

Research, Development, and Dissemination of an Exposure Evaluation Method to Diagnose Toxic Chemicals Quickly and Effectively

Field name "Industrial poisoning from exposure to chemicals"

The focus of this field is the research, development, and dissemination of a useful exposure indicator for the diagnosis and treatment of health hazards related to industrial chemical substances. From the consultation examples collected by the Tokyo Rosai Hospital Clinical Research Center for Occupational Poisoning and through the practical application of the newest analysis technologies, we established a new exposure indicator for toxic chemicals as described below ¹.

1. In order to establish a method for evaluating the arsenic exposure of former Japanese army chemical weapon disposal technicians, we established an analytical method according to the form of the arsenic compounds excreted in urine based on HPLC-ICP-MS for organic arsenic compounds such as diphenyl arsinic acid (DPAA) ². As the first step, we clarified the level of normal Japanese workers that did not have occupational exposure to arsenic compounds ³. Furthermore, we investigated the change in arsenic compounds found in urine that were absorbed from the large quantities of arsenic compounds found in hijiki, a brown algae type seaweed, that is consumed by many Japanese ⁴.
2. We developed the flame photometric detection – gas chromatography (FPD-GC) method that simultaneously assays N-methyl-2-pyrrolidone (NMP) and its metabolites such as N-methylsuccinimide (MSI) and 2-hydroxy-N-methylsuccinimide (2-HMSI) for a biomonitoring method of NMP because the amounts of these compounds used in solvents in resin systems is increasing ⁵.
3. We reported on a hemoglobin adduct for a proteomics-based exposure evaluation system ⁶.
4. We reported on the world's first case of a healthcare worker being poisoned by ortho-phthalaldehyde (OPA) a replacement for glutaraldehyde (GA) as an antiseptic to sterilize medical instruments ⁷. Furthermore, we carried out environmental research and medical examination outside the normal screening schedule ⁸.
5. We developed a highly precise lead measurement method for biological specimens that uses a newly developed chelate resin ⁹. Furthermore, we reported on the diagnosis and treatment of lead poisoning regarding patients with acute lead poisoning who were administered chelate treatment ¹⁰.
6. We reported on chrome ulcers and their estimation based on chromium level measurement results and the skin condition obtained through discussion with a patient with chemical burns from undetermined causes ¹¹. Afterwards, we verified the cause as hexavalent chromium exposure based on research by The Labor Standards Bureau.
7. In a consultation case from overseas, we developed the HPLC-ICP MS method for measuring the urine concentration in a patient with acute dimethyltin- based poisoning and confirmed the metabolite based on LC-MS/MS. We also reported the details of the case ^{12, 13, 14}. Furthermore, we conducted collaborative research with Nagoya University to verify the methylation in mammals, and reported the results of animal experiments ¹⁵.
8. As an influence index for pyrethroid-based pesticide exposure, we developed a method for measuring permethrin in the blood ¹⁶.
9. We clarified that psychological tests such as the State-Trait Anxiety Inventory (STAI) and Profile of Mood States (POMS) tests can be used as a differentiation diagnostic procedure for the sick house syndrome (SHS) and multiple chemical sensitivity (MCS).

In addition to these many research items, we created a homepage for the occupational poison center that provides a search function (Fig. 23) for information regarding the legal regulations and toxicity of approximately 800 substances and information on the allowable concentrations is updated annually ¹⁷.

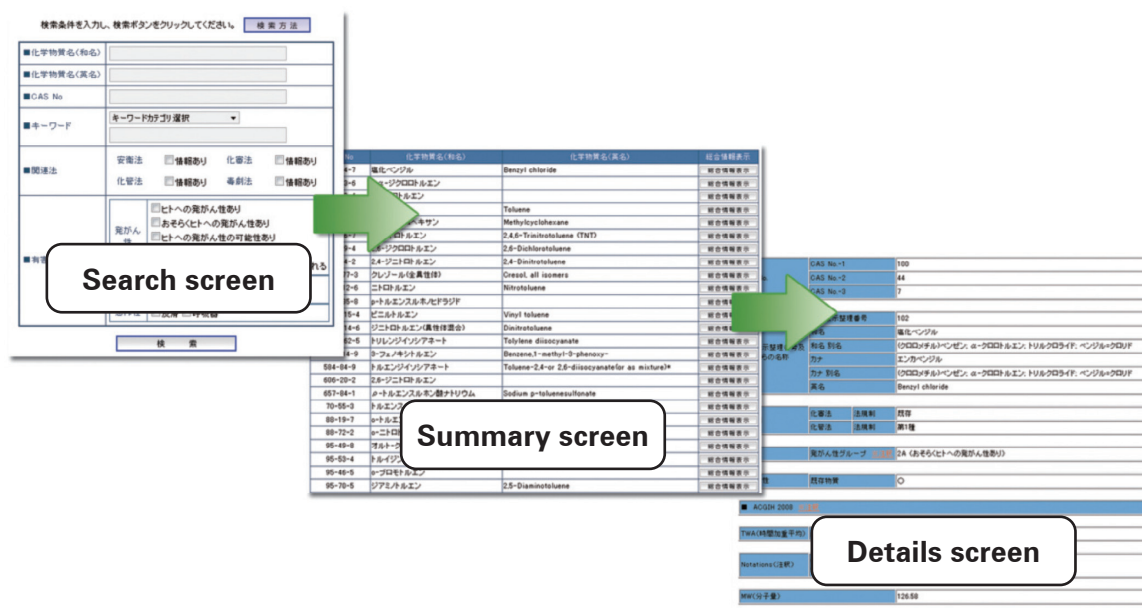


Fig. 23. Screens showing Industrial chemical substance search protocol (homepage is open to public)

[<http://www.research12.jp/sanchu/kagaku/index.html>]

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* Reference 1 can be viewed at <http://www.research12.jp/h13/index2.html>, a site dedicated to the research and development, and dissemination projects related to the 13 fields of occupational injuries and illnesses.

* Reference 17 can be viewed at <http://www.research12.jp/h13/index.html>, a site dedicated to the research and development, and dissemination projects related to the 13 fields of occupational injuries and illnesses.