



Chemical Mitigant Forms – Which is More Effective in Feed, Liquid or Dry? Feed and Feed Ingredient Pathogen Mitigation

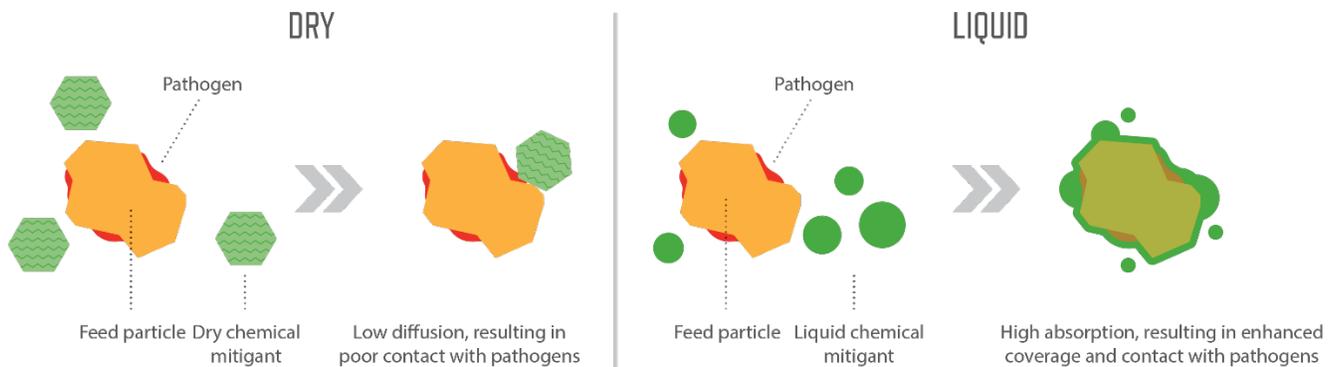
The Form of a Chemical Mitigant Matters

It is well established that feed and feed ingredients are possible transmission route for pathogens.^{1,2,3,4} With many producers evaluating the risk of internationally-sourced ingredients and feed contamination, chemical mitigants are being considered as part of a comprehensive biosecurity program – with formaldehyde and medium chain fatty acids (MCFA) being amongst them (Sal CURB® and CaptiSURE™, Kemin Industries, Des Moines, IA).⁵ Numerous discussions and ongoing research are focusing on certain product categories. But, which product form – liquid or dry – offers better efficacy against pathogens in feed?

Dilution of active ingredient: In general, dry products are simply liquid active ingredients diluted with large amounts of dry carriers (e.g. calcium carbonate, silica). Consequently, these dry products have a lower concentration of active ingredient compared to liquid products. Due to their form, liquid products typically have lower inclusion rates and better efficacy.

Carrier and mitigant separation: For a dry-form mitigant to exert an effect on feed or feed ingredients, it would have to diffuse from its aforementioned carrier. This separation process takes time and reduces the efficacy of the product. In contrast, liquid products don't need to diffuse from carriers and are instantly available to bind to feed particles when applied. This results in a more rapid effect and better efficacy with liquid products.

Contact with pathogens: Feed particles are not smooth, round objects – they have uneven surfaces and cavities that can harbor pathogens which would not be as accessible to dry products. Liquid products can more evenly distribute in feed and be absorbed by and on the feed particles – increasing the contact between the active ingredient and target pathogens. Once more, liquids offer better efficacy in feed pathogen control due to this increased contact.



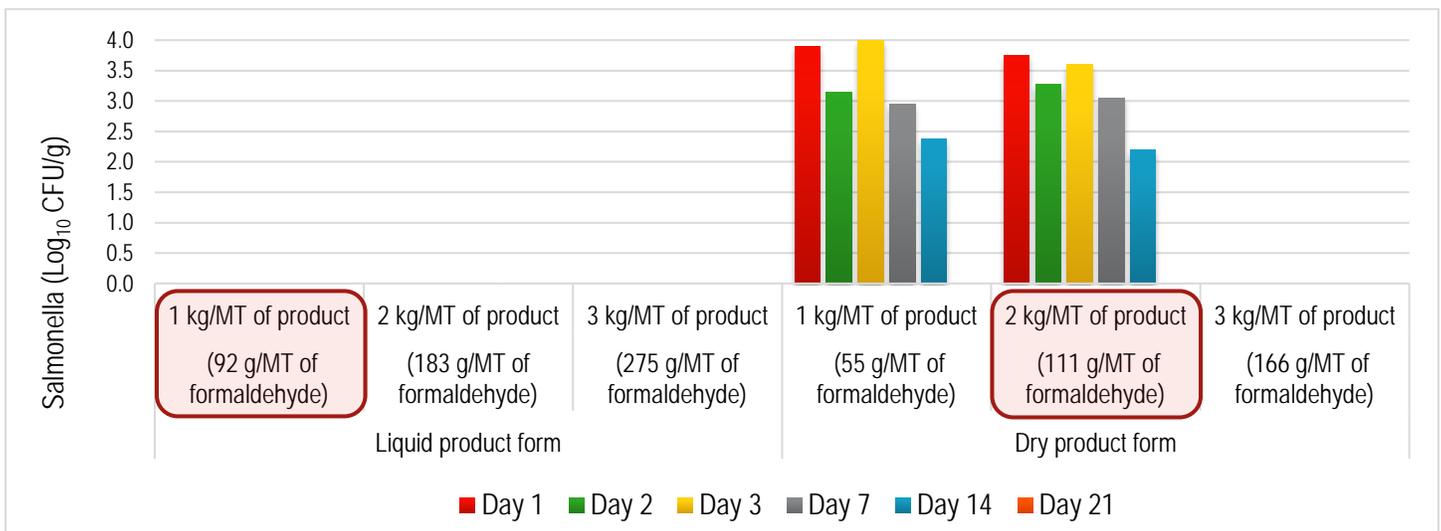
Liquid vs. Dry Study

To demonstrate the difference between liquid and dry products on feed, a study was developed comparing two forms (liquid or dry) of formaldehyde-based products. In this study, feed was artificially contaminated with *Salmonella enteritidis* by spraying and mixing 1 ml of a *Salmonella* biomass suspension containing 4.1×10^{10} cfu/ml onto 100 g of autoclaved mash feed. Then, the artificially-contaminated diet was separated in two portions, and each was treated with either the liquid or dry formaldehyde-based product. Enumeration of *Salmonella* was done at 24h, 48h, 72h, and on day 7, day 14 and day 21.

Results showed that the liquid form of the formaldehyde-based product at the minimum concentration rate of 1 kg/MT effectively reduced *Salmonella* to below the detection limit (<25 colonies) after 24h and throughout the experimental period (Figure 1). In contrast, the dry form of the formaldehyde-based product required the concentration rate of 3 kg/MT to reduce *Salmonella* to below the detection limit. It is important to note that because the dry form of the formaldehyde-based product is diluted with carrier, the final concentration of active ingredient in feed was reduced by roughly 40% compared to the liquid form. So, the concentration of 1 kg/MT of liquid product had roughly similar formaldehyde concentration as the dry product form at 2 kg/MT of product. In this case, despite the similar formaldehyde concentration in feed between dry (2 kg/MT) and liquid (1 kg/MT) forms, only the liquid form effectively reduced *Salmonella* in feed.

These results show that chemical mitigants offer better efficacy against pathogens in the liquid form when applied to feed, even at similar inclusion rates of active ingredients compared to dry products. The liquid form also allows for lower inclusion rate in diets compared with dry products.

Figure1. Liquid form of formaldehyde-based product out-performed dry form at roughly similar active ingredient concentration (1 kg/ton Liquid vs. 2 kg/ton Dry)



Proper liquid application to feed is critical for product efficacy. The Kemin Pathogen Control Team and Product Application Department have extensive expertise in liquid applications and can provide outstanding customer service to assure effective, accurate and safe application.

References

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