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# Occupational Health and Safety and Challenges Posed by Protecting the Health of Employees Working with Nanomaterials: How to Draft Laws So That the Obligation to Ensure Safe Working Conditions Is Performed Properly?<sup>2</sup>

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## Abstract

The intense development of nanotechnology in recent years poses the basic question about the safety of employees who work with nanomaterials. The study attempts to determine how employers should regulate health protection when working with nanoparticles. Employers should be aware of the importance of the risks associated with nanotechnology and their responsibility for worker health and safety. The study is a continuation of the author's previous analyses of ways to regulate occupational safety and health in the use of nanomaterials. The author examines the theory of responsive regulation in the context of health and safety with nanomaterials and the importance of dialogue in this regulatory process. The regulatory agencies should intervene in this area depending on the attainment of the assumed objectives of the law. The sense of responsibility for the effect could improve the quality of OH&S with nanomaterials.

**Keywords:** nanotechnology, employer, occupational health and safety, social dialogue, trade union.

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# Bezpieczeństwo i higiena pracy a wyzwania związane z ochroną zdrowia pracowników pracujących z nanomateriałami. Jak tworzyć prawo, aby obowiązek zapewnienia bezpiecznych warunków pracy był realizowany prawidłowo?<sup>3</sup>

## Streszczenie

Intensywny rozwój nanotechnologii w ostatnich latach stawia podstawowe pytanie o bezpieczeństwo pracowników pracujących z nanomateriałami. W opracowaniu podjęto próbę określenia, w jaki sposób pracodawcy powinni regulować ochronę zdrowia przy pracy z nanocząstkami. Pracodawcy powinni być świadomi znaczenia zagrożeń związanych z nanotechnologią i swojej odpowiedzialności za zdrowie i bezpieczeństwo pracowników. Badanie jest kontynuacją wcześniejszych analiz autora dotyczących sposobów regulacji bezpieczeństwa i higieny pracy przy stosowaniu nanomateriałów. Autor analizuje teorię responsywnej regulacji w kontekście bezpieczeństwa i higieny pracy z nanomateriałami oraz znaczenie dialogu w tym procesie regulacyjnym. Organy regulacyjne powinny interweniować w tym obszarze w zależności od osiągnięcia założonych celów prawa. Poczucie odpowiedzialności za efekt mogłoby poprawić bezpieczeństwo i higienę pracy z nanomateriałami.

**Słowa kluczowe:** nanotechnologia, pracodawca, bezpieczeństwo i higiena pracy, dialog społeczny, związek zawodowy.

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<sup>3</sup> Badania wykorzystane w artykule nie były finansowane przez instytucje zewnętrzne. Badanie zostało przeprowadzone w ramach wewnątrzuczelnianego zadania badawczego zatytułowanego *Współpraca związków zawodowych z pracodawcami w zakresie bezpieczeństwa i higieny pracy: Nowe wyzwania postępu naukowo-technicznego i epidemii COVID-19 oraz Dialog w zbiorowych stosunkach pracy*.

## Background

Nanotechnology is one of the areas in which unparalleled development can be observed in the 21st century. Nanotechnology covers the production and use of particles and materials of a very small size, called the nanoscale.<sup>4</sup> The literature indicates that nanotechnology is associated with interference with the atomic structure of matter and enables, e.g. increased strength of a specific material (better than a standard scale material), flexibility.<sup>5</sup> An increase in the global manufacture of nanomaterial is projected.<sup>6</sup>

Speaking of nanotechnology, one has to outline the notion of nanomaterials. On 18 October 2011, the European Commission announced a recommendation on the definition of nanomaterial 2011/696/EU,<sup>7</sup> according to which a nanomaterial is a material containing particles, in an unbound state or as an aggregate or as an agglomerate and where, for at least 50% of the particles in the number size distribution, the minimum of one external dimension is in the size range 1–100 nm. Exceptionally where warranted by concerns for the environment, health, safety or competitiveness, the number size distribution threshold of 50% can be reduced to a threshold of between 1% and 50%. Fullerenes, graphene flakes and single-walled carbon nanotubes can be considered nanomaterials as long as they have one dimension below 1 nm.

Nanomaterials can be used in many different areas of life. For instance, carbon nanotubes, made of atom layers of graphite formed into cylinders, are very popular. They may be made of a single layer of graphite or multiple concentric layers of graphite.<sup>8</sup> Thus, they comprise carbon atoms connected in the shape of a tube, sometimes with a single wall (cylinder) – then they are single-walled carbon nanotubes, or multiple walls (cylinders) – then they are multi-walled carbon nanotubes.<sup>9</sup>

<sup>4</sup> E. Stokes, *Regulating Nanotechnologies: Sizing Up the Options*, "Legal Studies" 2009, 29, p. 1.

<sup>5</sup> G.N. Mandel, *Regulating emerging technologies*, "Law, Innovation and Technology" 2009, 1, p. 77.

<sup>6</sup> A. Wardak, M.E. Gorman, *Using Trading Zones and Life Cycle Analysis to Understand Nanotechnology Regulation*, "The Journal of Law, Medicine & Ethics" 2006, 34, p. 700.

<sup>7</sup> European Commission Recommendation of 18 October 2011 on the definition of nanomaterial (Text with EEA relevance) (2011/696/EU) [2011] OJ L 275/38.

<sup>8</sup> *Nanotubes and Buckyballs*, "Nanotechnology Now", <https://www.nanotech-now.com/nanotube-buckyball-sites.htm> (access: 7.11.2022).

<sup>9</sup> C.A. Poland et al., *Carbon Nanotubes Introduced into the Abdominal Cavity of Mice Show Asbestoslike Pathogenicity in a Pilot Study*, "Nature Nanotechnology" 2008, 3, pp. 423–426; H. Nagai, S. Toyokuni, *Differences*

In medicine, carbon nanotubes are tested as prospective carriers for anti-neoplastic drugs.<sup>10</sup> Despite traditional applications, such as the manufacture of tennis rackets or baseball bats, they are used increasingly often in constructing aeroplane wings or video displays.<sup>11</sup> Carbon nanotubes may be used to manufacture cosmetics and durable water filters,<sup>12</sup> which may prove beneficial considering possible global water deficits in the future.<sup>13</sup> They are flexible and lightweight, offering enhanced heat transfer efficiency, and they are an ideal material for the manufacture of solar cells in the solar power sector.<sup>14</sup> Their sturdiness may benefit the manufacture of wind turbines in the wind power sector.<sup>15</sup> Combined with specific bacteriophages, they may be rapidly carried in an aquatic environment.<sup>16</sup> Carbon nanotubes are insoluble in water and do not degrade in nature.<sup>17</sup>

The global development of nanotechnology has significant consequences for workplace OH&S. Sources of exposure to nanomaterials may be found in multiple sectors, e.g. construction, medicine or any industry where nanomaterials are used or contracted with. Exposure is also present during the processing of nanomaterials.<sup>18</sup> Nanomaterials may be inhaled, ingested or come into contact with skin. Workers may inhale harmful nanoparticles, and they can reach workers' lungs or with blood to hearts.<sup>19</sup>

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*and Similarities between Carbon Nanotubes and Asbestos Fibers during Mesothelial Carcinogenesis: Shedding Light on Fiber Entry Mechanism*, "Cancer Science" 2012, 103, p. 1381.

- <sup>10</sup> M. Wiśniewski et al., *Medyczne aspekty nanostrukturalnych materiałów węglowych*, „Inżynieria i Ochrona Środowiska” 2013, 6, p. 258; W. Yang et al., *Carbon Nanomaterials in Biosensors: Should You Use Nanotubes or Graphene?*, "Angewandte Chemie International" 2010, 49, p. 2134.
- <sup>11</sup> J.C. Monica, *An Industry-Driven Approach to EHS Issues: The NanoSafety Consortium for Carbon*, "Nanotechnology Law & Business" 2010, 7, pp. 254–257.
- <sup>12</sup> K.A. Van Tassel, R.H. Goldman, *The Growing Consumer Exposure to Nanotechnology in Everyday Products: Regulating Innovative Technologies in Light of Lessons from the Past*, "Connecticut Law Review" 2011, 44, p. 501.
- <sup>13</sup> N. Block, *The Very Big Fuss over Very Small Things: Advising on the State of Regulation of Nanotechnologies*, "Texas Environmental Law Journal" 2007, 38, pp. 2–5.
- <sup>14</sup> L.A. Ferrigni, *The Use of Nanotechnology within the Solar Industry: A Sustainability Perspective*, "Jurimetrics" 2014, 54, p. 414.
- <sup>15</sup> N. Kaddour, *No Laws in Nanoland: How to Reverse the Trend: The French Example*, "Pace Environmental Law Review" 2013, 30, p. 487.
- <sup>16</sup> A.E. Merrymana et al., *Interaction between Functionalized Multiwalled Carbon Nanotubes and MS2 Bacteriophages in Water*, "Science of The Total Environment" 2019, 670, p. 1148.
- <sup>17</sup> J. Sass et al., *Nanotechnologies: The Promise and the Peril Sustainable*, "Development Law & Policy" 2006, 6, p. 11.
- <sup>18</sup> *European Agency for Safety and Health at Work*, "Managing Nanomaterials in the Workplace", <https://osha.europa.eu/pl/themes/nanomaterials> (access: 7.04.2022).
- <sup>19</sup> S. Heselhaus, *Risk Management of Nanomaterials: Environmental and Consumer Protection under Existing EC Legislation on Chemicals, Pesticides and Biocides*, "Environmental Law Review" 2010, 12, pp. 115–117; W. Utembe, M. Gulumian, *Questioning the Adequacy of the Regulatory Regime for Nanotechnology in Malawi*, "Malawi Law Journal" 2013, 7, p. 14; P.C. Sarahan, *Nanotechnology Safety: A Framework for Identifying and Complying with Workplace Safety Requirements*, "Nanotechnology, Law & Business" 2008, 5, p. 193.

## Nanomaterials in the Working Environment

Broader application of nanomaterials and their manufacture may lead to increased exposure to the release of nanomaterials to the working environment at every stage of any nanomaterial's lifecycle. The working environment risks to workers may particularly occur when manufacturing and formulating nanomaterials or products of nanotechnology.<sup>20</sup>

Consequences for workers' health have to be analysed in the context of exposure routes. For example, unique features of carbon nanoparticles may reach specific body parts via inhalation easier than in the case of standard-sized particles.<sup>21</sup>

The literature presents results of tests indicating toxicity of carbon nanotubes comparable to that of asbestos (particularly concerning inflammations), depending on their functionality and size.<sup>22</sup> The results of one of the tests accepted conclusions on their adverse impact on a biological organism. The test demonstrated the toxic action of long, thin, multi-walled carbon nanotubes that look and behave like asbestos fibres, which under specific exposure conditions may lead to the development of lung cancer caused by inhaling such carbon nanotubes, the same as with exposure to harmful asbestos.<sup>23</sup> Some other tests demonstrated the potential toxic effect of carbon nanotubes on lungs and cells. Depending on the dosage, carbon nanotubes caused the development of, for instance, lung inflammation in mice.<sup>24</sup> As a consequence of such results, some companies halted the use of carbon nanotubes or distribution of carbon nanotubes, and in one case, an insurer refused to insure companies manufacturing carbon nanotubes.<sup>25</sup>

Carbon nanotubes are the main example of the potential adverse effect of nanomaterials on the human body.<sup>26</sup> Results of tests indicate further that nano-zinc oxide may cause tissue inflammation, the production of free radicals or damage to lysosomes.<sup>27</sup> Researchers of medicinal applications observed, in turn, in their tests

<sup>20</sup> M.G.M. Berges et al., *Risk Assessment and Risk Management*, [in:] U. Vogel et al. (eds.), *Handbook of Nanosafety: Measurement, Exposure and Toxicology*, London 2014, p. 283.

<sup>21</sup> J.C. Monica, op. cit., pp. 254–257.

<sup>22</sup> C.A. Poland et al., op. cit., pp. 423–426; H. Nagai, S. Toyokuni et al., op. cit., pp. 1381–1388.

<sup>23</sup> C.A. Poland et al., op. cit., pp. 423–426.

<sup>24</sup> A.A. Shvedova et al., *Unusual Inflammation and Fibrogenic Pulmonary Responses to Single-walled Carbon Nanotubes in Mice*, "American Journal of Physiology-Lung Cellular and Molecular Physiology" 2005, 289, p. 698.

<sup>25</sup> J.C. Monica, op. cit., pp. 254–257.

<sup>26</sup> S. Kaluza et al., *Workplace Exposure for Nanoparticles*, *Workplace Exposure for Nanoparticles*, [https://osha.europa.eu/en/publications/literature\\_reviews/workplace\\_exposure\\_to\\_nanoparticles](https://osha.europa.eu/en/publications/literature_reviews/workplace_exposure_to_nanoparticles) (access: 7.11.2022).

<sup>27</sup> A.E. Nel et al., *Understanding Biophysicochemical Interactions at the Nano-bio Interface*, "Nature Materials" 2009, 8, p. 551.

that nanoparticles of titanium dioxide caused genetic damage in mice.<sup>28</sup> Nanoparticles of iron oxide may pose the risk of neoplastic diseases under specific exposure conditions.<sup>29</sup>

For instance, test results indicate that the exposure degree of epithelium cells in human lungs varies depending on nanotubes' physical and chemical properties. Bigger length, higher metal content and larger nano-tube agglomerate size can provide a higher surface area of interaction with a cell, accelerating the reduction of cell vitality.<sup>30</sup> Carbon nanotube exposure analyses in mice conducted by scientists indicate that their toxicity may also be caused by, i.e. their rigidity.<sup>31</sup>

Undoubtedly, nanoparticle characteristics alone are not the factor deciding on their adverse effect on employees in the working environment. From the workplace exposure perspective, it is significant what quantity, type, and nature of nanoparticles find their way into the human body.<sup>32</sup> This is why adopting acceptable occupational exposure parameters at places of work and defining suitable protection measures for employees is so important. Uncontrolled exposure of a human to nanomaterials may result in yet unknown risks, requiring defining methods of responding to nanoparticle release scenarios at the workplace.

On the other hand, not every single risk has been identified yet.<sup>33</sup> There are multiple varying nanomaterials in the working environment, characterised by different weights, surface area and the number of particles. For instance, carbon nanotubes may vary between themselves in characteristics. There are more than 20 various types of thin-walled carbon nanotubes in lengths from five to 300 nanometres. The literature informs us about the existence of over 50,000 variants of single-walled carbon nanotubes, and each of them may have different chemical, physical and biological properties.<sup>34</sup> In addition, nanoparticles released may differ in their nature from any original ones. Attempts at characterising released nano-

<sup>28</sup> B. Trouiller et al., *Titanium Dioxide Nanoparticles Induce DNA Damage and Genetic Instability In Vivo in Mice*, "Cancer Research" 2009, 69, p. 8784.

<sup>29</sup> T.A. Stueckle et al., *Evaluation of Tumorigenic Potential of CeO<sub>2</sub> and Fe<sub>2</sub>O<sub>3</sub> Engineered Nanoparticles by a Human Cell In Vitro Screening Model*, "NanoImpact" 2017, 6, pp. 39–40.

<sup>30</sup> R. Eldawud et al., *Carbon Nanotubes Physicochemical Properties Influence the Overall Cellular Behavior and Fate*, "NanoImpact" 2018, 9, p. 81.

<sup>31</sup> S. Halappanavar et al., *Ranking of Nanomaterial Potency to Induce Pathway Perturbations Associated with Lung Responses*, "NanoImpact" 2019, 14, p. 12.

<sup>32</sup> The Royal Society & The Royal Academy of Engineering, *Nanoscience and Nanotechnologies: Opportunities and Uncertainties*, [https://royalsociety.org/-/media/Royal\\_Society\\_Content/policy/publications/2004/9693.pdf](https://royalsociety.org/-/media/Royal_Society_Content/policy/publications/2004/9693.pdf) (access: 7.11.2022).

<sup>33</sup> L.A. Ferrigni, *The Use of Nanotechnology within the Solar Industry: A Sustainability Perspective*, "Jurimetrics" 2014, 54, p. 431.

<sup>34</sup> N. Block, op. cit., pp. 2–5.

materials are in the early stages.<sup>35</sup> From this perspective, it is important to establish useful databases based on research conducted that could consider the lifecycle of nanoparticles and their various types in the context of potential routes of exposure.<sup>36</sup> It is also worth pointing to non-uniform research methods adopted to determine particle parameters – measurements are based on particle mass, quantity or surface area and size.<sup>37</sup>

## Legislative Initiatives on Nanotechnology in the European Union

Regarding the law, problems relating to nanomaterials may be governed on a regional, national level or even at company level. Nanomaterials are the subject of the European Union Recommendation 2011/696/EU on the definition of nanomaterials.<sup>38</sup> The definition of nanomaterial is adopted in the Regulation (EU) 2017/745 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No. 178/2002 and Regulation (EC) No. 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC.<sup>39</sup> This Regulation introduced a principle that products are designed and manufactured with a particular focus on nanomaterials, and the risks relating to the size and properties of particles that might be released into the body of a patient or a user, are reduced to the minimum. In addition, the Regulation qualified products containing nanomaterials to specific classes.

The obligations regarding the formulation of workplace OH&S principles were defined in Council Directive 89/391/EEC on the introduction of measures to encourage improvements in the safety and health of workers at work,<sup>40</sup> which in Article 6(1) sets out a general principle that ‘the employer shall take the measures necessary for the safety and health protection of workers, including prevention of occupational risks and provision of information and training, as well as provision of the neces-

<sup>35</sup> A. Al-Kattan et al., *Characterization of Materials Released into Water from Paint Containing Nano-SiO<sub>2</sub>*, “Chemosphere” 2015, 119, p. 1315.

<sup>36</sup> D.M. Mitrano et al., Review of Nanomaterial Aging and Transformations through the Lifecycle of Nano-enhanced Products, *Environment International* 2015, 277, p. 144.

<sup>37</sup> E. Jankowska, *Nanobiętki w środowisku pracy*, “Podstawy i Metody Oceny Środowiska Pracy” 2011, 70, pp. 7–20.

<sup>38</sup> European Union Recommendation 2011/696/EU of 18 October 2011 on the definition of nanomaterials [2011] OJ L 275/38.

<sup>39</sup> Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC [2017] OJ L 117/1.

<sup>40</sup> Council Directive 89/391/EEC of 12 June 1989 on the introduction of measures to encourage improvements in the safety and health of workers at work [1989] OJ L 183/1.

sary organisation and means.' Under Article 4(1) of the Council Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work,<sup>41</sup> 'the employer shall first determine whether any hazardous chemical agents are present at the workplace. If so, he shall then assess any risk to the safety and health of workers arising from the presence of those chemical agents.' Further, the employer undertakes to eliminate or reduce to a minimum 'risks to the health and safety of workers at work' (Article 5(2)(a) of the Directive). Protection of health in the context of chemicals is also governed by Regulation (EC) No. 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.<sup>42</sup> The text of that Regulation stresses that it is for that it is 'for manufacturers, importers and downstream users to ensure that they manufacture, place on the market, or use such substances that do not adversely affect human health or the environment' (Article 1(3) Regulation (EC) No 1907/2006). This Regulation governs obligations relating in particular to notifying of data on chemicals under the supply chain, including informing workers of their use and risks they pose in the working environment. Provisions of another Regulation of the European Parliament and of the Council No 1272/2008 of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 provides for the classification of chemical substances placed on the EU market.<sup>43</sup> The above regulation on substances or mixtures also applies to nanomaterials, which are subject to classification, labelling and packaging regulations. However, these regulations do not explicitly address the impact of the special characteristics of

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<sup>41</sup> Directive 98/24/EC of 7 April 1998 on the protection of the health and safety of workers from the risks related to chemical agents at work [1998] OJ L 131.

<sup>42</sup> Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC [2006] OJ L 396/1.

<sup>43</sup> Regulation of the European Parliament and of the Council No 1272/2008 of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 provides for the classification of chemical substances placed on the EU market [2008] OJ L 353/1.



nanomaterials, particularly their unusual size, on worker health in the work environment and the employer's response to that impact.<sup>44</sup>

A variety of positions presented by individual EU bodies can also be observed. For instance, the European Parliament has adopted the Resolution on regulatory aspects of nanomaterials.<sup>45</sup> The Parliament addressed the Commission to assess the need for the revision of regulations on the protection of employees, i.e. to include the use of nanomaterials only in enclosed systems or in a manner preventing exposure, until reliable methods of detection and control of exposure are available, and that manufacturers and employers are clearly burdened with liability for the use of nanomaterials. In addition, the Parliament called for consideration of all routes of exposure (inhalation, skin contact, other). In 2014, the European Commission published the guidelines for protecting employees' health against potential risks posed by nanomaterials occurrences in the working environment.<sup>46</sup>

## How to Regulate Health and Safety at Work in Nanomaterials?

Regulating nanotechnology requires many steps, especially adequate knowledge of nanoparticle toxicity. Communicating this through relevant authorities and scientists, risk assessment of nanomaterials and employer response can help. The interaction of legal protection authorities with employers is extremely important. The United States of America, where the OH&S Act has been in force since 1970, may serve as a good example of undertaking such efforts.<sup>47</sup> The Nanotechnology Research and Development Act of 2003 governs the organisational sphere of national research on nanotechnology so that research activities in this area are well coordinated.<sup>48</sup> Also visible are the effects of efforts undertaken by individual institutions as regards OH&S in the environment of nanomaterials. The US National Institute for Occupational Safety and Health prepared, for instance, 2009 a report on nano-

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<sup>44</sup> For further discussion, see: M. Jarota, *European Legal Protection of Employees' Health Working with Nanoparticles in the Context of the Christian Vision of Human Work*, "Nanoethics" 2021, 15, pp. 106–108.

<sup>45</sup> European Parliament resolution of 24 April 2009 on regulatory aspects of nanomaterials (2008/2208(INI)) [2010] OJ C 184 E/82.

<sup>46</sup> European Commission, *Guidance on the Protection of the Health and Safety of Workers from the Potential Risks Related to Nanomaterials at Work*, Brussels 2014, <http://ec.europa.eu/social/BlobServlet?docId=13087&langId=en%20> (access: 7.11.2022).

<sup>47</sup> Occupational Safety and Health Administration, *OSH Act of 1970*, <https://www.osha.gov/laws-regs/oshact/toc> (access: 7.11.2022).

<sup>48</sup> 108th Congress (2003–2004), *21st Century Nanotechnology Research and Development Act*, <https://www.congress.gov/bill/108th-congress/senate-bill/189> (access: 7.11.2022).

materials, and in 2012, they provided OH&S guidelines for the workplace use of nanomaterials.<sup>49</sup> NIOSH is also undertaking broadly understood scientific and information activities, expressed, i.e. by the analysis of the safety of operations in a nanomaterial reactor<sup>50</sup> or postulating recommendations with regard to the permitted concentration of nanotubes for exposure in the working environment.<sup>51</sup> In 2004 NIOSH established a Research Centre, which objectives include, among others, informing especially workers and employers dealing with nanomaterials, about hazards and risk management methods.<sup>52</sup> Currently, NIOSH has a plan in effect for 2018–2025 – its goal is to protect workers who perform job duties involving nanomaterials.<sup>53</sup>

The United States Environmental Protection Agency, based on the Toxic Substances Control Act 1976,<sup>54</sup> collects information on new and existing nanomaterials. In addition, EPA obtains data on new chemicals from manufacturers, which should be submitted before the substance is put into production or marketed. The EPA can then take specific measures against these substances when there is a health risk to workers.<sup>55</sup> The form submitted to EPA specifically includes information about risk management and the characteristics of the substance.<sup>56</sup> The EPA has great authority under TCSA, particularly regarding the safety verification of new chemicals.<sup>57</sup>

<sup>49</sup> The National Institute for Occupational Safety and Health, *General Safe Practices for Working with Engineered Nanomaterials in Research Laboratories*, Publication No. 2012–147, <http://www.cdc.gov/niosh/docs/2012-147/pdfs/2012-147.pdf> (access: 7.11.2022).

<sup>50</sup> The National Institute for Occupational Safety and Health, *Protecting Workers during Nanomaterial Reactor Operations*, <https://www.cdc.gov/niosh/docs/2018-120/pdf/2018-120.pdf?id=10.26616/NIOSH.PUB2018120> (access: 7.11.2022).

<sup>51</sup> The National Institute for Occupational Safety and Health, *Occupational Exposure to Carbon Nanotubes and Nanofibers, Current Intelligence Bulletin 65*, <https://www.cdc.gov/niosh/docs/2013-145/pdfs/2013-145.pdf> (access: 7.11.2022).

<sup>52</sup> The National Institute for Occupational Safety and Health (NIOSH), *Nanotechnology at NIOSH*, <https://www.cdc.gov/niosh/topics/nanotech/nanotechnology-research-center.html> (access: 7.11.2022).

<sup>53</sup> The National Institute for Occupational Safety and Health (NIOSH), *Nanotechnology News & Events*, <https://www.cdc.gov/niosh/docs/2019-116/> (access: 7.11.2022).

<sup>54</sup> *The Toxic Substances Control Act* (October 11, 1976), <https://uscode.house.gov/view.xhtml?hl=false&edition=2018&path=%2Fprelim%40title15%2Fchapter53&req=granuleid%3AUSC-prelim-title15-chapter53&num=0> (access: 7.11.2022).

<sup>55</sup> United States Environmental Protection Agency, *Control of Nanoscale Materials under the Toxic Substances Control Act*, <https://www.epa.gov/reviewing-new-chemicals-under-toxic-substances-control-act-tsca/control-nanoscale-materials-under> (access: 7.11.2022).

<sup>56</sup> United States Environmental Protection Agency, *Sample: TSCA §8(a) Reporting for Chemical Substances When Manufactured or Processed as Nanoscale Materials: Data Submission Form*, [https://www.epa.gov/sites/production/files/2017-08/documents/sample\\_nano\\_8a\\_submission\\_form\\_with\\_form\\_number\\_08172017.pdf](https://www.epa.gov/sites/production/files/2017-08/documents/sample_nano_8a_submission_form_with_form_number_08172017.pdf) (access: 7.11.2022).

<sup>57</sup> F.P. O'Brian, *An Overview of the Law of Nanotechnology*, [in:] D.D. Dana (ed.), *The Nanotechnology Challenge: Creating Legal Institutions for Uncertain Risk*, New York 2014. p. 360.

Should occupational health and safety law be drafted in such a way as to ensure an active role in it for Bodies with similar tasks as EPA or NIOSH? Can worker health protection when working with nanomaterials be effectively enforced?

On the one hand, one can point out that the main problem is related to a lack of strong enforcement of the obligation to ensure health and safety by competent legal protection bodies. Public authorities should develop such a law. According to this concept, strong control and prescriptive mechanisms for public administration bodies should be introduced through hard law in order to automatically enforce the fulfilment of duties by addressees of legal standards. Subsequently, one should rigidly enforce the obligations of, for instance, employers, by using tough sanctions. This law-making theory is also called legal centralism.<sup>58</sup> Some national labour inspectorates have adopted procedures to enforce compliance with OH&S standards.<sup>59</sup> Therefore, does introducing the possibility of such interference by a body into the consultations between an employee and its workers guarantee an improvement in dialogue quality? The need to put the legal status in order and respond to challenges related to the development of globalisation and corporatisation worldwide can be an advantage of such a form of legislation.<sup>60</sup> In turn, there is a risk inherent in this strong law concept due to the fact that such regulations can be symbolic, and such laws are easy to circumvent in practice.<sup>61</sup> Due to societal differences, centralised law can selectively solve problems and differentiate citizens' situations in an unauthorised manner.<sup>62</sup>

The approach opposing the centralised law assumes that the regulation based on governmental orders does not bring expected results. According to the supporters of this theory, one should apply the laissez-faire concept according to which the policy of public authorities should interfere with private activities and, therefore, also with the employers' activities as little as possible. This concept assumes that the law enters too many areas of the socio-economic life of the state.<sup>63</sup> The main advantages of this approach are its flexibility and freedom from state interference.<sup>64</sup> In some cases, however, this concept weakens, especially in employees,

<sup>58</sup> M. Galanter, *Justice in many rooms*, "Journal of Legal Pluralism" 1981, 19, p. 4–22.

<sup>59</sup> A. Jain, J. Hassard, S. Leka, C. Di Tecco, S. Iavicoli, *The Role of Occupational Health Services in Psychosocial Risk Management and the Promotion of Mental Health and Well-Being at Work*, "International Journal Environmental Research and Public Health" 2021, 18, p. 3632.

<sup>60</sup> J. Braithwaite, *The Regulatory State?*, [in:] R.E. Goodin (ed.), *The Oxford Handbook of Political Science*, New York 2011, pp. 217–235.

<sup>61</sup> I. Ayres, J. Braithwaite, *Responsive Regulation: Transcending the Deregulation Debate*, New York 1992, p. 3.

<sup>62</sup> M. Galanter, *op. cit.*, pp. 4–22.

<sup>63</sup> M.J. Lindsay, *In Search of 'Laissez-faire Constitutionalism'*, "Harvard Law Review" 2010, 123, p. 70.

<sup>64</sup> D.K. Brown, *Free Market Criminal Justice: How Democracy and Laissez Faire Undermine the Rule of Law*, New York 2016, p. 4.

the pursuit of common goals.<sup>65</sup> This is an important drawback because the will to implement common goals can motivate to work better.

There is also a third path: the responsive regulation theory, which points to the disadvantage of introducing orders without reference to a specific situation. Responsiveness enables widespread regulatory approaches (multiple variants of regulations), none of them universal because their effectiveness depends on the facts of the case.<sup>66</sup> This theory focuses on whether the behaviour of addressees of legal standards causes the correct application of the law. Under this concept, it is possible to adopt the rules of determining the behaviour's compliance with legal regulations according to the so-called pyramids.<sup>67</sup> Effective regulation should refer to assumed objectives. According to this theory, attaining such objectives is possible when pyramids of the hierarchy of sanctions and the hierarchy of regulatory strategies with a different degree of interventionism depending on the needs and circumstances. In such cases, regulatory Bodies escalate an intervention or reduce its scale in line with the place in the pyramid depending on the law's effectiveness results and whether objectives have been attained.<sup>68</sup> Such intervention can be soft, e.g. an explanation or persuasion, or tough, e.g. a civil or a criminal sanction.<sup>69</sup> The assumption that the higher the degree of strict enforcement of the law one can refer to (at the top of the law enforcement pyramid), the more effective legal regulations will be complied with is an argument favouring this theory. Consequently, it will not be necessary to resort to tougher law enforcement.<sup>70</sup>

Self-regulation is another variant of the responsiveness theory. Public authority bodies can delegate the regulation of certain areas to private entities (e.g. employer groups), but such delegation is conditional. The entities are held accountable for the application and creation of the law, and this means that companies are obliged to create the internal law subsequently ratified publicly and internally enforced by these companies. If the private enforcement of legal standards fails, they are enforced publicly.<sup>71</sup> This theory assumes that the law should be made considering

<sup>65</sup> R. Véronique, C. Vandenberghé, *Laissez-Faire Leadership and Affective Commitment: The Roles of Leader-Member Exchange and Subordinate Relational Self-concept*, "Journal of Business and Psychology" 2021, 36, pp. 533–551.

<sup>66</sup> J. van der Heijden, *Responsive Regulation in Practice: A Review of the International Academic Literature. State of the Art in Regulatory Governance Research*, Wellington 2020, pp. 7–17.

<sup>67</sup> M. Ivec, J. Braithwaite, *Applications of Responsive Regulatory Theory in Australia and Overseas: Update Regulatory Institutions Network; Regulatory Institutions Network*, Canberra 2015, pp. 3–41.

<sup>68</sup> I. Ayres, J. Braithwaite, *Responsive Regulation...*, p. 3.

<sup>69</sup> M. Ivec, J. Braithwaite, *Applications...*, pp. 3–41.

<sup>70</sup> I. Ayres, J. Braithwaite, *Responsive Regulation...*, p. 3.

<sup>71</sup> *Ibidem*.

the context, circumstances, behaviour and legal culture.<sup>72</sup> This concept of law making can turn out to be cheaper than the immediately direct law enforcement by public administration agencies themselves.<sup>73</sup> The risk inherent in this concept is about understanding why responsive mechanisms are applied.<sup>74</sup>

The responsive regulation theory is applied in practice to regulate occupational health and safety in New Zealand, Australia and Canada, among others. For instance, an agency in New Zealand, i.e. WorkSafe NZ, enforces the application of OH&S regulations through interventions and initiates various educational actions.<sup>75</sup>

There are not many studies referring to the aspect of effectiveness of this method in the countries where it is applied. The method should be analysed on a case-by-case basis in relation to the OHS risk in question. By way of example, it may be noted that the use of this method by labour inspectors in Australia has been studied in the past. The overall conclusions regarding this method are positive. The method helps employers to understand the importance of their response to risks and to detect undesirable or unlawful behaviour.<sup>76</sup> The advantages of using this method have been pointed out by the OECD, of which Australia is a member, highlighting that this mechanism allows employer inspection bodies to adapt to and monitor changing OHS risks in the work process on an ongoing basis.<sup>77</sup> Australia's experiential response mechanism approach is highly regarded.<sup>78</sup> However, the effectiveness of the responsive method may be questionable in the context of psychosocial risks. Labour inspectors may struggle to match appropriate measures to a given situation.<sup>79</sup> Nevertheless, research also indicates that under prevailing

<sup>72</sup> M. Ivec, J. Braithwaite, *Applications...*, pp. 3–41.

<sup>73</sup> I. Ayres, J. Braithwaite, *Responsive Regulation...*, pp. 173–176.

<sup>74</sup> J. van der Heijden, *op. cit.*, pp. 7–17.

<sup>75</sup> M. Ivec, J. Braithwaite, *Applications...*, pp. 3–41.

<sup>76</sup> R. Johnstone, M. King, *A Responsive Sanction to Promote Systematic Compliance? Enforceable Undertakings in Occupational Health and Safety Regulation*, "Australian Journal of Labour Law" 2008, 3, pp. 280–315; E. Donelan, *Regulatory Governance, Policy Making, Legislative Drafting and Law Reform*, Cham 2022, pp. 88–89.

<sup>77</sup> OECD, *Regulatory Enforcement and Inspections, OECD Best Practice Principles for Regulatory Policy*, OECD Publishing, <http://dx.doi.org/10.1787/9789264208117-en> (access: 7.03.2023).

<sup>78</sup> OECD, *Reviews of Regulatory Reform Government Capacity to Assure High-Quality Regulation in Australia*, <https://www.oecd.org/australia/44529857.pdf> (access: 7.03.2023).

<sup>79</sup> M. Quinlan, M. McNamara, R. Johnstone, *OHS Inspectors and Psychosocial Risk Factors: Evidence from Australia*, "Safety Science" 2011, 4, pp. 547–55; G. Baril-Gingras, *The Quebec Mandatory OHS Prevention Programme*, [in:] D. Walters, R. Johnstone, K. Frick, M. Quinlan, G. Baril-Gingras, A. Thébaud-Mony (eds.), *Regulating Workplace Risks: A Comparative Study of Inspection Regimes in Times of Change*, Cheltenham 2011, p. 236.

conditions, Australian inspectors can adapt over time to new situations and changes affecting the OHS risks.<sup>80</sup>

To date, no detailed studies have been carried out on the effectiveness of the application of this method in the context of the risks associated with using nano-materials in the working environment. It is, therefore, difficult to ascertain conclusively what the effect of applying responsive measures might be. Nevertheless, the impact of law on OHS practice in relation to biological risks has been analysed in the past, which allows some conclusions to be drawn. These analyses suggest that adopting guidelines for dealing with such risks and requiring employers to comply with them can positively impact working conditions. Research indicates that a key aspect and challenge in dealing with biological risks is a proper understanding of the risks by the employers themselves.<sup>81</sup> In this context, the responsive method is an interesting alternative to other methods, as it allows regular monitoring of OHS and the use of measures such as guidance, persuasion, and activating employers to protect workers' health, amongst other things. The more opportunities the authority has to use soft methods to influence the employer, the greater the chance that the employing entity will understand the importance of OHS measures.

The view that this method positively impacts OHS may also be supported by British research that analysed the impact on OHS of using only harsh sanctions. The results of these studies indicate that in the case of employers where physical hazards occur, such as railway companies, it is more appropriate to respond by remediation using a responsive method rather than by meting out traditional punishment.<sup>82</sup>

The example of Polish practice is interesting in the context of mechanisms used to monitor employers for chemical risks. In the Polish legal reality, employers apply OHS regulations, which the State Labour Inspectorate checks. In occupational health and safety matters, as defined in Article 11 of the Act of 13 April 2007 on the State Labour Inspectorate<sup>83</sup> labour inspectors may order the rectification of the identified shortcomings within a set deadline in cases where the violation concerns OHS regulations and principles, demand the suspension of specific works or prohibit them. An inspector may impose a fine ranging from PLN 1,000 to PLN 30,000 for

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<sup>80</sup> K. Frick, *Inspecting Occupational Health and Safety Process Standard in Australia*, [in:] D. Walters, R. Johnstone, K. Frick, M. Quinlan, G. Baril-Gingras, A. Thébaud-Mony (eds.), op. cit., pp. 112–114.

<sup>81</sup> J. Swan, A. Weyman, K. Oakley, B. Crook, *Legislative Aspects: An Evaluation of the Impact of COHSH Schedule 9 for Assessing Biological Risks*, "International Biodeterioration & Biodegradation" 2002, 3/4, pp. 150–153.

<sup>82</sup> B.M. Hutter, *Regulation and Risk. Occupational Health and Safety on the Railways*, New York 2007, pp. 313–321.

<sup>83</sup> Journal of Laws of 2022, item 1614.

OHS violations, according to Article 283 of the Labour Code Act of 26 June 1974.<sup>84</sup> Moreover, although this is a power that allows the inspector to react quickly to a threat, it is subject to criticism because the punishment is imposed on employers by the inspector self-imposed without specific and regular control.<sup>85</sup> There is no provision in the law for ways of rewarding employers, pyramids of sanctions and rewards, but when OHS regulations are violated, the inspector should respond to a given situation by issuing an order or prohibition. In principle, in the event of irregularities, the inspector has only hard measures at his disposal, such as an order or a ban on a specific action or omission. Exceptionally, according to Article 37a of the Act, in justified cases, particularly if it has not been established that there is a direct threat to the life or health of employees or other persons performing work or that a breach of regulations has been committed deliberately, the labour inspector may refrain from applying the abovementioned legal measures. Thus, it should be assumed that in Poland, the method of traditional punishment by means of sanctions only is applied. Indeed, one of the main assumptions of the Act on the State Labour Inspectorate at the time of its enactment was to tighten sanctions against employers for petty offences and crimes against the rights of persons performing paid work.<sup>86</sup> The provisions of the Act assume that the labour inspectorate applies the measures under Article 11 of the Act only in the case of the occurrence of a violation of the law or OHS rules. Where no such violation has been found, sanctions could not be applied. How should the effectiveness of this method be assessed?

There are no in-depth studies in Poland indicating a link between the current model of the way in which orders, prohibitions or penalties are imposed on employers in the field of OHS and the level of employee health protection, in particular, the achievement of adequate results of this protection by employers. Labour law literature, however, notices shortcomings on the part of the State Labour Inspectorate with regard to the preventive impact measures applied to employers in order to avoid the negative impact of working conditions on employee health. It is postulated, irrespective of the type of risk, that it should be monitored on an ongoing basis using external bodies. Above all, it is pointed out that it is necessary to broaden the scope of the inspection's activities in order to achieve the assumed goals due to the ineffectiveness of the actions sometimes taken by the inspection.<sup>87</sup> Literature

<sup>84</sup> Consolidated text Journal of Laws of 2022, item 1510, as amended.

<sup>85</sup> M. Flasiński, *Kontrola i nadzór Państwowej Inspekcji Pracy – granice uprawnień*, "Praca i Zabezpieczenie Społeczne" 1997, 10, p. 12.

<sup>86</sup> D. Makowski, *Rozwój regulacji dotyczących ustroju i kompetencji inspekcji pracy w Polsce*, "Acta Universitatis Wratislaviensis. Przegląd Prawa i Administracji" 2019, 3945, pp. 21–37.

<sup>87</sup> M.A. Liwo, *Problematyka ryzyka zawodowego w stosunkach pracy i stosunkach służbowych oraz egzekwowanie jego oceny przez Państwową Inspekcję Pracy*, "Studia z Zakresu Prawa Pracy i Polityki Społecznej" 2018, 4, pp. 351–352.

emphasises that the State Labour Inspectorate is more of a policing body rather than a control and protection authority. The main challenge is to extend the authority's sovereign competencies according to the need to counteract unlawful phenomena.<sup>88</sup> In fact, the current practice of labour inspection is mainly limited to the imposition of sanctions after inspection proceedings in response to violations of the law discovered.<sup>89</sup> Experts in labour law are right in postulating that the ways and mode of using the powers of labour inspectors should be altered and adjusted to the changing labour conditions.<sup>90</sup>

It is also worth noting that, according to the latest data from the State Labour Inspectorate, one of the reasons for OHS violations by employers is the disregard for hazards and the lack of knowledge regarding them.<sup>91</sup> The Authority's report for 2021 shows that in cases of chemical hazards characterised by a large number of hazardous and harmful environmental factors, inspections can broaden knowledge of, amongst other things, legal regulations, positively affecting occupational health and safety.<sup>92</sup>

Given such significant problems with employers' awareness of OHS risks, the Authority's efforts to motivate them to protect workers' health are particularly justified. The basic issue is what measures of influencing the employer would be effective. At this stage, it is difficult to unambiguously say which measures would be more effective than simple punishment in the context of specific nanomaterial risks. Certainly, however, the Authority's cooperation with employers, including pointing them in the direction of the desired behaviour, can positively influence the response to these risks. This, in turn, can be served by the responsive method, which, through the involvement of the Authority and its ability to use more measures than is currently guaranteed by law, can motivate employers to identify and respond to potential risks. A wider involvement of both employers and labour inspectors is needed to counter these violations.

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<sup>88</sup> M. Jabłoński, *Miejsce Państwowej Inspekcji Pracy w systemie organów państwa: wnioski de lege lata i de lege ferenda*, "Acta Universitatis Wratislaviensis. Przegląd Prawa i Administracji" 2019, 3945, pp. 66–78.

<sup>89</sup> Ł. Paroń, *Stosowanie środków kontroli i nadzoru nad przestrzeganiem przepisów i zasad ochrony pracy w praktyce inspektorów pracy*, "Acta Universitatis Wratislaviensis. Przegląd Prawa i Administracji" 2019, 3945, p. 105.

<sup>90</sup> T. Wyka, *Władcze formy działania Państwowej Inspekcji Pracy w dziedzinie ochrony pracy*, "Acta Universitatis Wratislaviensis. Przegląd Prawa i Administracji" 2019, 3945, p. 99.

<sup>91</sup> Sprawozdanie PIP z rekomendacją, <https://www.pip.gov.pl/pl/wiadomosci/139860,sprawozdanie-pip-z-rekomendacja.html> (access: 7.03.2023).

<sup>92</sup> Sprawozdanie z działalności Państwowej Inspekcji Pracy w 2021 r., <https://www.pip.gov.pl/pl/t/v/269141/Sprawozdanie%20z%20dzialalnosci%20Panstwowej%20Inspekcji%20Pracy%20-%202021.pdf> (access: 7.03.2023).



## Can Dialogue Be an Appropriate Instrument for Implementing OH&S Regulations at Employers Using Nanoparticles?

Pointing to the regulation of nanotechnology in the work environment through self-regulation by employers, it is important to consider how the law is introduced. Nanotechnology can be regulated in the employer's internal regulations introduced as part of the dialogue between the employer and the trade unions. Attention is now being drawn to the need not only to regulate but also to coordinate and implement appropriate instruments using dialogue by state and private bodies, including employers. Projects demonstrating the importance of dialogue in connection with the development of nanotechnologies have already been carried out in Germany and Austria, among others.<sup>93</sup>

Dialogue is an expression used when referring to all kinds of negotiations and consultations between representatives of employers and employees, including joint follow-up actions.<sup>94</sup> It is a conversation that aims to reach an agreement on a specific matter in the process of real-time debate between two opposing parties. This all points to the overriding objective of dialogue, namely future benefit.<sup>95</sup> Dialogue is defined as communication embodying the concept of democracy at work.<sup>96</sup> Dialogue based collaboration of partners mostly serves as a conflict prevention tool. Employees may effectively seek the protection of their collective interests, acting as one community. Dialogue makes it possible to conduct negotiations in such a manner that allows all the interested parties involved to have a sense of their joint responsibility for the result of their dialogue. Parties to the dialogue can confront their views with those of the interlocutor and present conclusions resulting from different perspectives adopted to evaluate a situation.<sup>97</sup> On the international level, according to Article 2 of the International Labour Organisation's Convention No. 154,<sup>98</sup> this term refers to negotiations between an employer, a group

<sup>93</sup> NanoTrust, *Austrian Academy of Sciences: Nanotechnology – Governance through Dialogue*, <https://www.nanowerk.com/spotlight/spotid=31258.php> (access: 7.11.2022).

<sup>94</sup> International Labour Organisation, *Social Dialogue: Finding a Common Voice*, [https://labordoc.ilo.org/discovery/fulldisplay?vid=41ILO\\_INST:41ILO\\_V2&docid=alma994818913402676&context=L](https://labordoc.ilo.org/discovery/fulldisplay?vid=41ILO_INST:41ILO_V2&docid=alma994818913402676&context=L) (access: 7.11.2022).

<sup>95</sup> A. Arnold, *Słownik języka polskiego*, Bielsko-Biała 2008, p. 87.

<sup>96</sup> M. Gładoch, *Dialog społeczny w zbiorowym prawie pracy*, Toruń 2014, p. 10.

<sup>97</sup> E. Hazelzet, H. Bosma, A. de Rijk, I. Houkes, *Does Dialogue Improve the Sustainable Employability of Low-Educated Employees? A Study Protocol for an Effect and Process Evaluation of "Healthy HR"*, "Front. Public Health" 2020, 8, p. 2.

<sup>98</sup> Collective Bargaining Convention International Labour Organisation No. 154, [https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100\\_INSTRUMENT\\_ID:312299](https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312299) (access: 7.11.2022).

of employers or one or more employers' organisations and a trade union or unions, conducted to determine terms of employment or to regulate relations between employers and workers. In principle, according to the ILO, the term *dialogue* covers all negotiations relating to collective working conditions.<sup>99</sup> Dialogue and collaboration between trade unions and employers is the cornerstone of the so-called European Social Model. European Social Model is based on, i.e. fundamental social rights, solidarity and employee participation.<sup>100</sup> The European Commission underlines that better organisation of work or ensuring OH&S may be reached under collaboration between trade unions and employers on the site level.<sup>101</sup>

The requirement of consultation on OH&S matters is a direct implementation of Article 11 of Directive 89/391/EEC. This Directive is imposed on both employers and employees with the obligation to collaborate on OH&S related matters.<sup>102</sup> Such collaboration is also assumed by Article 19 of Convention No. 152 of the International Labour Organisation on the health and safety of workers and the working environment.<sup>103</sup>

The general rule resulting from European regulations is that employers should consult workers and their representatives on issues relating to the occupational health and safety of workers occupational health and safety. Individual European states regulate the rules of such dialogue and its detailed scope internally. However, is the dialogue being used optimally?

For instance, in Poland health care employers are not consulting with trade unions on OH&S matters all too often.<sup>104</sup> Even in connection with changes in work organisation and equipment of the workplace, implementation of new processes

<sup>99</sup> B. Gernigon, A. Odero, H. Guido, *Collective Bargaining: ILO Standards and the Principles of the Supervisory Bodies*, Geneva 2000, p. 75.

<sup>100</sup> R. Blanpain, *In Search of a European Social Model (ESM): A Dream?* [in:] M. Matey-Tyrowicz, L. Nawacki, B. Wagner (eds.), *Prawo pracy a wyzwania XXI wieku. Księga Jubileuszowa Profesora Tadeusza Zielińskiego*, Warszawa 2002, pp. 569–575; M. Matey-Tyrowicz, *Podstawowe prawa społeczne w dziedzinie pracy jako „mega-źródła” prawa pracy*, [in:] M. Matey-Tyrowicz, T. Zieliński (eds.), *Prawo pracy RP w obliczu przemian*, Warszawa 2006, pp. 53–100; R. Blanpain, *European Labour Law*, Alphen aan den Rijn 2014, pp. 1031–1046.

<sup>101</sup> European Commission. Communication from the Commission Partnership for change in an enlarged Europe – Enhancing the contribution of European social dialogue. COM(2004) 557 final, <https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52004DC0557> (access: 7.11.2022).

<sup>102</sup> A.M. Świątkowski, *Kodeks pracy. Komentarz*, Warszawa 2018, Legalis/el 2022.

<sup>103</sup> Occupational Safety and Health Convention International Labour Organisation No. 152, Polish Journal of Laws of 2005 no 93, item 775, [https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100\\_ILO\\_CODE:C152](https://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C152) (access: 7.11.2022).

<sup>104</sup> Table 1. Health and safety consultation on specific issues under labour law. The analysis used the survey conducted among chairpersons of one national trade union operating in different employers, representing healthcare professionals' rights and interests. The data was collected from a questionnaire referring to OH&S talks with the employer. The survey was conducted between 6 September 2021 and 30 November 2021; 21 union presidents with union activities at 21 employers participated.

and chemical substances and their preparations, if they pose a danger to the health and life of employees, a collaboration between employers and employees is not functioning as it should be.<sup>105</sup> It should be noted that in the Polish reality, the Minister of Health issued the regulation of 13 March 2020 on the announcement of epidemic risk in the territory of Poland.<sup>106</sup> In the regulation of 20 March 2020 on the announcement of epidemic state in the territory of Poland,<sup>107</sup> the Minister of Health announced the nationwide introduction of the epidemic state. Despite the challenges of the COVID-19 outbreak, the dialogue was not used frequently at select health care employers. Poland's example may also provide guidance to other EU countries. European employers should duly comply with the obligation to engage in OH&S talks with workers in connection with the objective set out in Article 11 of Directive 89/391/EEC.

The law is clear and does not raise doubts when it comes to its interpretation. If clear law makes it possible to undertake consultations, why is this form of dialogue not being used appropriately? The above analysis demonstrates that even the detailed definition of obligations gives no guarantee of the correct execution of OH&S consultations. Even the best structure of the law cannot replace the appropriate attitudes of parties to dialogue. The experience of dialogue in health service demonstrates that it is not the legislation that creates the main difficulties in the negotiations; the very application of the law is a challenge.

The introduction of tougher sanctions by public administration agencies by itself does not seem to be of key importance in this situation, but the modelling of legal culture in European societies can turn out to be important. Attitudes to the law and social responsibility for occupational health and safety are fundamentally important, and the key is the behaviour that should be promoted to prevent misapplication of the law in practice.

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<sup>105</sup> Table 2. Consulting on matters referring to changes in work organisation and workplace equipment, implementation of new processes and chemicals and their preparations, if they pose a danger to the health and life of employees. The analysis used the survey conducted among chairpersons of one national trade union operating in different employers, representing healthcare professionals' rights and interests. The data was collected from a questionnaire referring to OH&S talks with the employer. The survey was conducted between 6 September 2021 and 30 November 2021; 21 union presidents with union activities at 21 employers participated.

<sup>106</sup> Regulation of Minister of Health of 13 March 2020 on the announcement of epidemic risk in the territory of Poland, Polish Journal of Laws of 2020, item 433.

<sup>107</sup> Regulation of Minister of Health of 20 March 2020 on the announcement of epidemic state in the territory of Poland, Polish Journal of Laws of 2020, item 491.

Table 1. Health and safety consultation on specific issues under labour law

		Yes, always	Yes, not always	No, there was no need for such a consult	No, although there was a need for such a consult	No, but I am not sure if there was a need for such a consult	No answer
Has the Employer consulted the representatives of employees assigned by the trade union on the assessment of occupational risk for specific jobs and notification of such risk to employees?	before 14 March 2020	4.76%	14.29%	4.76%	47.62%	9.52%	19.05%
	between 14 March 2020 and 30 November 2022	0.00%	28.57%	4.76%	52.38%	4.76%	9.52%
Has the Employer consulted the representatives of employees assigned by the trade union on the assignment of personal protection equipment, work clothes and footwear to employees?	before 14 March 2020	14.29%	19.05%	4.76%	42.86%	4.76%	14.29%
	between 14 March 2020 and 30 November 2022	9.52%	19.05%	4.76%	47.62%	9.52%	9.52%
Has the Employer consulted the representatives of employees assigned by the trade union on the induction of personnel in occupational health and safety?	before 14 March 2020	14.29%	14.29%	14.29%	33.33%	9.52%	14.29%
	between 14 March 2020 and 30 November 2022	0.00%	28.57%	14.29%	33.33%	9.52%	14.29%
Has the Employer consulted the representatives of employees assigned by the trade union on medical counterindications in employees before permitting them to work in a specific workplace and new conditions?	before 14 March 2020	9.52%	19.05%	4.76%	42.86%	9.52%	14.29%
	between 14 March 2020 and 30 November 2022	0.00%	9.52%	9.52%	52.38%	14.29%	14.29%

Has the Employer consulted the representatives of employees assigned by the trade union on matters concerning the establishment of OH&S service or entrusting duties of such OH&S service to other persons or assigning first-aid personnel, and on the performance of tasks in firefighting and rescue of employees?	before 14 March 2020	9.52%	19.05%	9.52%	33.33%	33.33%	9.52%
	between 14 March 2020 and 30 November 2022	4.76%	14.29%	9.52%	28.57%	23.81%	19.05%

Source: own elaboration.

**Table 2.** Consulting on matters referring to changes in work organisation and workplace equipment, implementation of new processes and chemicals and their preparations, if they pose a danger to the health and life of employees

		Yes, always	Yes, but not upon introduction of each case (A2)	No, because no such changes were introduced (A3)	No, although such changes were introduced (A4)	No, but I do not know such changes were introduced (A5)	No answer
Has the employer consulted the representatives of employees assigned by the trade union on matters referring to changes in work organisation and workplace equipment, implementation of new processes and chemicals and their preparations, if they pose a danger to the health and life of employees?	before 14 March 2020	0.00%	14.29%	4.76%	57.14%	14.29%	9.52%
	between 14 March 2020 and 30 November 2022 (from the day of the epidemic risk in the territory of Poland and then during the epidemic state)	0.00%	23.81%	9.52%	57.14%	4.76%	4.76%

Source: own elaboration.

## Conclusions

The main reason for the lack of specific regulations in Europe is that, it is difficult to adopt a specific and universal model of action due to the diversity of nanomaterials. Since the properties of nanomaterials and their effect on human health are still at the test stage, it would be advisable to consider implementing internal standards and precautionary rules concerning work with nanomaterials. For example, some essential rules could be adopted with regard to general measures reducing the exposure (e.g. ventilation in premises) or PPE (e.g. face masks fitted with special filters, protective clothing). Also, it would be worth considering the implementation of the monitoring of indoor concentrations. It is not practicable to provide the same response to all nanomaterials, when their individual characteristics may vary significantly.<sup>108</sup>

In a situation where the addressee of the law makes choices, it may be justified to hold the employer responsible for improper conduct, such as failing to conduct OH&S procedures. In this way, the employer is encouraged to introduce internal rules so as to facilitate compliance with the provisions established by the legislator.<sup>109</sup>

In this context, it is worthwhile to consider the responsive regulation theory that makes it possible to grade the scope of regulation of issues. The scope depends on the needs and challenges of addressees of legal standards, making it possible to refer to a situation comprehensively. Both employers and the legislator can take advantage of this idea by appropriate regulation of the enforcement of the obligation to OH&S matters. Obviously, each employer should adapt such measures to the level of risks in the working environment. The employers could be authorised to regulate the terms of OH&S and, after that, draw potential conclusions related to law application in line with the attainment of a point in the hierarchy of the assumed results and objectives. There could be obligations for employers to respond to risks arising from evaluations of specific nanomaterials by scientists. In turn, regulatory agencies should intervene in this area depending on the attainment of the assumed objectives of the law. There is no doubt that such an approach would be very transparent.

Employers should have guaranteed mechanisms of the OH&S evaluating their actions to protect the health of workers working with nanoparticles. Such actions would make it possible to avoid the blurring of responsibility in a specific situation, especially when it comes to the responsibility of the state and employers for the

<sup>108</sup> See: M. Jarota, op. cit., pp. 105–115.

<sup>109</sup> Y. Feldman, *The Law of Good People. Challenging States' Ability to Regulate Human Behaviour*, Cambridge, New York 2018, pp. 219–222.

application of the law. In the event of the failure of private enforcement of legal standards, they are publicly enforced by agencies that intervene in line with attained results of the exercise of the purpose of the law could play a material role in this context. It is worthwhile to implement the theory of responsive regulation of safety in working with nanomaterials. The sense of responsibility for the effect could improve the quality of OH&S with nanomaterials. Employers should be aware of the importance of the risks associated with nanotechnology and their responsibility for worker health and safety. This is not about penalties for employers, but rather about showing them the desired direction in applying the law.

Occupational health and safety should be regulated through dialogue with employees. Both parties – employers and – trade unions to collective bargaining should strive to establish the OH&S dialogue. In this respect, much depends on the employer, who organises its work and takes responsibility for its functioning, especially regular meetings with workers' representatives. Presently, nothing will substitute the proper approach of the employer as the organiser of talks. Also, the trade union's approach, their openness to dialogue, is of paramount importance. Deployment of in-house procedures and principles for OH&S consultations should be considered. Employees should be adequately informed about the risks associated with nanomaterials and should participate in the development of regulations.

### List of abbreviations

**OH&S** – Occupational Health and Safety

**ILO** – International Labour Organisation

**EPA** – Environmental Protection Agency

**NIOSH** – The US National Institute for Occupational Safety and Health

**TCSA** – The Toxic Substances Control Act 1976

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