that its quality can be checked by employers, authorities and risk-assessors. Regarding DMELs, which do not have a threshold mode of action, it is strongly advised to disseminate the additional individual risk level, since this level is a policy decision and may deviate between countries.

6.3 Comparison of Dutch OELs and corresponding DNELs

The comparison of all Dutch OELs and corresponding DNELs shows that the values were the same in about 25% of the cases, which can be explained by the fact that both values are often based on IOELs derived by SCOEL. In about ten percent of the cases the difference was a factor of 10 or higher, not going into one direction. For substances without a threshold and for which a DMEL should be derived, about the same (preliminary) conclusion can be drawn. The number of substances is very low, but comparing twelve substances with a risk-based Dutch OEL and a DM(N)EL showed that in four cases the DM(N)EL was a factor 2 or more higher than the corresponding risk-based OEL. So we may conclude that it is not possible to derive a private OEL from a DNEL in a simple way (e.g. by taking a percentage of the DNEL).

It should be stressed that the comparison of Dutch public OELs and worker DN(M)ELs is made on the small subset of substances with a Dutch public OEL. In general it can be said that there is pretty much toxicological information for substances with a Dutch OEL, since else no Dutch OEL will be derived. The substances where opinions on the "safe level" are most likely to deviate are those for which toxicological data is largely –or completely- missing. These, most challenging substances often do not have a health-based OEL due to the lack of data. REACH however requires DNELs to be derived also for substances with little toxicological information. Hence, it is questionable whether the same variability that was found in this study is also applicable to the large number of substances for which no Dutch OEL exists.

6.4 Comparison of registrant's DNELs with DNELs derived by RIVM experts

To gain more insight into the quality of worker-DNELs derived by the registrants, a small subset of 18 substances was chosen for which the registrant's worker-DNEL was compared with a DNEL derived by RIVM experts based on the ECHA guidance and the toxicological information in the chemical safety report ("ECHA method" DNEL). An important limitation is that the sample of substances is extremely small in relation to the whole number of available worker-DNELs. Also, the sample was intentionally biased so as to be able to identify the most severe issues. The comparison between the two DNELs shows that the registrant's long-term worker-DNELs were higher than the corresponding "ECHA

method" DNELs in all but one case. In more than half of the cases the difference was a factor of 10 or more, with a maximum of 24600. It was also found that in several cases, outdated OELs were used by the registrants. In three cases the RIVM experts decided that a DNEL is not appropriate due to a lack of a threshold effect. Short-term "ECHA method" DNELs were either equal to or lower than the short-term worker-DNEL derived by the registrants. The maximum difference was a factor 1665. In summary, the numerical values of the "ECHA method" DNELs were (much) lower than the registrant's worker-DNELs. The main sources of the differences were found to be the selection of the leading health effect and the choice of the key dose descriptor and the application of assessment factors. Comparing "ECHA method" DNELs to EU-IOELs and national OELs yielded similar results; "ECHA method" DNELs generally were more than 10 times lower than the corresponding OEL (up to a factor of 222).

6.5 General findings

The findings in this study are not very surprising. Research performed on the derivation of (international) OELs showed that many factors may affect the final level of an exposure limit. Henschler (1991) investigated the definition of adverse effect in relation to OEL setting and found a wide range of interpretations. Hansson (1998) investigated the ACGIH, the German and Swedish systems for OELs, performing detailed studies of the relationship between OELs and underlying toxicity. Inconsistencies in all three were found. Haber and Maier (2002) showed that differences in methodology and scientific policy lead to large variations in the OELs set for chromium, even if similar toxicological data was reviewed. The International Council on Mining and Metals reviewed the OELs for nine substances from five different standard-setters (34 documentations in total) and found that the use of key studies, identification of critical effects and use of assessment factors was very variable (ICMM, 2007). Schenk (2010) investigated the reasons for differences for a set of 14 substances for which different standard-setters had determined OELs whose level spanned over a range covering at least a factor of 100. Differences in the identification of the critical effect could explain the different level of the OELs for half of the substances. The age of the data review could not account for all the differences in data selection. Also the evaluation of the key studies varied significantly. The use of assessment factors was also identified as an important factor. In an investigation of the consistency of the use of assessment factors in the EU SCOEL recommendations, Schenk and Johanson (2010) found that only one third of the investigated IOELs were derived using explicit assessment factors. On average, the safety margin of the IOEL recommendations was 2.1 higher when an explicit assessment factor had been used.

Hence, like in the derivation of health-based OELs, there are many different factors that could be expected to influence the quality of registrant's worker-DNELs. However, the fact that the registrants under REACH have a detailed guidance document available, and a framework for the use of assessment factors with default values offered for several aspects, one would expect a more consistent approach to the application of assessment factors in the derivation of registrant's worker-DNELs than previous research found in OEL setting.

"ECHA method" DNELs are lower than registrants DNELs, EU–IOELs or national OELs for substances with relatively much toxicological information. Since DNELs also have to be derived for substances with little toxicological information, it seems reasonable and advisable that the "ECHA method" should be conservative. There is no established answer on how to identify the most

optimal health based exposure level. There is no "correct" health based value which is illustrated in the large variety in values between various OELs for the same substance. However, this study shows that registrants' DNELs cannot be adopted as health-based limit values without an evaluation of each individual DNEL. At the present time it not possible to perform such an evaluation because of lack of transparency in the ECHA database, which in turn may be due to confidentiality of the information. Possible ways to improve the quality of DN(M)ELs in the Registration dossiers will be discussed in Part B of this study.

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9 Appendix I: Examples of the transparency of worker-DNELs

The table below presents publicly disseminated information on the ECHA webpage (echa.eurpa.eu, in October 2013) for the 47 substances with a significant or large difference between the Dutch public OELs and long term worker-DNELs (factor 2 or more). Some substances have more than one DNEL.

Substance	**Long term worker DNEL**					
CAS nr	**MSE**	**Route Exp**	**DD**	**Mod. DD**	**OAF**	**OEL**
111-76-2	X					
112-07-2	X					
67-56-1	X	X			X	X
115-10-6	X		X			
75-05-8						
7440-48-4	X		X			
121-44-8						
100-41-4						
100-41-4	X		X		X	
75-21-8	X	X				
110-86-1	X		X		X	
7664-38-2	X		X		X	
7664-38-2	X					
7783-06-4						X
50-00-0						
123-91-1	X					
144-62-7	X		X		X	
109-86-4	X					
96-18-4	X	X	X	X	X	
106-89-8	X		X		X	
7440-50-8						
98-83-9	X		X		X	
7726-95-6						
7664-39-3	X		X			
64-18-6	X	X				
7697-37-2						
7446-09-5	X	X				
24613-89-6	X					
110-80-5	X		X		X	
541-85-5	X	X	X	X	X	
101-14-4	**X**		**X**		**X**	
106-99-0						
106-99-0	**X**				**X**	
98-95-3	X		X			
95-50-1	X	X	X		X	
1327-53-3	X					
7778-39-4	X		X		X	
106-93-4	**X**		**X**		**X**	
1330-20-7	X		X		X	

Substance	**Long term worker DNEL**					
CAS nr	**MSE**	**Route Exp**	**DD**	**Mod. DD**	**OAF**	**OEL**
1333-82-0	X					
110-12-3	X		X		X	
79-06-1	**X**				**X**	
67-66-3	X		X		X	
108-65-6	X	X	X		X	
91-20-3	X					
109-99-9	X	X			X	
110-82-7	X		X		X	
1314-56-3	X					
127-19-5	X		X		X	
95-63-6	X		X		X	

MSE: most sensitive endpoint
Route Exp: route of exposure in the key study
DD: dose descriptor of key study used as starting point
Mod DD Modification of the dose descriptor
OAF: overall assessment factor
OEL: reference to OEL

Bold face: the registrant designated the value DMEL rather than DNEL

Part B: Discussion paper on the possibilities to improve the overall quality of DN(M)ELs

D. Theodori

Publiekssamenvatting

Om een veilige en gezonde werkomgeving te creëren voor werknemers die met gevaarlijke stoffen werken, is het belangrijk dat de blootstelling wordt beperkt. Dit gebeurt op basis van grenswaarden. Van een klein deel van deze stoffen heeft de grenswaarde voor de blootstelling een wettelijke status in Nederland. Voor het merendeel moeten werkgevers deze grenswaarden zelf bepalen.

Een hulpmiddel om deze grenswaarden te bepalen, kunnen zogeheten DNEL's (Derived No Effect Levels) zijn die de industrie zelf moet vaststellen volgens de Europese stoffenwetgeving REACH. Deze DNEL's zijn vereist voor stoffen die in de EU worden geproduceerd of geïmporteerd in een volume van 10 ton per jaar of meer. Uit parallel RIVM-onderzoek blijkt dat er grote verschillen kunnen bestaan tussen de DNEL's die door RIVM-experts zijn afgeleid en DNEL's die door bedrijven zelf zijn bepaald. Daardoor is het onzeker of werknemers voor deze stoffen voldoende worden beschermd. Het RIVM vindt het daarom van belang dat de DNEL's, en daarmee beschermingsniveaus, op een juiste, transparante en breed gedragen wijze tot stand komen.

In dit rapport bespreekt het RIVM hoe dit kan worden gerealiseerd en welke rollen verschillende stakeholders daarbij hebben. Een belangrijk uitgangspunt blijft dat de industrie ervoor verantwoordelijk is dat de DNEL's op de juiste manier worden afgeleid. Een eerste logische stap in een verbeterslag is dat de industrie de wijze waarop de DNEL's worden afgeleid, beter te controleren maakt. Ook kan de industrie kwaliteitseisen stellen aan de wijze waarop de DNEL's worden afgeleid. Zo kan de industrie afspreken dat DNEL's alleen bepaald mogen worden door mensen met voldoende kennis van zaken, gekoppeld aan een opleidingseis. Voor overheden liggen er verbetermogelijkheden vanuit hun controlerende taak, die op Europees niveau binnen het REACH-raamwerk kunnen worden ingevuld. Ook kunnen nationale overheden verkennen welke mogelijkheden nationale handhavingsorganen, zoals de Inspectie SZW (voorheen de Arbeidsinspectie), hebben. Ook ligt er een rol voor de overheid om het huidige richtsnoer voor de DNEL's gebruiksvriendelijker en transparanter te maken.

Tot slot moet er aandacht komen voor de verankering van de kwaliteitsvraag in het juiste proces. Een mogelijkheid hiertoe is kwaliteit van DNEL's en bedrijfsgrenswaarden op te nemen in de collectieve afspraken tussen werkgevers en werknemers, en daarmee onderdeel te maken van de afspraken binnen een sector. Dat kan bijvoorbeeld in een zogenoemde arbocatalogus, een set afspraken over arbeidsomstandigheden die binnen een sector tussen werkgevers en werknemers wordt gemaakt.

Abstract

Limit values are important to control worker exposure to substances in order to create safe and healthy working conditions. For a restricted number of substances, public limit values with a legal status have been derived. For the remaining substances, employers must derive their own private limiting values.

The REACH regulation introduced two new concepts of limit values for exposure of humans, the so-called Derived No-Effect Levels (DNEL) and the Derived Minimum Effect Levels (DMELs). These DNELs and DMELs are used within the REACH systematics to derive the appropriate risk management measures to ensure safe working with chemicals. Outside the scope of REACH the DNELs and DMELs are considered as a useful and important tool to help companies set company specific exposure limit values.

In this report, we discuss and underline the need for good quality DNELs and DMELs considering their pivoting role in the effective control of worker exposure to chemicals. Considering the fact that there are strong indications that the quality of DNEL/DMEL and DNEL/DMEL-derivation is not up to standard, we identify and discuss a number of routes that are open to each of the stakeholders to come to an improved quality for DNELs and DMELs.

Summary

Risk Assessment of workers' exposure to chemical substances essentially involves the comparison of two parameters: the amount of the chemical to which a person is exposed to, and the level at which a health effect is expected to occur. For the latter, occupational limit values are set in the current practice. Several varieties of these occupational limit values exist, all with a different origin and legal status. On the EU-level, for inhalation exposure, the occupational exposure limits (OEL) are used within the occupational health regulatory context.

The REACH regulation introduced two new concepts of limit values for exposure of humans, the so-called Derived No-Effect Levels (DNEL) and the Derived Minimum Effect Levels (DMELs). These DNELs and DMELs are used within the REACH systematics to derive the appropriate risk management measures to ensure safe working with chemicals. Outside the scope of REACH the DNELs and DMELs are considered as a useful and important tool to help companies set company specific exposure limit values.

Considering this potential pivoting role in the health protection of employees, we address the important question of the quality of the DNELs and DMELs. This report only addresses inhalation exposure and identifies first of all a number of issues of importance when considering the quality of DNELs and DMELs. Furthermore we focus on and discuss elements and approaches to improve the quality of DNELs and DMELs.

We identify the following quality issues

- The soundness of the DNEL and DMEL derivation can only be externally assessed using the confidential part of the submitted REACH information. This information is only accessible for authorities (ECHA and EU Member states), and only in the formal REACH evaluation processes.
- The formal REACH evaluation processes are far from straight forward and often time consuming.
- Part A of the report shows that, although the derivation of DNELs and DMELs is formalised in a REACH guidance, the DNEL derived by the registrants deviates from the DNEL derived by RIVM experts in many cases, although both are based on the same data.
- The hazard and risk related information communicated through the public part of the ECHA website often needs a specialist's-eye to interpret correctly.
- Reliability of the DNELs and DMELs is essential as they on the one hand are essential for assessing the maximum level of worker exposure, and on the other hand determine the type and costs of risk management measures needed to guarantee safe use.
- For substances with little data (data-poor substances)[7], DNELs or DMELs *must* still be derived according to REACH in case they are produced or imported in quantities more or equal to 10 tonnes per year. Risk management measures actually based on this type of limited DNEL or DMEL may be inappropriate and/or insufficient.

[7] These can be not poorly studied substances for which little data exist and/or low tonnage chemicals as REACH standard requirements for the lower tonnage bands may be insufficient for the determinations of DN(M)ELs.

We analyse and discuss a number of routes and approaches that can be taken to initiate a process to improve the current quality of the (derivation of) the DNEL/DMEL. In our analyses we distinguish among several actors.

1. Industry is urged to share more information on derivation of DN(M)ELs in the public domain.
2. Industry may also consider to adopt quality standards concerning the competences of persons responsible for the DN(M)ELs derivation, or standards on how industry should supervise and encourage the generation of high quality DN(M)ELs.
3. DN(M)ELs could be included in the collective sector oriented agreements between employers and employees about occupational conditions at work (after the example of the Dutch arbo-catalogi).
4. ECHA en MS should consider intensifying their effort within the evaluation processes with specific focus on issues related to quality of DN(M)ELs.
5. National enforcement authorities could explore the possibility of enforcing the correction of gross and demonstrable shortcomings in the derivation of the DN(M)ELs.
6. EU Authorities should initiate the process to develop mechanisms that allow OSH scientific committees to derive OELs for substances representing a high risk in the working environment by making use of the REACH data.
7. EU Authorities should initiate the process to improve the transparency and user-friendliness of the R-8 guidance.
8. All actors should discuss and reach consensus on tolerable level of risk to be used for the derivation of DMELs

Thus , several options exists which could lead to an improvement of the present quality of DNELs and DMELs. Further discussions among the stakeholders are needed to identify and agree on the most feasible and effective actions.

10 DN(M)ELs – what are they and why does their quality matter?

REACH introduced two new concepts of limit values for exposure of humans, the so-called DNELs[8] and DMELs[9]. Along with these new concepts it is assumed that within the context of REACH workers are protected against the hazard of a substance if exposure is below the DNEL or that, in case a substance has no threshold, very limited effects may occur following exposure below the DMEL.

In part A, an in depth analysis of a selection of DN(M)ELs derived within the scope of Registration, illustrates the need to improve their quality. After a short introduction on the different types of DN(M)ELs, how they relate to OSH OELs and why their quality matters, part B includes a discussion on the possibilities of enhancing their overall quality. These options have emerged following the analysis of the current instruments and practices under REACH and OSH. They are by no means exhaustive or the most preferred ones and need to be further developed and possibly augmented by alternatives in consultation with stakeholders. Part B will be of interest to all stakeholders involved in the orderly running of (overlapping) provisions stemming from REACH and OSH. It is primarily of interest to competent authorities, branch associations and industry bodies as well as workers organizations.

10.1 Different types and scope of part B

Four mechanisms are in place under REACH that can lead to the generation of DN(M)ELs: (1) the Registration process, (2) and (3) the Authorisation and Restriction processes and finally, (4) the art 77.3(b) procedure, REACH Registration being the main mechanism.

The responsibility for deriving DN(M)ELs within the Registration process lies with the industry in its capacity as registrant.
DN(M)ELs resulting within the regulatory processes of Authorisation and Restrictions are derived either by the EU authorities (for the Restriction process) or by companies (when applying for Authorization) and are for both routes scrutinized by Risk Assessment Committee (RAC), an independent experts committee that prepares the opinion of European Chemicals Agency (ECHA) related to the risks of substances to human health and environment in the various REACH and CLP processes including the processes Authorization and Restrictions.
Finally, the Executive Director of ECHA may utilize the art 77.3(b) option to request RAC to develop DN(M)ELs for specific needs (e.g. as preparation for anticipated applications for authorization).

This report is only concerned with DN(M)ELs within the scope of Registration. DN(M)ELs derived under RAC scrutiny in the processes of Restriction and Authorization or by art 77.3(b) procedure are not part of this study as DM(N)ELs are surrounded by different issues.

[8] DNEL=Derived No Effect Level
[9] DMEL=Derived Minimal Effect Level; DMELs are similar in concept to DNELs but have a different toxicological background. DMELs were not a part of the study reported here.

10.2 Derivation of DN(M)ELs

REACH requires the derivation of DNELs as a key step in the risk characterisation of a chemical substance. DNELs are used by the registrants to define which conditions are safe or cause an acceptable low risk when substances are manufactured and used. In REACH, the safe conditions are described in terms of the so-called Operational Conditions (OCs) and Risk Management Measures (RMMs). The risk characterisation of a chemical substance – including DN(M)ELs, OCs and RMMs - must be reported in the so-called Chemical Safety Report (CSR) that belongs to the confidential part of the Registration dossier.

The REACH legal text only refers to DNELs without specifying how they must be derived; there is, however, relevant REACH guidance on DNELs derivation where also the concept of DMELs is introduced for carcinogens without a threshold (Chapter R.8 of the ECHA guidance document entitled "Guidance on Information Requirements and Chemical Safety Assessment"). Different DNELs – or DMELs if this is appropriate – have to be derived to reflect all likely route(s), duration and frequency of exposure and for each relevant endpoint and relevant human population (e.g. workers, consumers and general population that can be exposed directly via the environment). See part A of this report for more details.

10.3 DN(M)ELs in Registration dossiers and their relation to risk evaluation for chemicals in the workplace

As part of the REACH Registration obligation, a large number of DN(M)ELs have been generated for many substances that do not have an EU-IOEL or a statutory OEL. DN(M)ELs in the Registration dossiers are expected to be based at any time on the maximum (most recent) set of hazard information of the substances involved. By their numbers and indirect binding character within REACH, DN(M)ELs in the Registration dossiers are of importance for the protection of the workers' health.

DN(M)ELs and IOELs are derived within two different legal frameworks. However, in nature and purpose, DN(M)ELs are similar to IOELs. Both are health-based and intended as reference values that employers must use to define site-specific Risk Management Measures. Their large abundance and principal similarity with IOELs, makes them relevant for the risk evaluation for chemical substances that is obligatory under OSH rules. In the Dutch regulation the use of private exposure limits for this is mandatory, and the DN(M)ELS are interesting candidates to be used as these private OELs. DN(M)ELs resulting within the Registration process share an extra similarity with these private OELs on the top of the ones mentioned above namely, that they are both derived by private actors. DN(M)ELs within the scope of Registration, are derived by companies up in the supply chain, in their capacity as " registrants", while private OELs in the Netherlands are derived by individual companies in their capacity as " employers". DN(M)ELs derived during the Registration process are communicated in the supply chain through (e)SDS and the ECHA public dissemination website.

10.4 Quality issues related to the DN(M)ELs in the Registration dossiers

Evaluation by the authorities
In general there is a concern that the scientific soundness of the DN(M)ELs in the Registration dossiers may be heterogeneous and, sometimes, give rise to

questions that can only be answered after an evaluation of the confidential part of the CSR. A proces that can only be initiated by authorities along the two REACH Evaluation processes: compliance checks and substance evaluation. Although both are very important in promoting the overall quality of the REACH Registration dossiers, they are of rather limited importance when it comes to the improvement of the overall DN(M)ELs quality for the following reasons. First, these two REACH Evaluation processes do not address all Registration dossiers but a subset of them. Second, when targeting DN(M)ELs in the Registration dossiers, authorities can only indirectly influence their quality as they cannot impose the DN(M)EL which they deem correct but rather require additional information that may justify a different value. Third, up to now only a very limited number of issues concerning DN(M)ELs have been subject of a REACH Evaluation process and our expectation is that this number will stay that low in the future as quality issues related to DN(M)ELs are difficult to identify in an automated way.

Assessment of the current practice
In part A of the report an analysis is given of the quality of a selected number of DN(M)ELs taken from the Registration dossiers. The analysis is based upon the comparison of these values with the corresponding Dutch public OELs and a closer look into the way registrants derive DNELs for a selection of 18 substances. The main conclusion reached is that DNELs in Registration dossiers are not always derived in a proper way and following the recommendations in REACH Guidance R.8. Similar conclusions can be found in the ECHA's Progress Report of 2013 on the Evaluation under REACH[10] as well as in previous ECHA reports regarding REACH Evaluation processes. More specifically, the main issues at stake are related to:

(a) the selection of the leading health effect and the choice of the key dose descriptor;
(b) route-to-route extrapolation;
(c) the application of assessment factors: deviation from the default values in REACH Guidance R.8 without sufficiently sound and substance specific arguments (default ECETOC assessment factors are often used instead) while assessment factors are missing for the quality of the whole database.

DNELs derived from a limited dataset
There is a particular issue related to substances for which - even after the REACH introduction - little data exist. In such cases it is not easy to judge whether the DN(M)ELs based on such a limited set of data are an improvement for the protection of the worker. In the absence of sufficient data, in the regime prior to REACH, the employers are required to follow the precautionary principle, to be on the safe side and treat such chemicals as high risk chemicals. It needs to be understood whether REACH registrants apply the same precautionary approach when setting DN(M)ELs for substances with a limited data set.

Interpretation of the registration data
Next to issues related to the derivation of DN(M)ELs by Registrants, problems may occur with the communication of the DN(M)ELs on the ECHA pubic dissemination website. In our experience, understanding the information on the

[10] http://echa.europa.eu/documents/10162/13628/evaluation_report_2013_en.pdf

ECHA dissemination website requires quite some toxicological background and experienced close-eyed reading. An illustrative example is the case of mutagenic or respiratory sensitizing substances. Mutagenicity and respiratory sensitization can be overlooked by an untrained observer as these are effects for which no DN(M)ELs can be derived while the communicated DN(M)EL for other health hazards of the substance may not be sufficiently protective. Another example of communication issues is the case of a value communicated as dermal DNEL on the ECHA dissemination website while this proved to be indicating internal exposure.

DN(M)ELs and their role in risk management
At present there is uncertainty about the quality of the DN(M)ELs within the scope of Registrations. Different studies show that they are not at always reliable. It is this very uncertainty that undermines their use as reference values for the protection of workers. An important notion here is that DN(M)ELs do play an important role in the risk management of substances *regardless* of whether they are attributed the status of private OELs within the scope of the national OSH legislation. Even without this status DN(M)ELs will exercise their significance through the REACH obligations in the supply chain. They are of particular value for the substances that have no statutory OEL. To reach their full potential, however, stakeholders - authorities and the different actors in the supply chain - should be confident that DN(M)ELs are well derived and in a transparent way, and that they can be subjected to critical control and improvement by the ones who make use of these values. It is imperative that the DN(M)ELs are neither too high or too low. Too low DN(M)EL may lead to overly strict measures, which, on the top of that, are often focusing on personal protective equipment (PPE) with their heavy burden on employees and/or lead to high investment costs for companies. Too high DN(M)ELs on the other hand – i.e. higher than the actual protective limit – may, for obvious reasons, also be problematic as, in these cases, workers are exposed to levels that may impair their health.

It should be stressed that this report only deals with the DN(M)ELs in the Registration dossiers. DN(M)ELs derived under RAC scrutiny in the processes of Restriction and Authorization or by art 77.3(b) procedure are not part of this study as DM(N)ELs are surrounded by different issues. An issue with these RAC-DN(M)ELs is that they may differ from the OELs derived by SCOEL or another independent national scientific committee for the same substance (and vice versa). This difference can be explained by differences in methodology, assessment factors, expert judgement and underlying available data. The consequences of possible discrepancies between SCOEL and the RAC values, and the possible ways to overcome these discrepancies are discussed elsewhere[11].

[11] SZW non-paper EU-OSH and REACH

11 DN(M)ELs quality improvement – a way forward

Regardless of the question whether or not DN(M)ELs in the Registration dossiers can be used as private OELs, it is in the benefit of the improvement of worker safety to increase their overall quality. In our opinion this can be realized along two lines. First, by increasing the actual possibilities of all different actors in actively influencing the quality of the DN(M)ELs stemming from the REACH Registration process. Secondly, by increasing the confidence of the different actors in their current possibilities to do so. In both ways, quality improvements of the DN(M)ELs in the Registration dossiers can be realised. To this end all actors who can influence and benefit from high quality DN(M)ELs are encouraged to participate in a common effort.

In the following we present a list of possible actions aimed at introducing checks and balances in the system as well as new possibilities of interventions by different actors in case of concern. It is by no means an exhaustive list but rather a first attempt to identify existing mechanisms within REACH and EU-OSH that can serve this purpose and invent some new promising ones. They are meant as input for discussion with the various stakeholders. They are classified in terms of the actors who can bear the main responsibility for their initiation: the industry- in its capacity as registrants and employers – the authorities and, finally the employees. In a next step they need to be evaluated and prioritized in terms of their feasibility and effectiveness.

11.1 Actors who can influence the quality of the Registration DN(M)ELs

As elaborated in part A, we formulated the following conditions for the derivation of high quality DNELs:

1. The DNEL derivation uses as a starting point the most appropriate studies based on the leading health-effect.
2. The DNEL derivation follows the ECHA guidance (R.8) and, any deviation from this guidance is based on substance-specific considerations that are properly documented in the registration dossier.
3. The DNEL derivation occurs in a transparent way and is well documented so that it can be peer-reviewed by actors in the public domain. These are the ones who have to use these values (DU) as well as other stakeholders (branch associations, NGO’s en scientists and experts like occupational hygienists and toxicologists).

There are three principle actors who can exert influence on the quality of the DN(M)ELs in the registration dossiers: 1) the industry in its capacity as registrants, DU and employers; 2) the authorities and, finally 3) workers or organisations representing them. A schematic presentation is given in the figure below:

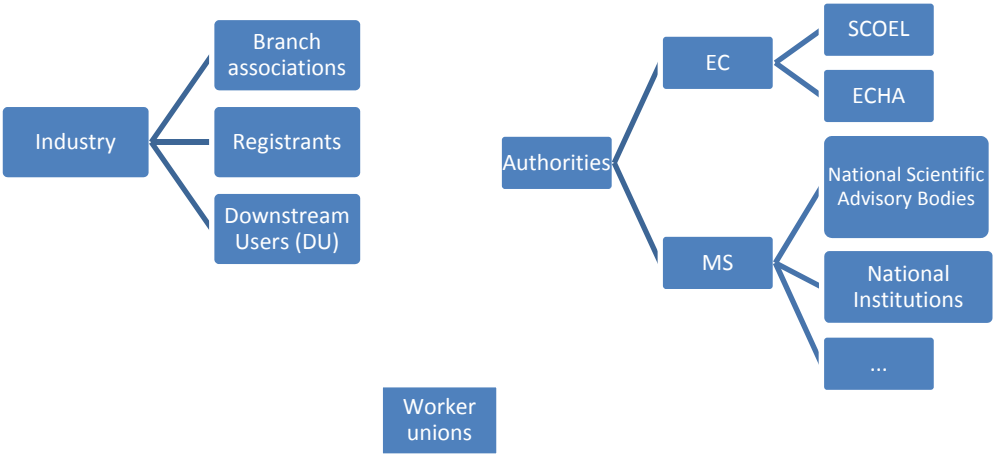

Figure 3 Leading actors influencing the quality of DN(M)ELs; (SCOEL=scientific Committee on Occupational Exposure Limits; ECHA= European Chemicals Agency; DECOS=Dutch Committee on Occupational Safety; RIVM=National Institute for Public Health and the Environment)

The registrant's impact on the quality of the DN(M)ELs is obvious as they are the ones deriving DN(M)ELs in their registrations. Employers have a direct interest in trustworthy and realistic DN(M)ELs in order to protect their employees. DUs c.q. employers can utilize upstream communication to clarify quality issues related to DN(M)ELs either individually or through their branch associations. Besides employers, employees may explore additional mechanisms and possibilities common for the OSH practices in order to improve the DN(M)ELs quality like reaching specific agreements with the employers. Authorities, at last have various evaluation processes at their disposal. Finally, in the case of substances of very high concern, authorities can choose to set statutory limit values under either OSH – on the basis of SCOEL or national scientific committees like Decos -or through the REACH authorisation and restriction processes. While the establishment of statutory values does not impact directly the quality of Registration DN(M)ELs, the mere existence of this possibility puts the whole issue in a different perspective in the sense that for substances of high risk in the working environment, authorities have the possibility at their disposal to establish statutory reference values instead of only relying on the REACH Registration.

11.2 Actions to be primarily considered by the industry

11.2.1 Information in the public domain

The ECHA public dissemination website[12] contains as a general rule and for each registered substance information about the DN(M)ELs, summaries of the toxicological studies and, occasionally, the overall assessment factor applied by the registrant. It does not contain so-called Robust Study Summaries (RSS)[13], which contain information that allow the independent evaluation of the studies included in the Registration dossier. In effect, the actual information communicated on the ECHA public dissemination website may be even more

[12] http://echa.europa.eu/information-on-chemicals/registered-substances
[13] RSS are required on by article 14 (1) in conjunction with Annex I and Article 10 (a)(vii) of the REACH Regulation for substances above 10 tonnes per year.

limited. The only information held by ECHA that has to be published on the ECHA dissemination website is the DN(M)EL itself while some relevant information like study summaries may be claimed confidential by the registrant[14].

Increasing transparency about the DN(M)ELs derivation in Registration dossiers is in our opinion essential for the acceptance and confident use of these limit values within the scope of workers protections. Industry is, in our view, urged to improve the amount of information shared in the public domain on the derivation of DN(M)ELs.. This will allow risk-experts, both inside and outside the domain of REACH and DU, to make independent judgments on the DN(M)ELs quality and improve in this way the system of checks and balances that is created around the DN(M)ELs. It is important to stress in this context that the information on the ECHA website should be clear and straightforward. Particular attention should be given to the communication of critical effects without a DN(M)EL (mutagenicity and respiratory sensitization). In such cases we have witnessed that stakeholders may erroneously consider the DN(M)ELs of other, less serious effects as the most critical.

11.2.2 Self-regulating quality management system

Registrants have the most direct influence on the quality of DN(M)ELs as they are the ones who have the formal obligation within REACH to generate data and derive such limits. At the moment there are not broadly used quality standards concerning the competences of persons responsible for the DN(M)ELs derivation or standards on how industry should supervise and encourage the generation of high quality DN(M)ELs as well as how to sanction suboptimal results. A quality system could (or not) involve accreditation and licensing services and making public lists of licensed or accredited persons and companies. Registrants could additionally consider to allow for a (greater) involvement of DU and employees in the derivation of DN(M)ELs as these are parties that have an interest in improving the quality of the DN(M)ELs.

11.3 Actions to be primarily considered by employers and employees

11.3.1 Collective agreements by employers and employees

Another instrument that can be employed in the attempt to improve the quality and reliability of DN(M)ELs is to include these exposure limits in the collective sector oriented labor agreements between employers and employees. In the Netherlands, such agreements are already a functioning tool, the so-called "arbocatalogi". Arbocatalogi are best described as occupational health reference catalogs. They form an instrument by which workers and employers in a sector describe the way in which they want to meet their obligation for realizing a safe and healthy working environment. Such catalogs are not compulsory, but once agreed they act as a starting point for the Labour Inspectorate to base their conclusions and actions on. By including DN(M)ELs in the process of collective agreements, there is the opportunity for the social partners to evaluate their quality. This can be done by either upstream communication organized by the branch - in order to allow the registrants to clarify possible uncertainties surrounding the relevant DN(M)ELs – and the employment of external experts to assist in this process. By including DN(M)ELs in the collective labor agreements, the DN(M)ELs acquire a more or less formal status within the Dutch system as reference values for workers protection regulations in the Netherlands.

[14] The legal basis for the public access to information on DN(M)ELs is to be found in art 119 of REACH

11.4 Actions to be considered by authorities

11.4.1 Targeted Evaluations

Compliance checks (CCH) and substance evaluations (SEv) are two REACH evaluation instruments that ECHA and the Member States have at their disposal to address shortcomings related to the lack of information in the REACH registrations in general and subsequently also elements related to the quality of DN(M)ELs. The initiative for conducting CCH lies with ECHA and focuses on individual dossiers, for conducting SEv it lies with the Member States, under the control of ECHA, and focuses on all registration dossiers on the same substance. With CCH, ECHA may examine any registration dossier in order to verify if the information submitted by registrants is compliant with the legal requirements. REACH obliges ECHA to examine 5% of each tonnage band. CCH can be random or following a specific concern, both full compliance checks or targeted to specific parts of the dossiers. Substance evaluation aims to verify whether a substance constitutes a risk to human health or the environment. This may result in an information request that goes beyond the legal information requirements of REACH. Requests for new information are laid down in legally binding Commission Decisions aimed at the registrant.

CCH and SEv can be used to improve specific quality aspect of individual dossiers by requesting further information from the registrants regarding the following issues:

- Is the value well justified in terms of assessment factors (AF) and key data selection?
- Are all relevant routes and durations of exposure taken into account?
- Is the identified mechanism for the key effect (threshold / non-threshold) well justified?

In other words; is the DN(M)EL derived according to the ECHA guidance Chapter R.8?

Both instruments, CCH and SEv, have however limited powers to improve the quality of the DN(M)EL on the whole. We have identified four main reasons for this. First, only a limited number of dossiers or substances can be subject to CCH and SEv. Second, both evaluating instruments have uncertain outcomes, as they cannot directly impose to the industry the DN(M)EL values that the authorities may consider as correct. CCH and SEv are requests to the industry to update its registration with relevant missing information. In the case of CCH there is also a third reason: tracing DN(M)ELs of questionable quality by automated IT-assisted tools is rather complicated as different elements of the registration dossier have to be combined and searched for in the IUCLID database, including the Chemical Safety Report which is difficult to query due to its non-structured format and which requires expert judgement. Finally, many shortcomings related to DN(M)ELs are not due to the lack of information but are quality issues including inadequate substantiation, clarity issues or inconsistencies. In such cases ECHA issues so-called Quality Observation Letters (QOBL's) instead of formal decisions to invite the registrant to update the registration dossier. QOBL's are informal and do not trigger legal obligations formalised in Commission Decisions but they can trigger enforcement actions.

Up to now only a limited number of CCH have targeted issues related to DN(M)ELs. Further efforts could be made by ECHA in this field. Screening criteria

for identification of possibly problematic DN(M)ELs could involve – but need not be limited to - the following:

- dossiers with of hazardous substances for which workers exposure is likely with market volumes above 10 t/y with missing DN(M)ELs since DN(M)ELs have to be derived for such dossiers
- DN(M)ELs that are different from existing statutory OELs
- DN(M)ELs for well-known substances assuming a deviating mode of action, and in particular for substances known to be carcinogens or respiratory sensitizers for which a no threshold mechanism is to be expected
- when there are more DN(M)ELs (for the same substance, route, duration and frequency of exposure)
- when assessment factors are used that deviate from the default values proposed by the ECHA Guidance
- when strong concerns are expressed by stakeholders towards a specific DNEL
- DN(M)ELs with a poor database in the public domain for which independent expert committees (like the Dutch DECOS) have recently concluded that the data are insufficient to derive a limit value (see also part_A)

It should be stressed here that the abovementioned criteria do not indicate questionable quality per se but rather give hints that there may be a quality issue at stake that needs to be further investigated by employing the evaluation instruments of SEv and CCH.

The main shortcoming, however, of evaluation as instrument to improve the DN(M)ELs quality, is that it only targets individual dossiers. To share insights gained during CCH and SEv of individual dossiers by the whole Registrant's community, ECHA could consider a meta-analysis of the conclusion regarding individual DN(M)ELs in an anonymised way in addition to the Evaluation reports of ECHA In this way the information is shared with the broader group of stakeholders and the corrective action of CCH and SEv can influence the quality of the DN(M)ELs beyond the specific dossiers which are subject to controls.

11.4.2 Enforcing appropriate scientific DN(M)ELs derivation

It is also interesting to explore whether in case of gross and demonstrable shortcomings in the derivation of the DN(M)ELs, national enforcement authorities could enforce the correction of these failings without a formal decision following a CCH or a SEv. To this end, a Competent Authority for REACH should initiate an investigation in response to a report by the enforcement authorities of suspected failings. We think that – if this is legally possible - one could make a strong case for this approach in cases that the Member State Authorities can demonstrate deliberate error or gross negligence in DN(M)EL derivation by Registrants.

11.4.3 Procedure for intervention by OSH scientific committees - besides REACH regulatory processes

When a specific substance gives rise to serious concern authorities may decide to intervene by involving expert committees operating under the OSH and/or REACH regulations . In the case REACH regulatory processes are selected then

the DN(M)ELs identified in such processes are subject to scrutiny. Within REACH regulatoryprocedures exist and can be initiated by the authorities (EC and/or Member States). These are the processes of Restriction and Authorisation. Although such processes are not intended to be used to evaluate DN(M)ELs, they do provide this possibility too, within a broader scope of targeting substances of concern.

Analogous mechanisms that allow for an independent investigation of DN(M)ELs are not operational within the OSH framework. Moreover OSH scientific committees cannot access the confidential data in the REACH chemicals safety report (CSR). A procedure including scrutiny and adoption of DN(M)ELs as national (or European) reference values for worker protection, does not exist. As a consequence, OSH scientific committees cannot take advantage of the registrants efforts under REACH to derive DN(M)ELs for their work in the field of OSH. To make this possible, for example a procedure may be established how OSH scientific committees gain access to the confidential data in the chemicals safety report (CSR) that are relevant for DN(M)EL derivation. The confidential information in the CSR is in most cases comparable to the public summary on the ECHA website. The only additional data that would be helpful are the original study reports. In our experience, most industries are willing to provide these studies on request to Member State Competent Authorities (MSCA) but claiming confidentiality. It is an option for the industry to voluntarily share with OSH committees the confidential information in the REACH registration dossier.

11.4.4 Review R-8 guidance and decision support tool for SMEs

Efforts should be made to remove any possible ambiguity concerning the derivation of DN(M)ELs in chapter R.8 of the REACH "Guidance on Information Requirements and Chemical Safety Assessment". Of specific importance is to try to specify how to handle uncertainty in data, define clear criteria for deviating from the default assessment factors (AF) and make more explicit what kind of justification may be considered as acceptable. A specific point that needs to be addressed in this guidance is whether REACH Registrant may use default AFs of ECETOC guidance (without substance-specific considerations).
In addition, a decision support tool when deriving DNELs could be considered to reduce errors due to limited experience. This is particularly relevant for the 2018 registrations with more SMEs having to register.

11.5 Actions to be considered by all actors

11.5.1 Consensus on tolerable level of risk for DMELs

REACH distinguishes between threshold and non-threshold chemicals within the processes of Registration and Authorisation but leaves open the issue of what is an accepted low risk. When setting Derived Minimal Effect Levels (DMELs) for workers for the purposes of Registration, a level of 10^{-5} is, among others mentioned as an indicative level for tolerable risks[15]. A complicating issue here is that the ECHA guidance is not clear whether 10^{-5} is the residual risk related to 1 year or to 40 years of occupational exposure to carcinogens. In essence, however, the guidance does not specify or prescribe the level of accepted risk. It is therefore up to the registrant to make an evaluation and assessment of the level of risk applicable to that particular situation.

[15] Chapter R.8 of the ECHA guidance document entitled "Guidance on Information Requirements and Chemical Safety Assessment"

These risk levels are generally not reported in the publically available information about DMELs it is therefore not possible for third parties (for example employers and their employees) to judge whether the applied risks-estimates are in line with e.g. national policies for non-threshold chemicals[16]. In the absence of consensus on the risk-levels associated with DMELs, many uncertainties remain concerning their quality and reliability. We believe that a formal consensus would increase the acceptance of DMELs as reference values for workers protection.

[16] So also in the Netherlands – where a target level of 10^{-6}/y and a prohibition level of 10^{-4}/y is applied for non-thresholds - it is important to know which level of risk the Registrant's DMEL corresponds.

12 Conclusions and recommendations

DN(M)ELs in Registration dossiers are generated for a big number of substances that do not have an EU-IOEL or a statutory OEL. By their numbers and indirect binding character within REACH, DN(M)ELs in the Registration dossiers are of importance for the protection of the workers' health. Moreover, their abundance and similarity with occupational limit values, as defined within the EU-OSH legislation, renders them interesting candidates as a tool for the risk evaluation of chemicals that is obligatory under OSH rules. (In the Netherlands the use of private exposure limits for this is mandatory, for which the DN(M)ELS could be used directly if of sufficient quality.) In general there is a concern that the scientific soundness of the DN(M)ELs in the Registration dossiers may be heterogeneous and, at occasions, give rise to concern.

It is in the benefit of the improvement of worker conditions to increase the overall quality of the DN(M)ELs in the registration dossiers. In REACH, the primary responsibility for the quality of the DN(M)ELs in the Registration dossiers lies with the industry and in particular with the industry responsible for the registration of substances. Registrants have the most direct influence on the quality of these values as they are the ones who also have the formal obligation within REACH to generate data and derive such limits. Industrial and professional users – referred to as downstream users, under REACH - have an interest in high quality DN(M)ELs and can exercise their influence by utilizing up-stream communication mechanisms. Employers and employees can additionally utilize their rights within OSH legislation in order to exercise their influence on the quality of the DN(M)ELs in the Registration dossiers. The EU en national authorities at last, may also play a role in the advancement of the DN(M)ELs quality. The current reports is a first attempt in this direction. The non-exhaustive list of actions include:

1. Industry is urged to share in the public domain more information about the DN(M)ELs derivation.
2. Industry may also consider to adopt quality standards concerning the competences of persons responsible for the DN(M)ELs derivation or standards on how industry should supervise and encourage the generation of high quality DN(M)ELs.
3. DN(M)ELs could be included in the collective sector oriented agreements between employers and employees about occupational conditions at work (after the example of the Dutch arbo-catalogi).
4. ECHA en MS could consider intensifying their Evaluation work with specific focus on issues related to quality of DN(M)ELs.
5. National enforcement authorities could explore the possibility of enforcing the correction of gross and demonstrable shortcomings in the derivation of the DN(M)ELs.
6. Develop mechanisms that allow OSH scientific committees to derive OELs for substances representing a high risk in the working environment by making use of the REACH data.
7. Improve the transparency and user-friendliness of the R-8 guidance.
8. Reach consensus on tolerable level of risk for DMELs

Further discussion is needed among stakeholders to identify the most feasible and effective actions.

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