Disinfectant #3: Phenols: What Degree Have Phenols Achieved?

The versatile phenolic compound, in all its derivatives and variations, has become accustomed to a more scrutinized disinfectant portfolio. Suffice it to say that the young guns of disinfection technologies have boasted more impressive characteristics as opposed to the withered profile of phenolics. However, the phenol family of disinfectants, unlike many things its age, have managed to avoid extinction altogether. In this week's blog we will thoroughly analyze the characteristics of this adaptive disinfectant technology in today's dynamic environment.

This is how we would rate Phenol disinfectants based on the key decision making criteria: (see below)

Phenol Disinfectant Report Card

Subject	**Grade**	**Comments**
Speed of Disinfection	C	*Most phenols retain 10 minute contact times. This is not an ideal contact time, and can only be reached through multiple applications.*
Spectrum of Kill	B to C	*There are intermediate level phenols, that is, they are efficacious against mycobacterium.* *However, phenols are known to be unable to eradicate non-enveloped viruses such as Norovirus, which is a major weakness of the technology.*
Cleaning Effectiveness	B	*Phenols exhibit a high affinity for working in an organically contaminated environment, although best practices always recommend pre-cleaning of surfaces prior to disinfection.*
Safety Profile	D	*Phenols consistently exhibit harsh safety profile and typically warrant careful usage and handling instructions.*
Environmental Profile	C	*Phenols are readily biodegradable compounds; however they are also extremely reactive disinfectants and can contaminate the environment with harmful by-products.*
Cost Effectiveness	C	*Although commonly misconstrued, phenols are quite expensive because usage requires highly concentrated solutions. Also, diluting generally requires deionized water due to the reactivity of phenols.*

There are numerous variations of phenolic disinfectants. This adaptive quality is an important factor in the use of phenols today, as they can be synthesized to serve specific purposes. Common examples of these derivatives include thymols, xylenol, o-phenyl-phenol (OPP) and triclosan. Phenols used today do not pose an extreme health risk because the more volatile versions have been banned. However, even the **most common phenol used, OPP, is considered moderately toxic and an indirect carcinogen**. Furthermore, triclosan, a common disinfectant used in hand and oral hygiene applications has been shown to **produce bacterial resistance upon repeated exposure**. These are alarming factors in considering the usage of phenols.

The disinfection capabilities of phenolic compounds have been recognized for an extremely long time. Since the 17th century, phenols have been used as dressing on wounds. Today, phenols exhibit a broad range of disinfection capabilities. They show broad efficacy against bacteria, mycobacteria and fungi. In contrast, the range of viruses that phenols show efficacy against is limited to enveloped (easy to kill) viruses such as influenza.

The efficaciousness of phenols largely depends on a multitude of environmental factors. They are susceptible to changes such as pH, temperature, dilution and soil load challenge. Positively, phenolic disinfectants show a strong ability to perform on surfaces contaminated with soil. Also, **phenols perform the best as highly concentrated solutions** in acidic conditions (low pH). However, **solubility significantly drops at these pH values**, and vice versa. This interchanging characteristic further emphasizes the opportunity cost associated with phenolic compounds. **One must forego a specific characteristic in order to improve on another.**