Ann. Occup. Hyg., 2016, Vol. 60, No. 4, 403–404
doi:10.1093/annhyg/mev096
Advance Access publication 11 January 2016

BOHS
The Chartered Society for Worker Health Protection

COMMENTARY

Hygiene Without Numbers

HANS KROMHOUT*

Department of Environmental Epidemiology, Institute for Risk Assessment Sciences, Utrecht University, Yalelaan 2, 3584 CM Utrecht, The Netherlands
*Author to whom correspondence should be addressed. Tel: +31 30 253 9440; e-mail: h.kromhout@uu.nl
Submitted 1 December 2015

I have been a member of both British and Dutch Occupational Hygiene Societies and a 'hygienist' (AKA: 'exposure scientist') for >30 years. During my attendance at a recent meeting in Manchester between Occupational Health and Safety specialists from companies contributing to the IMA-Europe Dust Monitoring Programme and representatives of the UK's Health and Safety Executive (HSE), I was intrigued and amazed to note that the following title showed up in the programme: 'Hygiene Without Numbers'.

I wondered, did HSE finally discover the key to the Holy Grail, or were they trying to put the genie back into its bottle given that UK Business needs help with cutting red tape nowadays (https://cutting-red-tape.cabinetoffice.gov.uk/)?

In truth, the 'Hygiene Without Numbers' concept presents nothing new since it basically boils down to the old 'COSHH Essentials' concoction (Russell *et al.*, 1998) in a new wineskin. The old mantras of 'measurements are expensive', 'measurements delay control measures', 'with statistics you can prove anything', and of course 'if you provide enough guidance on best practices everything will be well-controlled' made up the gist of the message.

If 'hygiene' was as simple as suggested in the 'Hygiene Without Numbers' concept, we would have solved the problem of hazardous working conditions and evolving health risks a long time ago.

Numbers are indeed not required for approaches like control banding, which entail moving from hazard assessment to control without an exposure assessment step. Such numberless interventions may be appealing to policymakers, who face the hefty task of creating meaningful and economically feasible guidelines for workplace health. However, treating workers' exposure to chemical, biological, or physical agents as a static entity that can be satisfactory controlled by guidance sheets is factually wrong and ignores the intrinsic variability of occupational exposure. An individual's work tasks and circumstances can produce very different exposures from minute-to-minute, from hour-to-hour, from shift-to-shift, from week-to-week, and from season-to-season. Furthermore, individuals performing the same job in the same location might, more often than not, have considerably different average exposures (as has been convincingly shown in this journal; Kromhout *et al.*, 1993; Symanski *et al.*, 2006). Ignoring temporal and personal variability in occupational exposures might lead to underestimated health risks and wrongly advised risk management measures.

In order to control hazardous exposures well, we must carefully collect numbers (perform measurements), especially in situations where exposure situations are not obvious (e.g. respirable crystalline silica), or in situations where exposures are not restricted to a point source and direct interaction with the exposure source is essential and needed (e.g. a nurse providing care to a

cancer patient receiving—ironically, carcinogenic—antineoplastic agents). With numbers in our hands, we can develop meaningful interventions and confidently monitor progress in preventing hazards from becoming risks.

In most occupational settings, work produces measurable exposures that must be controlled. Enclosing every source of exposure or eliminating every hazardous substance might solve all our workplace health problems, but of course this would be economically disastrous and infeasible in practical terms (imagine a world without antioxidants in rubber products, crystalline silica in construction materials, or antineoplastic agents to treat cancer).

Effective control requires careful consideration of the situation at hand, which is strongly informed by numbers. Therefore, I would like to encourage the development of cheaper and handier devices (e.g. Cate *et al.*, 2015; Eninger and Johnson, 2015) that will make the job easier and cheaper and will hopefully end the disturbing trends of fewer occupational exposure numbers being collected and centralized (Hall *et al.*, 2014) and nationwide exposure databases leading a dormant life (Burns and Beaumont, 1989; Cherrie *et al.*, 2001). Luckily, some industries have taken up their responsibility and have started to collect numbers on a large scale. Results from the exemplary Industrial Minerals Association—Dust Monitoring Programme (http://www.ima-europe.eu/commitments/dust-monitoring-programme) with currently >28 000 measurements of respirable crystalline silica collected over a 15-year period were also presented at the previously mentioned meeting in Manchester.

Applying simple rules with unrealistic protection factors (e.g. a factor 10 for local exhaust ventilation to a factor 100 for full enclosures and containment) will hardly ever be met in practice (Fransman *et al.*, 2008). REACH and its chain responsibility is a good framework that in principle will reduce hazardous exposures in European workplaces, but with safe scenarios based on unrealistic unproven best practices, workers will continue to run unnecessary health risks. Control banding works in dire circumstances where any control measure will improve the situation. However, in the 'grey bands' where most European workers operate, simple guidance for control measures can be either insufficient (leading to unnecessary health risks for workers) or too extreme (resulting in sky-high operational costs for employers). Furthermore, moving away from numbers creates the threat of 'hygienists without numbers' who will be ill-prepared to interpret an abundance of numbers from unsolicited measurements that workers and consumers eventually will collect themselves (see for instance http://www.myexposome.com/).

Preventing occupational hygiene to follow the path of demise like its sister discipline occupational medicine in the UK (Raynal, 2015) should be our first priority. Cutting red tape—resulting in fewer carefully inspected and controlled European workplaces—may 'solve' the issue of the burden of collecting numbers in the short term, but this is likely to produce thousands of preventable cases of occupational disease and untimely disability. 'Hygiene Without Numbers' comes with a price and we all know who will have to pick up the bill.

ACKNOWLEDGEMENTS

The author has no conflict of interest to declare.

REFERENCES

Burns DK, Beaumont PL. (1989) The HSE National Exposure Database–(NEDB). *Ann Occup Hyg*; 33: 1–14.

Cate DM, Noblitt SD, Volckens J *et al.* (2015) Multiplexed paper analytical device for quantification of metals using distance-based detection. *Lab Chip*; 15: 2808–18.

Cherrie JW, Sewell C, Ritchie P *et al.* (2001) Retrospective collection of exposure data from industry: results from a feasibility study in the United Kingdom. *Appl Occup Environ Hyg*; 16: 144–8.

Eninger RM, Johnson RL. (2015) Unmanned Aerial Systems in Occupational Hygiene-Learning from Allied Disciplines. *Ann Occup Hyg*; 59: 949–58.

Fransman W, Schinkel J, Meijster T *et al.* (2008) Development and evaluation of an exposure control efficacy library (ECEL). *Ann Occup Hyg*; 52: 567–75.

Hall AL, Peters CE, Demers PA *et al.* (2014) Exposed! Or not? The diminishing record of workplace exposure in Canada. *Can J Public Health*; 105: e214–7.

Kromhout H, Symanski E, Rappaport SM. (1993) A comprehensive evaluation of within- and between-worker components of occupational exposure to chemical agents. *Ann Occup Hyg*; 37: 253–70.

Raynal A. (2015) Occupational medicine is in demise. *BMJ*; 351: h5905.

Russell RM, Maidment SC, Brooke I *et al.* (1998) An introduction to a UK scheme to help small firms control health risks from chemicals. *Ann Occup Hyg*; 42: 367–76.

Symanski E, Maberti S, Chan W. (2006) A meta-analytic approach for characterizing the within-worker and between-worker sources of variation in occupational exposure. *Ann Occup Hyg*; 50: 343–57.