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The working conditions and analysis of occupational hazards IN WORKERS OF POULTRY INDUSTRY

Abstract. ***It is noted that there are many serious risks to the safety and health of workers at poultry farms in Ukraine. These hazards include exposure to high levels of noise, dust, hazardous equipment, slippery floors, musculoskeletal disorders, hazardous chemicals and biological hazards. Studies show that prolonged exposure to high noise levels leads to noise hearing loss in workers of all ages. When performing work on catching, transplanting, transporting poultry, taking blood for chemical and serological tests, the noise level in the poultry house reaches 86 90 dB. It is noted that during the repair and maintenance of machinery and equipment there is a risk of injury due to heat, electric shock, burns, cuts, tears, amputation or fractures of body parts. Poultry workers are the most vulnerable occupational group in terms of the risk of developing respiratory diseases. It has been established that 8-hour inhalation of dust in a concentration exceeding 4 mg/m3 is especially dangerous. The highest level of respiratory diseases was in 45-55-year-old workers. It is noted that poultry workers are exposed to ergonomic risks, which can cause injuries to the musculoskeletal system. The researchers found that 81% of poultry processing jobs have an increased level of repetitive hand movements and exertion. Workers complained of pain, numbness, burning, tingling in the hands or wrists. It is noted that new technologies will be able to reduce some types of ergonomic injuries. A significant danger for poultry workers is the risk of catching avian influenza. It is noted that workers have the right to healthy and safe working conditions, the development of special programs to protect them from industrial hazards. To protect workers, it is necessary to implement engineering and control measures and provide appropriate personal protective equipment.***

Key words: *poultry, poultry workers, employers, jobs, poultry farms, occupational hazards, occupational safety, working conditions*

There are many serious safety and health hazards in the poultry industry in Ukraine. These hazards include exposure to high noise levels, dust, dangerous equipment, slippery floors, musculoskeletal disorders, hazardous chemicals and biological hazards. Musculoskeletal disorders are of particular concern and continue to be common among workers in the poultry industry. Employees can also be exposed to biological hazards associated with handling live birds or exposures to poultry feces and dusts which can increase their risk for many diseases *(Marchyshyna et al., 2015)*.

Thousands of poultry workers every year suffer from preventable hearing loss due to high workplace noise levels. Noise may be a problem in workplace if hear ringing or humming in your ears when you leave work; you have to shout to be heard by a coworker an arm's length away; experience temporary hearing loss when leaving work. Research has shown that those workers who work on poultry farms have had significantly higher rates of hearing loss than the general population. Poultry workers is among the occupations recognized as having the highest risks for hearing loss. Tractors, feed dispensers, electric motors of the ventilation system,

technological equipment of poultry processing shops and feed shops (disk units, automatic machines, gas scorching chambers, crushing units, conveyors) are some of the most typical sources of noise on the poultry farm. Studies suggest that lengthy exposure to these high sound levels have resulted in noise-induced hearing loss to workers of all ages. Hearing loss is not as dramatic nor as sudden as an injury from equipment overturn or machine entanglement, but it is permanent. When performing work on catching, transplanting, transporting poultry, taking blood for chemical and serological studies, the noise level in the poultry house reaches 86-90 dB. As poultry processing shops began adding many processing machineries, noise levels began to rise in plants. Initially, poultry workers used ear plugs, but in the late attempted to develop engineering controls such as sound absorbing panels to reduce high reverberant noise levels resulting from the hard walls and ceiling surfaces *(Marchyshyna et al., 2016)*.

Employers can achieve noise reduction in several ways – usually related to the maintenance of the equipment's. Worn, loose, or unbalanced machines parts can increase decibel levels during operation. Regular lubrication and parts replacement reduce friction and lower noise levels. Larger engines that can be operated at lower speeds reduce noise levels. Vibration isolation pads may be installed under the legs of noisy equipment to reduce noise generated by the equipment vibrating on a cement floor. Newer leaf blowers have flexible mountings to reduce vibration-induced noise as well. Tractors, equipment's and skid-steers can be purchased with sound reducing cabs and tightly fitted cab doors and windows to reduce outside noise reaches the operator. Acoustical materials may be installed on walls and ceilings to enclose sound. In addition, employers may provide workers with personal protective equipment (PPE) but must train them in using the PPE correctly. Personal protective equipment is equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits *(Marchyshyna and Melnyk, 2019)*.

Energy sources including electrical, mechanical, hydraulic, pneumatic, chemical, thermal or other sources in machines and equipment can be hazardous to poultry workers. During the servicing and maintenance of machines and equipment, the unexpected startup or release of stored energy can result in serious injury or death to workers. Workers servicing or maintaining machines or equipment may be seriously injured or killed if hazardous energy is not properly controlled. Injuries resulting from the failure to control hazardous energy during maintenance activities can be serious or fatal. Injuries may include electrocution, burns, crushing, cutting, lacerating, amputating, or fracturing body parts, and others. A steam valve is automatically turned on workers who are repairing a downstream connection in the piping. A jammed conveyor system suddenly releases, crushing a worker who is trying to clear the jam. Internal wiring on a piece of factory equipment electrically shorts, it shocking worker who is repairing the equipment. Poultry workers, electricians, machine operators, and laborers are among the millions of workers who service equipment routinely and face the greatest risk of injury *(Voinalovych and Marchyshyna, 2019)*.

Poultry workers routinely use knives and other cutting tools; work on ladders; or use machinery in their shops. However, these simple tools can be hazardous and have the potential for causing severe injuries when used or maintained improperly. All tools should be maintained in good condition and used according to the manufacturers' instructions. Power tools must be properly grounded or double insulated and all guards or shields must be in place. workers should wear the proper personal protective equipment and make sure that clothing has no strings or loose ends that could be caught by machinery. Long hair should be tied back to prevent entanglement. In addition, shops should be well lit and have clear walkways to eliminate slips, trips and falls.

Poultry workers are the most vulnerable occupational group in terms of the risk of developing respiratory diseases. The studies presented in the literature show that acute respiratory diseases, acute bronchitis, pneumonia, exacerbation of chronic bronchitis are more often observed in the structure of respiratory diseases. Poultry workers come into contact with protein-vitamin concentrates, which are finely dispersed antigen. This determines their ability to penetrate the respiratory system to a considerable depth and cause appropriate reactions directly in the lung tissue. According to domestic and foreign studies, up to 25% of workers in modern poultry farms suffer from one or another nosological form of diseases of the respiratory system associated with working conditions *(Bayanov El dar Imran-oglyi, 1999)*.

Many researchers have shown that plant and poultry dust from work environments is potentially hazardous to the health of poultry workers. Dust is a pronounced allergen that increases the likelihood of developing diseases, their progression and poor outcome. At the same time, an 8-hour exposure to the inspirational fraction of dust penetrating deep

into the respiratory tract in a concentration exceeding 4 mg/m^3 is especially dangerous. This leads to disruption of the normal mechanism for cleansing the lungs, i. e. to a violation of the clearance of pathogenic particles, which in turn can lead to dystrophic and allergic diseases of the upper and lower respiratory tract *(Marchyshyna and Melnyk, 2015)*.

In workers of modern poultry farms, it was found that more often the pathology of the upper respiratory tract is observed in workers in the main shops, where the highest concentrations of dust in the air of the working premises were noted. The studies noted that the frequency of pathological changes in the upper respiratory tract among workers of the main production of a poultry farm is almost 3 times higher than that among representatives of other professional groups. In subsequent studies, the patterns of development of allergic diseases of the respiratory system were established against the background of a violation of the immune system and the oxidant-antioxidant system. Frequent eye irritation with organic dust, increased concentration in the air of the working area of ammonia vapors, sulfur compounds and others, frequent ingress of dirt and dust into the conjunctival cavity contributes to the development of ophthalmic pathology.

The frequency and severity of adverse effects of bird down on workers increases with age. The highest rate of respiratory diseases was in 45–55-year-old workers. The researchers note that the revealed violations of the bronchial apparatus function are closely related to the duration of work and are most pronounced in workers with more than 15 years of work experience. It was found that catarrhal and allergic changes are most common in workers with a professional experience of up to 5 years, and after 10 years of work, sub- and atrophic processes predominate *(Hylmanov and Safyn, 2016)*.

Ammonia is considered a high health hazard because it is corrosive to the skin, eyes, and lungs. Exposure to 300 parts per million is immediately dangerous to life and health. Ventilation is one of the most important engineering controls available to the industrial hygienist for improving or maintaining the quality of the air in the occupational work environment. In the control of occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, appropriate respirators shall be used.

Control of aerosols might include the enclosure and ventilation, applying moisture to friable material, and respirators. A respirator shall be provided to each employee when such equipment is necessary to protect the health of such employee. The employer shall provide the respirators which are applicable and suitable for the purpose intended. The employer shall be responsible for the establishment and maintenance of a respiratory protection program. The program shall cover each employee required by this section to use a respirator. In any workplace where respirators are necessary to protect the health of the employee or whenever respirators are required by the employer, the employer shall establish and implement a written respiratory protection program with worksite-specific procedures. The program shall be updated as necessary to reflect those changes in workplace conditions that affect respirator use.

Ergonomic risk factors are found in jobs requiring repetitive, forceful, or prolonged exertions of the hands; frequent or heavy lifting, pushing, pulling, or carrying of heavy objects; and prolonged awkward postures. Workers in poultry operations typically use repetitive motions in awkward positions and which can cause musculoskeletal injuries. Musculoskeletal disorders of the upper extremities among poultry processing employees are well documented *(Marchyshyna et al., 2015a)*.

The combination of highly repetitive tasks, forceful movements and working in cold temperatures can increase risk for musculoskeletal disorders such as carpal tunnel syndrome, a disabling medical condition affecting the hands and wrists. Researchers found that 81% of the jobs, including all jobs in evisceration, involved increased levels of hand repetition and force. Researchers found that 76% of tested employees had abnormal results from a nerve conduction test while 34% had evidence of carpal tunnel syndrome. Workers complained of pain, numbness, burning, tingling in the hands or wrists that occurred more than three times or lasted 7 days or longer in the last 12 months; they had abnormal median nerve conduction in the affected hand or wrist. The high prevalence of carpal tunnel syndrome is not surprising given the literature in poultry processing showing a link between carpal tunnel syndrome and levels of exposure to hand repetition and force above recommended limits. These conditions put workers at increased risk for carpal tunnel syndrome and other musculoskeletal disorders. Vibration and cold may intensify these conditions.

Jobs involving repetition and force at or above the action limit should be redesigned or use automation or other engineering and administrative controls to prevent musculoskeletal injuries. New technology may reduce some types of ergonomic injuries. Proper tools, padding to reduce vibration, and fewer activities with high repetition are some methods for reducing musculoskeletal injuries.

When studying the incidence of poultry workers, the researchers noted that part of the technological operations (feeding, cleaning the feeders, collecting eggs) the operator performs in a forced bent position with significant physical

exertion on the upper and lower extremities, back muscles, lumbosacral spine. Operators perform more than 100 body tilts per shift, up to 50% of the time are in an uncomfortable position; in a standing position from 60 to 80% of the shift time. The authors emphasize that in connection with functional overstrain, there is a possible occupational risk of the formation of pathology of the musculoskeletal system in workers *(Marchyshyna et al., 2010*).

A significant danger for poultry workers is the risk of catching avian influenza. Current evidence indicates that avian influenza viruses do not spread easily from infected birds to humans. However, infected birds can spread avian influenza viruses through their saliva, nasal secretions and excrement. Direct contact with infected poultry, live or dead, or their secretions or excretions is a major risk factor for human infection.

Worker exposure to avian influenza viruses can occur when virus particles in aerosolized droplets or dust are inhaled or contact a person's mucous membranes, such as the eyes, nose, or mouth. Droplet exposure is most likely to occur during poultry slaughtering, defeathering, butchering, and preparation for cooking. Activities leading to dust exposure include cleaning tasks (such as using a blower to remove litter from around barn roof supports or a brush to clean cages or using a mechanical bucket to scoop up litter during litter/manure removal) and catching poultry.

Worker exposure also can occur when a person touches something that has avian influenza viruses on it and then touches the mouth, eyes, or nose. This indirect exposure happens when a worker touches contaminated surfaces, objects, or materials, including contaminated litter or egg collection containers. The role of environmental contamination in avian influenza virus's transmission is not well defined. A study found the length of time that avian influenza viruses survive on surfaces varies with environmental factors, but avian influenza viruses can remain infectious for long periods under routine conditions. A more recent study found two strains of

influenza A virus remained infectious on stainless steel surfaces for more than seven days *(MacMahon et al., 2008).*

Workers whose jobs involve contact with infected birds, whether live or dead, or their saliva, nasal secretions, or excrement, are among those at increased risk of expose to avian influenza viruses. Although avian influenza viruses generally do not spread easily from birds to humans, workers can still be exposed through contact with birds and their body fluids, by inhaling infectious dusts and droplets, and when touching contaminated surfaces and equipment. The worker, who does not wear recommended personal protective equipment, may be at risk of exposure to avian influenza viruses.

CONCLUSIONS

Workers have the right to: working conditions that do not pose a risk of serious harm; receive information and training about workplace hazards, methods to prevent them, and standards that apply to their workplace; review records of work-related injuries and illnesses; file a complaint asking to inspect their workplace if they believe there is a serious hazard or that their employer is not following rules; exercise their rights under the law, including reporting an injury or raising health and safety concerns with their employer. ■

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Умови праці та аналіз професійних небезпек у працівників птахофабрики

Анотація. ***Відмічено, що на птахофабриках України існує багато серйозних ризиків для безпеки та здоров'я працівників. Ці небезпеки включають вплив високого рівня шуму, пилу, небезпечного обладнання, слизької підлоги, порушення опорно-рухового апарату, небезпечних хімічних речовин та біологічних небезпек. Дослідження свідчать, що тривалий вплив високих рівнів шуму призводить до шумової втрати слуху у працівників різного віку. При виконанні робіт з вилову, пересадки, транспортування птиці, взяття крові на біохімічні та серологічні дослідження рівень шуму в пташнику досягає 86-90 дБ. Відмічено, що під час ремонту та технічного обслуговування машин та обладнання є загроза отримати травму внаслідок дії теплової енергії, ураження електричним струмом, зазнати опіків, порізів, розривів, ампутації або переломів частин тіла. Працівники птахівництва є найбільш уразливою професійною групою з погляду ризику розвитку респіраторних захворювань. Встановлено, що особливо небезпечним є 8-годинне вдихання пилу в концентрації, що перевищує 4 мг/м³. Найвищий рівень захворювань органів дихання був у 45-55-річних працівників. Відмічено, що працівники птахофабрик підпадають ергономічним ризикам, що може спричинити травми опорно-рухового***

апарату. Дослідники виявили, що на 81% робочих місць з переробки птиці є підвищений рівень повторюваності рухів рук і прикладання зусиль. Працівники скаржились на біль, оніміння, печіння, поколювання в кистях або зап'ястках. Відмічено, що нові технології зможуть зменшити деякі типи ергономічних травм. Значною небезпекою для працівників птахівництва є ризик зараження пташиним грипом. Відмічено, що працівники мають право на здорові й безпечні умови праці, розроблення спеціальних програм щодо їх захисту від дії виробничих небезпек. Для захисту працівників необхідно впроваджувати інженерні та контрольні заходи та надавати відповідні засоби індивідуального захисту.

Ключові слова: *птиця, працівники, роботодавці, робочі місця, птахофабрики, професійні небезпеки, безпека праці, умови праці*

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Условия труда и анализ профессиональных рисков у работников птицеводства

Аннотация. ***Отмечено, что на птицефабриках Украины существует много серьезных рисков для безопасности и здоровья работников. Эти опасности включают влияние высокого уровня шума, пыли, опасного оборудования, скользкого пола, нарушения опорно-двигательного аппарата, опасных химических веществ и биологических опасностей. Исследования показывают, что длительное воздействие высоких уровней шума приводит к потере слуха у работников разного возраста. При выполнении работ по отлову, пересадке, транспортировке птицы, при взятии образцов крови на биохимические и серологические исследования уровень шума в птичнике достигает 86-90 дБ. Отмечено, что во время ремонта и технического обслуживания машин и оборудования существует угроза травматизма в результате воздействия тепловой энергии, поражения электрическим током, получения ожогов, порезов, разрывов, ампутации или перелома частей тела. Работники птицеводства является наиболее уязвимой профессиональной группой с точки зрения риска развития респираторных заболеваний. Установлено, что особенно опасным является 8-часовое вдыхания пыли в концентрации, превышающей 4 мг/м^3. Самый высокий уровень заболеваний органов дыхания был в 45-55-летних работников. Отмечено, что работники птицефабрик подвергаются эргономичным рискам, что может привести к травмам опорно-двигательного аппарата. Исследователи обнаружили, что на 81% рабочих мест по переработке птицы существует повышенный уровень повторяемости движений рук и приложения усилий. Работники жаловались на боль, онемение, жжение, покалывание в кистях или запястьях. Отмечено, что новые технологии смогут уменьшить некоторые типы эргономических травм. Значительной опасностью для работников птицеводства является риск заражения птичьим гриппом. Отмечено, что работники имеют право на здоровые и безопасные условия труда, разработку специальных программ по их защите от воздействия производственных опасностей. Для защиты работников необходимо внедрять инженерные и контрольные мероприятия и предоставлять соответствующие средства индивидуальной защиты.***

Ключевые слова: *птица, работники, работодатели, птицефабрики, рабочие места, профессиональные опасности, безопасность труда, условия труда*

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