QACs are membrane-active agents that interact with the cytoplasmic membrane of bacteria and the plasma membrane of yeast. Their hydrophobic activity also makes them effective against lipid-containing viruses. QACs also interact with intracellular targets and bind to DNA. They are also effective against non-lipid-containing viruses and spores, depending on the product formulation. At low concentrations (0.5 to 5 mg/liter), they are algistatic, bacteriostatic, tuberculostatic, sporostatic, and fungistatic. At concentrations of 10 to 50 mg/liter, they are microbicidal for these same groups, depending upon the specific organism and formulation. Thus, QACs can be modulated to be more effective against specific targets and safer to humans.

In conclusion, it's extremely vital to recognize the role of a particular disinfectant with the occasion. Considering the chemical and microbiological effects of the disinfectant alone, will not yield expected results as many other factors govern the antimicrobial functions. Every disinfectant has its advantages and disadvantages for a particular situation. Selecting a suitable disinfectant for the application is crucial. Effects of disinfectants on the skin upon prolonged usage need to be carefully analyzed. Applying Chemical Knowledge along with some dosage of common sense is advisable at this point where different opinions galore.

At the end of the day, it's not who's right, but what's best for the society. Once the crisis is over, we need to stand up as one human race who successfully survived a global terror. It doesn't count who contributed more, or less, it ultimately boils down to who survived or not.

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Fate and Transport of Viruses in Groundwater Environments

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Groundwater contamination

Groundwater is widely used as drinking water supplies around the world, specifically in the developing economies. About 96 percent of all usable freshwater is found as groundwater, which globally provides 25 to 40 percent of the world's drinking water. Aquifers are the source of groundwater that is located subsurfaceis often connected with surface water systems and mostly recharge through rainwater infiltration and percolation and may discharge to surface water sources such as streams and lakes. Contamination of groundwater depends on the risk factors: 1) sensitive aquifers; aquifers in which viruses may travel faster and further than bacteria (e.g. limestone, lateritic or coastal plain sand aquifers, which are high in permeability; 2) shallow unconfined aquifers; 3) aquifers with thin or absent soil cover;4) close to surface water bodies; and 5) high population density areas.

Contamination of groundwater via chemical and pathogenic contaminants is a severe environmental problem that poses a significant threat to human health. Among the pathogenic contaminants such as viruses, bacteria, and protozoa, viruses are readily transported through soils, due to their smaller size compared to bacteria and protozoa. Studies have reported on the fate and transport of viruses in soils and aquifers are necessary to determine the vulnerability of groundwater to pathogenic contamination and to secure safe drinking water sources. However, only a handful of literature reports on the capacity of transport of viruses into groundwater.[1,2] Major processes that govern the subsurface transport of viruses are their rate of inactivation and their sorption into sediment particles. Inactivation of viruses as well as sorption to soil particles is controlled by the degradation of the viral capsid and by subsurface temperature. Included among the essential hydrogeological factors that can be used to evaluate viral transport are the flux of moisture in the unsaturated zone, the media through which the particles travel, porosity, the length of the flow path, organic matter, dissolved oxygen, presence of other microbes, groundwater chemistry and the time of travel.[2-4]

Sources of viruses in groundwater

It has been a well-known fact that the sewerage and cemeteries are among the chief anthropogenic sources of pollution and contamination of groundwater in urban areas and beyond, in the area of hydrogeology (Figure 1). In the case of cemeteries, 0.4–0.6 liters of leachate is produced per 1 kg of body weight, during the decomposition of a human corpse, which may contain pathogenic bacteria and viruses that may contaminate the groundwater.[5-7] Further, sewerage from hospitals or households or quarantine centers may discharge sewerage and wastewater with viruses (Figure 1). Burial in any means causes soil contamination and then leads to groundwater pollution via the discharge of inorganic nutrients, nitrate, phosphate, ammonia, chlorides etc. and various microorganisms. High biochemical and chemical oxygen demands, ammonia, and organic carbon have been reported as high as several hundreds of mg in L from cemeteries and mass burial sites. In the case of viruses, recent studies indicate that viral may transport in soil with rainfall infiltration and extends specifically to drinking water from an untreated groundwater source.[8] Several scientific publications report virus occurrence rates of about 30 percent of groundwater.[6,7]

In most cases, it is the general thinking that only the enteric viruses are found in groundwater; however, other types of pathogenic viruses have also been reported (Table 1). Severalstudies suggest that certain enveloped virusessuch as SARS, MERS, COVID-19, and avian influenza are capable of retaining infectivity fordays to months in aqueous environments, which implies the danger of untreated wastewater andgroundwater contamination.[9] Given the vulnerability of our groundwater aquifers, and lack of understanding about the behavior of COVID-19 virus, there can be a risk from corpses, septic waste or sanitary waste are having any contact with water sources. Hence, it is advisable to have careful measures in destroying the infected dead bodies, septic, and sanitary waste in proper conditions without provisioning chances in groundwater contamination for any future disease outbreak in any case of viral pandemicity.

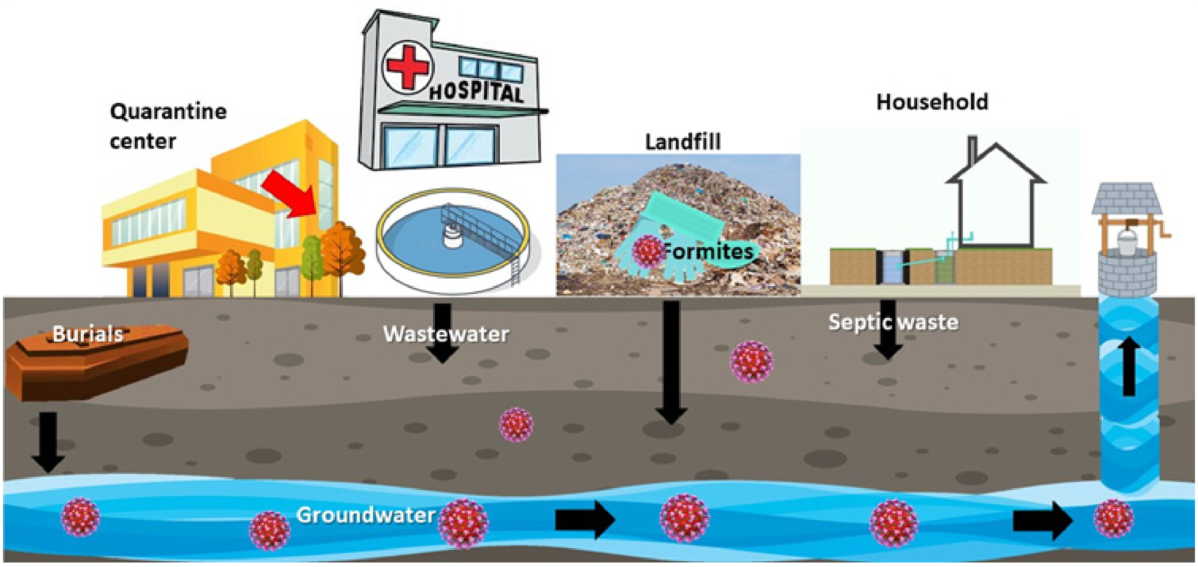

Figure 1: Possible sources of viruses in groundwater

Table 1: Detection of various viruses other than enteric in soil and groundwater environments

Virus common name	*Virus type*	*Associated illness*	*Country*	*Environmental condition*	*Reference*
Lassa virus	H40/1	Acute viral hemorrhagic illness	Germany	Gravel aquifer	[10]
Adenovirus	PRD1	Respiratory disease, pneumonia,gastroenteritis, keratoconjunctivitis	USA	Unconfined aquifer	[11]
	HAdV2		France	Unconfined and confined aquifer	[12]
Enterovirus	Poliovirus	Polio	USA	Unconfined aquifer	
Avian influenza virus	HPAI	Avian influenza	USA	Mississippian limestone	[13]
Hepatitis	HAV	Hepatitis	Korea	Unconfined aquifer	[14]

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