NATIONAL JEWISH Medical and Research Center
Global Leader in Lung, Allergic and Immune Diseases

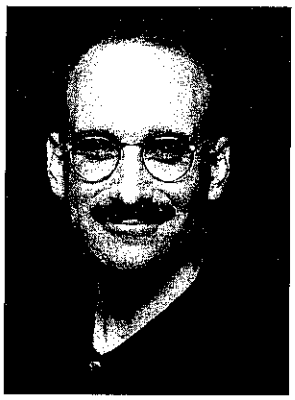
# Detecting Occupational Illness

## The Workplace: A Source of Preventable Illness

Patients increasingly express the concern that their occupations may adversely affect their health. Studies of general medicine hospital admission support this concern: when patients present with a respiratory or musculoskeletal primary complaint, occupational factors are implicated more than 10% of the time. For example, up to 15% of adult-onset asthma is due to occupational exposures or on-the-job aggravations.

Other statistics reveal that the economic costs of hazardous exposure and injuries on the job have reached more than $60 billion a year. Each year, physicians diagnose 125,000 to 350,000 first-time occupational illnesses. Failure to recognize and prevent these diseases clearly results in expensive, unnecessary health care and inappropriate treatment.

With these data in mind, physicians should consider the patient's occupation in relation to their chief complaint, treating each patient with a work-related illness as a "sentinel health event." With the sentinel approach, recognition of a work-related illness can lead to prevention when the history is traced to the hazards in the workplace that caused it. However, because so few physicians have training in recognizing and preventing such illnesses, they can easily miss the relationship between occupational risks and disease.



**Lee S. Newman, M.D.**
Director, Division of Environmental and Occupational Health Sciences
National Jewish Medical and Research Center;
Associate Professor
Department of Medicine and Department of Preventive Medicine and Biometrics
University of Colorado School of Medicine

The key to diagnosing occupational illness is to begin by suspecting it. The diagnosis may be obvious when the patient presents with an acute traumatic injury; physicians find more difficulty with diagnoses that result from repetitive motion or hazardous exposures that produce delayed latent health effects. Failing to ask patients about their work not only poses the risk of attributing the illness to non-work causes, but may also lead to unnecessary tests and a missed opportunity to protect others at risk in the environment.

## Collecting the Evidence: The Occupational Health History

An accurate occupational health history provides valuable clues to identifying relationships between the workplace and the patient's chief complaint. This process does not necessarily require unique knowledge of industrial processes or toxicology. "We recommend including a few simple screening questions in the written medical questionnaire that patients complete prior to the clinical visit," notes Lee Newman, M.D., Director of the Division of Environmental and Occupational Health Sciences at the National Jewish Medical and Research Center (see Table I on page 2 for example topics). "A brief chronology of jobs, exposures, and a checklist of hazards can be completed in minutes and reviewed quickly by the practitioner during the examination."

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Detecting Occupational Illness

**Table I. Elements of an Occupational Exposure Questionnaire**

(Reproduced with permission from Reference 1, page 1129)

**Current or most recent work and exposure history**
- Job title; type of industry; name of employer
- Year work started and year work finished (if not currently employed)
- Description of job, especially the parts of the job the patient believes may be potentially hazardous
- Current work hours and shift changes
- Current exposure to dust, fumes, radiation, chemicals, biologic hazards, or physical hazards
- Protective equipment used (clothes, safety glasses, hearing protection, respirator, or gloves)
- Other employees at the workplace who have similar health problems

**Earlier employment history**
- Job chronology, working backward from the current or most recent job
- The same information as above for each job previously held

**Checklist of major types of exposure associated with clinical illness**
- Gases
- Corrosive substances (acids, alkalis)
- Dyes and stains
- Dusts and powders
- Asbestos, other fibers
- Infectious agents
- Insecticides and pesticides
- Metals and metal fumes
- Organic dusts (cotton, wood, biologic matter)
- Plastics
- Solvents
- Petrochemicals (coal, tar, asphalt, petroleum distillates)
- Physical factors (noise, lifting, thermal stress, vibration, repetitive motion)
- Emotional factors (stress)
- Radiation (electromagnetic fields, x-ray radiation, ultraviolet radiation)

## Matching the History to Clinical Assessment

A quick scan of the medical questionnaire will help identify if the current illness might be work related. If the answers suggest a link, use the questionnaire as a guide during the interview and clinical assessment. The next step is simply to add a few brief questions to the medical interview and review of systems (see Table II).

Hazardous materials can affect any organ or system, but physicians can easily miss the occupational link by not using the occupational history interview and the clinical assessment together. Occupational medicine specialists such as those at National Jewish, through their experience in evaluation, treatment and research of work-related diseases, have learned important clues to the recognition of occupational disease by affected system (see examples in **Table III** on page 3). Even common illnesses can be caused or aggravated by occupational exposures.

These specialists have also discovered specific clues for which to search (see **Table IV** on page 5). When asked about the usefulness of familiarizing oneself with the type of data found in Tables III and IV, Dr. Newman points to the result of an improved patient–practitioner relationship. " Physicians who stop to ask their patients about their jobs and concerns about occupational hazards will be rewarded. Patients appreciate physicians who care about what they do and who are conversant with the potential health effects of workers—whether it's an OR nurse with latex allergy or a pipefitter with pleural plaques from asbestos."

## Investigating the Case: A Systematic Approach

Often, physicians choose to consult an occupational medicine specialist if their initial evaluation

**Table II. Beginning the Clinical Approach with a Two-Part Interview**

**The Quick Survey**

**Chief Symptoms and History of Present Illness**
- What kind of work do you do?
- Do you think your health problems are related to your work?
- Are your symptoms better or worse when you're at home or at work?

**Review of Systems**
- Are you now or have you previously been exposed to dusts, fumes, chemicals, radiation, or loud noises?

**Detailed and Job-Specific Questioning**

**Written Questionnaire (see Table I)**

**Practitioner Review of Exposure Guided by the Questionnaire**

**Examining the Link between Work and the Chief Symptom**
- More about the current job (description of a typical day)
- Review of job chronology and associated exposures
- Look for clinical clues (see Table IV)
- Follow-up on the timing link in detail (e.g., worse at work? better on vacation or weekends?)
- Ask if others at work have similar problems

## Table III. Examples of Occupational Disorders by Principal Target Organ, Exposure, and Cause

| Organ System and Disease | Exposure | Causative Agent |
|---|---|---|
| **Ophthalmologic** | | |
| Keratitis, conjunctivitis | Chemical industry | Organic acids |
| | Petroleum industry | Hydrogen sulfide |
| Cataracts | Radiologists | Ionizing radiation |
| | Glassblowers, bakers, blacksmiths | Infrared radiation |
| | Herbicide and pesticide production | Dinitrophenol, dinitro-o-cresol |
| **Ear, Nose and Throat** | | |
| Rhinitis | Agricultural workers, office workers | Pollens, molds, irritant dust |
| Nasal cancer | Woodworkers, furniture and cabinet workers | Hardwood dust |
| | Nickel smelting/refining | Nickel |
| **Hematologic/Lymphatic** | | |
| Anemia (hypochromic) | Battery, smelter, foundry workers | Lead |
| Non-Hodgkins lymphoma | Rubber industry, plastics industry, chemical industry | 1,3-butadiene |
| **Endocrine** | | |
| Goiter | Electroplating | Cyanide salts |
| | Rubber, pesticide, dye, chemical manufacture | Thiouracil, thiourea |
| Hypothyroidism | Chemical workers | Polybrominated biphenyls |
| **Respiratory** | | |
| Asthma/Asthma-like disorders (including vocal cord dysfunction) | Bakers, automotive painters, urethane workers | Flour, isocyanates, metals |
| | Jewelry makers, chemical industry | Platinum salts |
| Respiratory tract cancers | Asbestos manufacture and use | Asbestos |
| | Coke oven workers | Coke oven emissions |
| | Uranium miners | Radon daughters |
| | Chemists, ion exchange resin makers | Bis(chloromethyl)ether |
| | Metal processing, smelters | Arsenic, nickel, beryllium, chromate, cadmium |
| **Cardiovascular** | | |
| Atherosclerotic ischemic heart disease | Rayon workers, chemical workers | Carbon disulfide |
| | Tobacco smoking in confined spaces | Environmental tobacco smoke |
| Nonatherosclerotic ischemic heart disease | Explosives manufacture | Nitroglycerin, ethylene glycol dinitrate |
| | Motor vehicle, toll booth, garage, bridge and tunnel, foundry and furnace workers | Carbon monoxide |
| **Gastrointestinal/Hepatic** | | |
| Hepatitis | Dry cleaners, plastics industry, other users of solvents | Carbon tetrachloride, trichorethylene, chloroform |
| | Health care workers, child care workers, research laboratory workers | Hepatitis A, B, C viruses |
| Colorectal cancer | Pattern/model makers, woodworkers, metal workers | Abrasives, cutting oils, metal and wood dust |
| | Rubber workers | Benzidine, α-naphthylamine, β-naphthylamine |
| **Renal** | | |
| Interstitial nephritis | Battery manufacture, plumbers, solderers, lead workers | Lead |
| Renal malignancies | Coke oven workers | Coke oven emissions |
| **Genitourinary/Reproductive** | | |
| Bladder malignancies | Dye workers and rubber workers | Benzidine, naphthylamine, 4-nitrophenyl auramine |
| Male infertility | Chemical manufacture | Dibromochloropropane, lead |
| Female infertility | Chrome-plating, chemical manufacture | Chromium compounds |
| **Rheumatologic/Musculoskeletal** | | |
| Raynaud's phenomenon | Stone cutters, lumber jacks, foundry workers, workers handling power tools | Vibration |
| Progressive systemic sclerosis | Vinyl chloride manufacture | Vinyl chloride |
| | Epoxy resin manufacture | Bis(4-amino-3-methylcyclohexyl)methane |
| **Neurologic** | | |
| Acute encephalopathy | Solderers, battery manufacture, foundries, smelters, radiators/auto body repair | Lead |
| | Dry cleaning, textile industries, degreasers | Perchloroethylene, trichloroethylene, toluene |
| Headache | Pesticides, semi-conductor, pigment, electronics, smelters, soldering, battery industries | Metals (arsenic, lead, nickel, tin, tellurium) |
| | Paint, ink, paint removers, pharmaceutical, degreasers, dry cleaning, textiles industries | Hydrocarbon solvents |
| **Psychiatric** | | |
| Affective disorders, phobic disorders, depression, post-traumatic stress disorder | Secretaries, data entry, air traffic, transportation, police, waiters, health care, military workers | Stress from work load, dissatisfaction, monotony, harassment, shift work, lack of control, coworker death, past personal injury on the job |
| Acute psychosis/emotional instability | Mining, steel/iron, metal finishing, battery, welding industries | Manganese |
| | Electroplating, paint/varnish, viscose rayon, rubber | Carbon disulfide |
| **Dermatologic** | | |
| Contact dermatitis (irritant) | Chemical, alloy, metal, dye, ink/pigment, petrochemical, textile industries | Strong acids/alkalis, dichromates, arsenic oxide |
| Melanoma | Agricultural, brick layers, construction, fishing workers | Ultraviolet radiation from natural sunlight |
| | Welders, pipe cutters | Ultraviolet light from arc welding |
| **Systemic Disorders** | | |
| Inhalational fevers | Plastics manufacture | Polymer fumes |
| | Welders, metal cutting, smelters | Zinc oxide fumes |
| | Agricultural workers | Organic dust |
| Combined neurologic, dermatologic, respiratory symptoms | Office building workers, especially in "tight" and poorly ventilated buildings | Carbon monoxide, volatile organic compounds biological aerosols, building related illness |

raises suspicions of an occupational exposure. Few physicians in high volume practices have the time or resources to fully investigate the causal link of the patient's illness to the job site or prevent occupational illness. But, by being able to identify suspicious cases and turn to specialists who can investigate the exposures, toxicology, and industrial and agricultural work conditions, doctors extend their ability to prevent disease in the community.

In the current managed care environment, more and more primary care physicians assume responsibility for the management of those with workplace illnesses and injuries. Thus, these practitioners now have the unique opportunity to start the patient—and often whole corporations—on a path to disease prevention.

Occupational medicine physicians at National Jewish suggest a systematic approach if the chief complaint is work-related. First, establish a clear clinical diagnosis, such as the examples of asthma in bakers or bronchitis in coal miners. Then, conduct clinical tests to help exclude non-occupational causes.

Next, turn to available sources for supporting evidence. Major textbooks and internet sites present the most common environmental causes of particular occupational illnesses. Other resources offer information about specific workplace activities and describe the associated risks, including lists of common chemicals, typical exposures in common jobs, and their potential side effects. For example, the law requires companies using hazardous materials to maintain Material Safety Data Sheets (MSDS). The MSDS lists a particular product's ingredients, any known health hazards, precautions for safe handling, and permitted exposure limits. Occupational Health and Safety Administration (OSHA) regulation requires that employees have access to these sheets; however, they may be somewhat limited or overly generic. The MSDS often helps in identifying acute signs and symptoms rather than long-term health effects of a product. Table V (page 6) lists additional resources.

### "Fingerprinting" for Toxins

A variety of biologic assays are becoming available for detecting toxic exposures and health effects. Some such assays are better standardized than others. Physicians must be cautious in their selection and integration of blood, urine, and hair analysis for toxins. If used properly, such markers can confirm that an exposure has occurred and measure toxin-specific health effects or a person's individual susceptibility to toxins. For example, a whole blood lead assay can detect lead in the circulation from recent exposure. Erythrocyte or zinc protoporphyrin can estimate more remote lead exposure. The blood beryllium lymphocyte proliferation test measures the immunotoxic effects of beryllium. As in a recent case of chronic beryllium disease mistakenly identified as occupational sarcoidosis, such assays can help make the appropriate diagnosis. "At National Jewish," Dr. Newman comments, "we capitalize on our basic research in immunology to develop and clinically validate new bioassays for the effects of chemicals on the worker's immune system. A variety of metals, proteins—like latex—and toxins produce specific immunologic effects that we use as a marker of exposure."

Occupational medicine specialists at National Jewish expand the initial assessment inquiry by gathering detailed information on past and present exposure, work processes, and specific toxins. To accomplish this assessment, specialists use a team approach, coordinating with industrial hygienists, occupational heath nurses, health and safety personnel, and others at the patient's workplace. This assessment leads to an understanding of the nature and extent of the patient's exposure. The combination of the clinical evaluation and work site assessment leads to appropriate and effective treatment and primary and secondary prevention. Later, documentation from the specialist's investigation of a patient's work history can be critical in addressing workers' compensation issues and preventing the unnecessary illness in other workers.

## Clinical Management of Occupational Illness

Occupational medicine physicians can provide patients and their medical care providers with clarification of occupational illnesses. Findings and recommendations can significantly influence subsequent decisions about the management of the illness, such as return to work or work restriction. These decisions

**Table IV. Clues to the Recognition of Occupational Disease** (Reproduced with permission from Reference 1, page 1129)

| Clues | Comments | Examples |
|---|---|---|
| Job title or type of industry | Patients may be obviously at high risk or may work in hazardous industries where certain disorders occur at higher than average frequency | Tuberculosis in health care workers<br>Lead toxicity in radiator repair shops |
| Description of work tasks | Job titles are misleading and often fail to reflect workplace hazards; a description of a usual day at work is more helpful | Asthma in a taxidermist that turns out to be caused by the spraying of sensitizing isocyanate-containing polyurethane foams into molds |
| Major employment opportunities in the region | In areas with one or more large employers, many patients share common exposures, increasing the likelihood that work-related disease clusters will be recognized | Bronchitis and pneumoconiosis in coal-mining regions |
| The most common toxic exposures in local industries | The index of suspicion for certain work-related illnesses should be high because of the types of exposures and associated health effects in the largest local industries | Latex-induced dermatitis in a local glove manufacturing plan or in a hospital<br>Bladder cancer in rubber-manufacturing workers exposed to benxidine and naphthylamines |
| Coworkers who are sick or case clusters noticed in a clinical practice | Clusters of disease are often a helpful clue to both endemic and epidemic work-related illness | Viral hepatitis among workers in a child-care center<br>Nasal cancer among woodworkers |
| Past exposure to long-latency agents | Recognizing an important past exposure to toxic compounds helps the physician make the causal link to new symptoms of delayed onset | Asbestosis, lung cancer or mesothelioma in a former naval-shipyard worker with exertional dyspnea who has a history of exposure to asbestos |
| Pattern of disease onset | The onset of symptoms may be related to a change in employment, a change in job duties, or a change in the type of use of hazardous materials | New-onset angina after the use of a methylene chloride-containing paint stripper that is metabolized to carbon monoxide in blood |
| Pattern of aggravation of symptoms | There may be changes in symptoms during the workday or during the workweek or improvement during weekends and vacations | Improvement in hand paresthesias and wrist pain in a computer-terminal operator when on vacation, with recurrence on return to work |
| Unusual combination of multiorgan symptoms and signs | Multiorgan and systemic symptoms usually prompt concern about endocrine, infectious, drug-related, and autoimmune disorders; occupational-environmental exposures to toxins should also be considered | Psychiatric, neurologic, and hematopoietic symptoms and spermatogenic dysfunction due to concentration of inhaled or ingested manganese in mitochondrial-rich tissues in workers in welding, mining, and ore extraction |
| Unusual distribution of disease within an organ | The distribution of pathologic effects in an organ is often related to the area of most direct or intense contact with an occupational hazard | Rashes selectively involving the face, scalp, neck, and hands but sparing nonexposed parts of the body due to contact dermatitis in the workplace |
| Susceptible organ systems | Certain organs are more prone to occupational disease or to the aggravation of preexisting diseases because they | |
| | • are the portal of entry for or in direct contact with injurious agents | • Skin, mucous membranes, respiratory tract, auditory tract |
| | • detoxify or filter toxins | • Liver, kidney |
| | • are sites of bioaccumulation of toxic agents | • Bone, liver, central nervous system |
| | • are especially sensitive to the effects of toxic agents because of the rate of cell division or specialized cellular functions | • Lymphoid-hematopoietic system, reproductive organs, the fetus |
| | • are susceptible to injury by repetitive activity (cumulative trauma) | • Joints, muscles, carpal tunnel |
| Demographically "wrong" patient | When disease occurs in an unlikely person, one should consider occupational agents that can produce the same symptoms, signs, and pathologic consequences | Lung cancer in a lifelong nonsmoker due to past asbestos exposure, coke-oven emissions, or arsenic from a smelter |
| The "usual suspects" are innocent | When commonly recognized causes of illness have been eliminated from the differential diagnosis, the likelihood of an occupational and environmental cause rises | Hepatitis in a nonalcoholic, non-drug using patient with no risk factors and negative serologic tests caused by a workplace hepatotoxin |
| Idiopathic disease | Before assigning the designation "etiology unknown,' one should exclude environmental and occupational causes | Chronic beryllium disease masquerading as sarcoidosis in a in a patient who machines metals or ceramics or prepares dental alloys |
| Disease that does not respond to conventional medical therapy | In many instances of occupational disease, the problem has no chance of cure if the patient continues to be exposed | "Baker's asthma" in a corticosteroid-dependent patient who works as a baker and that could improve or be cured by avoidance of high-molecular-weight antigens in flour dust |

affect the patient's opportunities for employment, job advancement, earning potential, insurability, and psychological and social well-being in addition to physical health.

If a physician recommends a work restriction or permits return to work, he or she should first gather enough evidence that such interventions are justified.

- Is the restriction—even if temporary—likely to result in a better health outcome?
- Is return to full work duty safe or will the patient return to unhealthy conditions of re-exposure?
- Will the patient lose income or incur additional unnecessary medical expenses and hardship?
- Has the work site been modified to allow a safe return to duty?
- Does the patient have adequate protective equipment?
- How serious is the illness?
- Has the physician adequately documented the degree of impairment?

With these questions in mind, learn what tasks the worker needs to perform and determine the appropriate timing for return to work. Consider whether the work activities or ongoing or future exposures will aggravate, accelerate, or worsen the illness or condition.

If an exposure to allergens causes the disease and the patient remains in the exposure, then symptoms may worsen and require additional treatment with medication. For example, isocyanate-induced asthma (e.g., in auto body painters) can become life threatening or require unneeded steroids when the patient returns to work in the same plant—sometimes even in a seemingly "non-exposed" job.

Proper management of work-related disorders also requires an understanding of the workers' compensation system. Primary-care physicians and occupational medicine specialists are often asked to determine if the patient has a work-related illness or injury and if this condition has caused either temporary or permanent impairment. Such diagnoses require careful, thorough documentation of medical findings that support the medical conclusions. Reports should document the level of impairment, the effect of the illness on the activities of daily living, any necessary rehabilitation or treatment, and possible work modifications. Physicians must accurately describe and quantify the physical effects of the illness and ideally work with patient and employer to advise them on what modifications would be necessary if the worker were to return to the job. Dr. Newman concludes, "Physicians can help their patients who have work-related illnesses by being aware of their state's workers' compensation system. For example, in most states, this form of insurance should provide for a worker's lost wages, medical expenses, and, in some states, retraining and compensation for economic hardship caused by the job-induced illness. Usually, this applies to both those illnesses caused by work or those that were substantially aggravated by work. Clear and objective documentation by the treating practitioner helps."

## Reference

1. Newman, L.S. (1995). Occupational Illness. *New England Journal of Medicine*: 333, 1128–1134.

**Table V. Resources for Identifying Occupational Disease**

Textbooks and resource books
Telephone consultation with public health staff
OSHA resources *via* telephone, fax, CD ROM, or on-line (www.osha.gov)
Micromedex TOMES Plus Information System (www.micromedex.com)
Environmental Protection Agency's Integrated Risk Information System (IRIS) (www.epa.gov/iris/)
National Institute for Occupational Safety and Health (NIOSH) Registry of Toxic Effects of Chemical Substances (RTECS) (www.cdc.gov/niosh)
National Library of Medicine Toxline, Medline, and Toxnet (toxnet.nlm.nih.gov)

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National Jewish is known worldwide for treatment of patients of all ages with respiratory, immune and allergic diseases, including:

- Moderate to severe asthma (often patients with concomitant conditions and/or medication side effects)
- Allergic conditions (atopic dermatitis, drug allergies, food allergies, rhinitis)
- Chronic bronchitis
- Chronic fatigue syndrome
- Cystic fibrosis
- Emphysema/chronic obstructive pulmonary disease (COPD)
- Environmental and occupational lung and skin diseases
- Interstitial and fibrotic lung diseases
- Autoimmune diseases (lupus (systemic lupus erythematosis), juvenile rheumatoid arthritis
- Psychological issues relating to chronic diseases
- Sarcoidosis
- Sinusitis
- Sleep-related breathing disorders
- Tuberculosis/atypical mycobacterial infections
- Vocal cord dysfunction

# National Jewish Honors Levy Family

By Jeff Bradley

National Jewish Medical and Research Center hosted a ceremony on Friday, January 8 to dedicate a room in honor of the late J. Leonard Levy.

Various friends and three generations of the Levy family were present when Meyer Saltzman, chairman of the Board of Directors, and Lynn M. Taussig, M.D., president and CEO of National Jewish, dedicated the J. Leonard Levy Adult and Pediatric Rehabilitation Center Waiting Room. Patients who come from every state in the union use this facility.

The gift to National Jewish came from the J. Leonard and Myra Levy Family Fund. "We appreciate the generosity of this family," said Dr. Taussig. "They join a long line of supporters from the Jewish community who have taken this hospital from an 1899 tuberculosis center on the outskirts of Denver to an institution that U.S. News & World Report now ranks as the number one respiratory hospital in America."

Speaking at the ceremony, Dr. Taussig related the story of how Leonard Levy's parents, like so many people at the turn of the century, had left New York and came to Denver for their health. Mr. Levy grew up in Colorado and made his career in the beer distribution business.

"Leonard Levy came up the hard way," Dr. Taussig remarked, "and was certainly entitled to any and all aspects of the good life. As he prospered, however, he felt a need to 'give back' to his community and his city. He was generous with his money, his time, and his influence. He served on boards, he was president of his temple, and he made himself available to people and organizations who needed help."

Saltzman then recalled that Mr. Levy was on the board of the Children's Asthma Research Institute and Hospital, and helped facilitate the merger between the National Asthma Center and National Jewish. "Mergers are never easy," said Saltzman, "and it was through the hard work of Mr. Levy and others that the important work of the National Asthma Center continues today under the aegis of National Jewish.

Eddie Robinson, a member of the Board of Directors, who knew Mr. Levy for many years, also spoke on behalf of National Jewish. Speaking for the Levy family were Lana Friedman, daughter of Leonard Levy, and Les Berkowitz, his nephew.

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