

Effect of Disinfectants Usage in Pandemic Corona Virus on Domesticated Animals and Birds

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ABSTRACT

The COVID-19 pandemic represented a health threat to the world and since then, folks were forced to use disinfectants while not taking note of the negative effects it had on humans and animals. To estimate it, a survey study was undertaken (using a questionnaire) on the adverse effects of disinfectants utilized by citizens in home (within the town of Mosul) on the fauna and birds in the COVID-19 pandemic. The study showed that housewives used highest (37%) disinfectants and the least was used by staff in health departments (16%). It was distributed over 12 residential neighbourhoods (districts) in Mosul. Most of the survey participants observed signs of itching, eyes inflammation and breathing problems. The study showed that the foremost ordinarily used disinfectants were 70% alcohol and 3% chlorine. Therefore, wrong use of such disinfectants showed highest symptom of abdominal pain (95%) in animals and birds and the lowest sign of death (20%). The keepers of animals and birds additionally suffered from itching and eyes inflammation and difficulty in breathing. Only 33% of such animals and birds were taken to veterinary health care where the best-prescribed drug was 42% amoxicillin and 32% normal saline as eyewash. Thus, lack of information among animal keepers about the dangers of disinfectants and the fear of disease led to the exposure of domestic animals to their negative adverse effects.

Key words : Disinfectants, animals, birds, COVID-19 pandemic, side effects, adverse effects

INTRODUCTION

The COVID-19 pandemic is/was a health threat to the entire world. Corona virus is one of the viruses circulating in the world from the group of corona viruses. The name indicates the specific shape of these viruses due to the protrusions visible on their surface, which under the electron microscope resemble a crown (Bellini *et al.*, 2020; Mousa *et al.*, 2020). Corona viruses are a large family of viral pathogens. They have the ability to infect humans and animals in all their forms, and they have the ability to evolve upon entering a host and produce new strains, some of which are more dangerous. A number of strains have caused death to birds and animals, as well as to humans, old and young. Symptoms of infection range from cold symptoms such as Syndrome Middle East Respiratory Syndrome (MERS-CoV) to another type leading to serious symptoms which lead to death in living organisms such as severe acute respiratory syndrome (SARS-CoV; Chan *et al.*, 2015; Mohd *et al.*, 2016; Hassan *et al.*, 2019; Al-Jameel *et al.*, 2020; Wang *et al.*, 2020).

In November 2019, a new Corona virus

appeared in China, which caused panic and death in the world and caused huge and terrifying loss of life, in addition to economic losses in all societies that was never seen in humans before (Hassan *et al.*, 2020). The specialists (International Committee for Classification of Viruses) on February 11, 2020, after conducting research gave an official name as SARS-CoV-2 and defined as the virus of SARS-CoV (Hassan *et al.*, 2020; Hui *et al.*, 2020; Jin *et al.*, 2020). Later it was called Corona Virus 2019 (COVID-19; Jin *et al.*, 2020). It belongs to the genus Coronavirus and from the Coronaviridae family. It has a large genome compared to RNA viruses (Saif *et al.*, 2019). It is strange that this virus only appeared in invertebrates, and its impact was mainly on the respiratory, digestive and nervous systems of humans and animals. Animals are also the source of infection for humans, as they are transmitted from animal to human and then spread between humans (Chen *et al.*, 2020; Rodriguez-Morales *et al.*, 2020). People with COVID-19 suffered from mild to moderate respiratory illness and recovered without special treatment for people with good immunity. However, the elderly with

chronic diseases, using cortisone a lot with acquired immunodeficiency, chronic respiratory diseases, diabetes, cardiovascular disease, and cancer were more susceptible to infection with COVID-19. It was dealt with through social distancing and the use of disinfectants, in addition to research in the medical field, by adopting safety protocols at work and at home, which included distance and hygiene procedures, and the use of personal protective equipment using water, soap, alcohol, bleach, ethylene oxide, radiation ionizing and the efficacy of surgical masks compared to protective equipment (Karin and Marlene, 2017; Rubio-Romero *et al.*, 2020; Sahar Al-Zain, 2020). Disinfectant agents were used on spiritless surfaces, while antiseptic was used on the body and mucosa. Antiseptic agents had adverse effects on the skin, lungs and healthy areas and disinfectants had killing effects on bacteria (biocidal). Alcohol had both with disinfectant and antiseptic properties (Chan *et al.*, 2015; Hassan *et al.*, 2020; Tan *et al.*, 2020; Yari *et al.*, 2020).

Among the most widely used disinfectants was bleach, which is sodium hypochlorite in large concentrations. Sodium hypochlorite (NaClO) is a solution with a sharp and strong odour with an effective over various bacteria (Abu Hasna, 2020) which caused the death of humans, fish and animals, when exposed to chlorine in high concentrations in homes and the surrounding environment. Also, high concentrations of chlorine caused deformities in fish when fertilized eggs were exposed to high concentrations of chlorine (Wang *et al.*, 2019; Nasrin *et al.*, 2020; Fronczek *et al.*, 2021). Inhalation of chlorine at concentrations less than 50 ppm caused reversible bronchospasm, increased mucus production, airway resistance, acute lung injury, pulmonary fibrosis and decreased respiratory rate in humans and animals (Simkin and Snitily, 2015; Al-Zwean and Ibrahim, 2017; Zhou *et al.*, 2018; Achanta and Jordt, 2021; Guodong *et al.*, 2021). Chlorine is a halogen that is used as a disinfectant, and is highly resistant. They are manufactured in large quantities and at a very low cost. Its uses are wide in purifying drinking water and as disinfectants used in commercial, institutional or household applications, as well as in chlorine (especially hypochlorite) used in the food and dairy industries on a large scale. The lethal effect

of chlorine on microorganisms is generally seen as a result of the production of hypochlorous acid with where free chlorine kills microorganisms. The negative charge on the cell wall plays a role by repelling negatively charged particles in the water. Hypochlorous acid is neither negative nor positive, so it can affect and rupture the walls of bacterial cells. Inhibition of chlorine can be the result of a number of factors : oxidation of the enzyme amino acid and sulfur. Chlorination of the amino acid ring inhibits of protein synthesis. And it has an effect on the respiratory system through a decrease in oxygen uptake, causing oxidation of the respiratory system's oxidation part. It has an effect on the virus through the synthesis of low adenosine triphosphate, DNA breaks and RNA synthesis is depressed.

The availability of ethanol has caused a high incidence of poisoning, especially in the elderly and children. The action of ethanol includes the activity of several oxidation systems : alcohol dehydrogenation (ADH), aldehyde dehydrogenation (ALDH), cytochrome P-450 (CYP2E1) and catalase. Nicotinamide adenine dinucleotide (NAD) lowers nicotinamide adenine dinucleotide (NAD) and increases reactive oxygen production (ROS; Pereska *et al.*, 2021). Ethyl alcohol (ethanol) is used as an antiseptic and can be used for many purposes in different concentrations. It can be used as a preservative and antiseptic in pandemic corona virus. It's widely used in hand rubs as gels and foams for hands in public departments, healthcare settings and schools hygiene. The World Health Organization has listed 80% ethanol sanitizer as an essential medicine in the hand rub category as recommended in the COVID-19 pandemic. Hand sanitizer is important to reduce the activity of sanitizer through its action by denaturation and coagulation of proteins, which is the basic process of ethanol (McKeen, 2020). Ethanol is effective against various enveloped viruses. 42.6% (w/w) concentration of ethanol showed its effectiveness within 30 sec against MERS coronavirus, ebolavirus, SARS coronavirus, influenza A virus including the human type H1N1, human type H3N2, the avian type H3N8 and influenza B virus, HIV, HBV, vaccinia virus, togavirus, duck hepatitis B virus, pseudorabies virus, zika virus, newcastle disease virus, bovine viral diarrhoea virus, herpes simplex viruses type 1 and 2 (McKeen,

2016). Ethanol is effective at 73.6% (w/w) against HCV in 15 and 30 sec but not at 40%. The basic structure of alcohols is a hydroxyl group (-OH), which binds to a hydrogen protein bond and compromises the structure and function of proteins resulting in the inhibition and deposition of proteins. It's not sporicidal, it is involved in sports (McKeen, 2019). Ethanol is very effective and inactivates all lipophilic viruses (e. g. herpes, vaccinia, influenza virus) when used in 60-80% concentrations as well as on many hydrophilic viruses (e. g. rhinovirus, adenovirus, enterovirus), rotavirus, but not poliovirus or hepatitis A virus (HAV). Alcohol at a concentration of 70% was found to be the most effective concentration and ability to neutralize all viruses. It was used for preoperative disinfection and sterilization of surgical instruments. It can be used to disinfect the hands of health care providers and the skin of the patient. It is also used for preventing dental plaque, cleaning wounds, treating yeast infections of the mouth, and keeping urinary catheters from blocking. It is used both as a liquid and powder. A formulation of 70% (v/v) isopropyl alcohol (IPA; ChloroPrep; McKeen, 2020), 2% w/v chlorhexidine gluconate (CHG) was tested against *Staphylococcus epidermidis* RP62A, to reduce bactericidal activity (McKeen, 2016). From the above, the dangers of using disinfectants, especially chlorine, became clear in humans, animals and birds life, so this study was conducted to detect the negative effects and wrong use of disinfectants and their impact on animals raised in homes.

MATERIALS AND METHODS

A questionnaire was designed in English and translated into Arabic for the survey. After obtaining ethical approval, NO:78 Code: CCMRE- Nur-21-7 in 23/3/2021, the questionnaire containing four main questions was finalized. The survey was conducted from March to November 2021. After collecting

information from the questionnaire, statistical analysis was performed using Microsoft Excel 2016.

RESULTS AND DISCUSSION

Three hundred poultry breeders from the city of Mosul of different social groups were selected. A questionnaire was designed in both English and Arabic to facilitate understanding of what is enquired from the questionnaire. Most of the participants in the questionnaire suffered from signs of itching, inflammation of the eyes and difficulty in breathing. The study showed that the majority came into contact with disinfectants in their homes were housewives, with a rate of 37%, followed by daily wage of 27%, and distributed over 12 neighbourhoods of the city of Mosul. These were divided into six neighbourhoods on the right side of the city and six neighbourhoods on the left side of the city (Tables 1 and 2).

Table 2. Areas studied in research based on geographical dispersion

S. No.	No. of participants	Neighbourhood
1.	25	Al-Noor
2.	25	Al-Aellam
3.	25	Somar
4.	25	Al-Arabi
5.	25	Al-Maliea
6.	25	Al-Methaq
7.	25	Besaan
8.	25	University
9.	25	Teachers
10.	25	Al-Seddiek
11.	25	Al-Thawra
12.	25	Al-Yarmook
Σ	300	

The behaviour of citizens participating in the study on how to use different disinfectants in terms of the concentrations and the negative impact on animals and birds that live in the home environment and the treatments given by the veterinarian (Tables 3, 4 and 5). In the early months of 2020, the World Health Organization issued an alert that COVID-19

Table 1. Descriptive statistics of participants

Type of employment	Health of employee	Daily wage	Education of employee	Housewife	Total numbers
	48	80	60	112*	300
%	16	27	20	37	100

*Represents the largest class of people who deal with disinfectants.

Table 3. Types of disinfectants used

S. No.	Disinfectants	Concentrations of the used materials	Used as	Duration of use in months	Total numbers
1.	Ethanol	70%	Sprayer on skin	9	300*
2.	Chlorine	3-5%	Wiping surfaces+ sprayer use on skin	9	300*
3.	Dettol	30 ml/l	Sprayer+wiping surfaces	5	23
4.	Javel sodium chlorate	15 ml/l	Wiping surfaces	4	1
5.	Povidone iodine	4%	Skin washing	5	2
6.	Hydrogen peroxide	3%	Skin washing	4	11

*Representing the highest disinfectants used by people.

Table 4. The negative effects of the disinfectant materials

S. No.	Symptoms types of animals	No. of animals	Abdominal pain	Vertigo	Fatigue	Shortness of breath	Cough	Eye irritation	Itch	Death
1.	Dogs	30	15	9	9	12	15	15	15	0
2.	Cats	50	50	0	0	30	45	50	50	3
3.	Chicken	300	300	0	30	30	60	40	40	40
4.	Quail	100	90	0	20	20	20	20	15	20
5.	Pigeons	100	100	60	50	60	50	60	60	40
6.	Rabbits	35	30	20	20	30	20	20	40	15
7.	Budgie	67	60	67	67	60	30	67	50	20
	Σ	682	645	156	196	242	240	272	270	138
	%		95*	23	29	36	35	40	40	20

*Symptoms are the highest in animals and birds handling disinfectant.

Table 5. The type of treatments given to animals and birds

S. No.	Type of medicines that were dispensed	Repeat	Per cent
1.	Eye wash with normal saline	150	32
2.	Oxygen therapy	20	4
3.	Drink a lot of water	103	22
4.	Amoxicillin	200*	42*
5.	Σ	473	100

*Highest prescription for those who dealt with disinfectants (medicine).

was a global pandemic virus spreading rapidly across most continents around the world. This dangerous virus infected the respiratory system and in severe cases caused lung necrosis, difficulty in breathing, pain and kidney dysfunction. Some cases were cured of this disease and others died. At that time, there was no way to stop the infections other than using disinfectants, physical distancing and wearing masks. This caused fear and panic, which led to the emergence of incorrect practices in the use of disinfectants, causing negative effects on humans and animals (Rubio-Romero *et al.*, 2020; Sahar, 2020; Mahmoud *et al.*, 2021).

The only way to protect was the spacing and use of disinfectants and sterilizers. Therefore,

the study aimed at conducting a survey of the highest types of disinfectants used by citizens in homes and their knowledge of the concentrations, dilutions and side effects that these disinfectants caused on pets and birds as a result of the wrong use of disinfectants and ignorance (Cavero Olguin, 2020; Medina-Avitia *et al.*, 2021).

The study showed that the most commonly used types of disinfectants were ethanol and chlorine, which were used by all the 300 citizens participating in the research from different social classes who used disinfectants at homes of the city of Mosul. Most of those who dealt with it were housewives (37%) and the least were workers of health departments (16%) distributed in 12 residential neighbourhoods of the city of Mosul.

The study showed that the use of disinfectants in homes with unstudied concentrations caused negative and significantly harmed the animals and birds kept in the house, where the symptoms ranged from abdominal pain 95% to the lowest mortality 20%. Note that the animal and bird breeder also suffered from itching, inflammation of the eyes and difficulty in breathing, as was evidenced of the citizen's ignorance of concentrations, dilutions and methods of using disinfectants, in addition to

the death of birds and animals by 19% (Insignares *et al.*, 2020; Nasrin *et al.*, 2020; Fronczek *et al.*, 2021).

Animals and birds receiving health care from veterinarians accounted for 33% of the total, and the highest prescribed drug was amoxicillin 42%, followed by saline as eyewash 32%. It was concluded that the misuse and indiscriminate use of disinfectants in the COVID-19 had harmful and dangerous effect on the birds and animals raised by citizens, as well as the citizen's ignorance of the concentration and method of using each type of disinfectant, as some of them were to be used only on hard surfaces and the other to be used on living bodies, causing adverse effects on birds and animals kept by citizens.

CONCLUSION

The lack of information among breeders about the dangers of disinfectants, the type of concentration used and the type of surface to be disinfected during the COVID-19 epidemic, led to the use of disinfectants indiscriminately without paying attention to their negative effects on humans and pets that live with them in the same home and environment. Thus, lack of information among animal keepers about the dangers of disinfectants and the fear of disease led to the exposure of domestic animals to their negative adverse effects.

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