**A Corrosion Comparison of Agricultural Disinfectants on Metals**

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**Background:** The agriculture industry uses many different disinfectants in food production and processing, animal health and treatment and biosecurity. These disinfectants often come into contact with metal surfaces, highlighting the need to understand which disinfectants are most corrosive on which types of metals. This allows the proper selection of disinfectants that cause the least amount of corrosion on a specific metal to preserve the metal surface for as long as possible.

**Purpose:** To compare the corrosive nature of five commonly used agricultural disinfectants (Bleach, Virkon, Hydrogen peroxide, Isopropyl alcohol and HemaPeroxy) on a variety of metals used in food processing facilities, farms and veterinary clinics (aluminum, stainless steel, galvanized steel, mild steel and brass).

**Hypotheses: 1.** The mild steel coupons will be the most easily corroded of the five metals tested by all five of the disinfectants. If this is true then the mild steel coupons will have the most observable corrosion and should lose the most weight in comparison to the other four types of metal coupons. **2.**The disinfectant, Virkon, will be the most corrosive of the five tested disinfectants on all of the five tested metals. If this is true then the five metal coupons in the Virkon wells will have the most observed corrosion and should lose the most weight in comparison to similar metal coupons in the other disinfectants.

**Procedure:** Weigh the metal coupons, record the weights, label the wells and lids numbering 1-75, label the rows of wells with B (10% Bleach), V (1% Virkon), H2O2 (3% Hydrogen Peroxide), I (70% Isopropyl Alcohol) or H (1% HemaPeroxy). Place the coupons into the groove lids with parafilm. In each wells pipette a total of 5 ml of the designated disinfectant. I did three replicates of each metal/disinfectant combination. Lids with the attached coupons were put into the well solutions. The plates were left at room temperature on the counter. The wells and coupons were observed and photographed 5 times (Day 9, 16, 23, 33, 40) Coupon observations noted any crystallization, rust, disintegration, blackening, green (patina), mold and no change. On day 48, coupons were photographed, rinsed in distilled water, removed from the lids, air dried and weighed. Then the coupons were individually sonicated in beakers of 2.5% acetic acid (vinegar) for 20 minutes to remove all corroded metal consistently. Coupons were dried and weighed again. Visual observations and coupon weights were compared between disinfectants and metals to measure corrosion loss between the coupons starting weight and ending weight. \*This protocol is adapted from official methods of analysis 1990 Association of Analytical Chemists.

**Results:** Mild steel (200) had the most corrosion observations followed by galvanized steel (149), brass (123), aluminum (71) and stainless steel (11) had the least corrosion observations over the five observed time points. Graph Pad Prism 6.02 1 way ANOVA test was done. Mild Steel was significantly more corroded than the Stainless steel and Aluminum (P<0.05). Galvanized steel was significantly more corroded than Stainless Steel and Aluminum (P<0.05). Brass was significantly more corroded than Stainless Steel (P<0.05). Change in coupon weights from d0 to d48 after sonication were significantly different between brass and aluminum; and brass and stainless steel (P<0.05). Bleach (137) had the most corrosion observations followed by Virkon (108), H2O2 (107), HemaPeroxy (104) and Isopropyl Alcohol (98) had the least corrosion observations over the five observed time points. Graph Pad Prism 6.02 1 way ANOVA test was done and there was no statistically significant difference in the corrosiveness of the five tested disinfectants. Comparing the change in coupon weights from d0 to d48 after sonication between the disinfectants showed no significant different.

**Conclusions**: Galvanized steel, mild steel and brass were all statistically more corroded than stainless steel in all five disinfectants. Therefore, I accept my 1st hypothesis as true. There was no statistically significant difference in corrosion action between the five disinfectants however bleach was observed numerically to cause the most corrosion observations as well as the greatest loss in coupon weights. Therefore I would reject my 2nd hypothesis. Based on these results from a corrosion perspective stainless steel would be the best metal to choose for use as a surface coming into contact with these five disinfectants. However, in addition to corrosion when selecting a metal other factors such as cost and durability must be taken into consideration. Selection of a disinfectant from a corrosive perspective on the five tested metals would support not using bleach and instead using Isopropyl alcohol. When selecting a disinfectant besides corrosion bacterial killing capability and cost must also be considered.

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