



bioWALL
Protecting Water, Air, Land & Life

FOOD SAFETY:

Protection from
Farm to Table



SAFELY FEEDING A GROWING WORLD: CHALLENGES & SOLUTIONS

Food safety has long been a paramount concern for humanity, leading to stringent dietary laws and health protocols across cultures. Over the last several decades, incredible strides have been made in terms of productivity gains, reduced food costs and increased food safety due to pasteurization, refrigeration, irradiation, and prophylactic use of antibiotics. Antibiotics, while effective, also face a changing social and microbiological landscape, calling for alternative and innovative large-scale solutions.

Delivering food securely from source to consumer presents an array of challenges for farmers, food processors, commercial kitchens and the burgeoning food service industry. Population growth and globalization, coupled with increased demand for antibiotic free, non-GMO, and organic products, highlights the need for clean, safe prevention and decontamination solutions with minimal environmental impact across the supply chain.

Global Trends & Impacts

- Food costs have decreased to less than 10% of income in the developed world and a rapidly emerging middle class globally continues to drive demand for high-quality animal proteins
- With globalization and long-distance supply chains across the food industry, risks for disease and bacterial transfer are increased
- Maximizing yield and profitability across all segments of agriculture, especially poultry and livestock increases bio-density and with it pathogen spread potential
- Concern exists over broad use of antibiotics: potential for mutations, reduced effectiveness, drug resistance, and trans-species infection
- Hybridization, pesticide usage and other factors over the past several decades have reduced bio-diversity and with it some natural disease resistance among plants and animals

A GROWING RANGE OF RISKS

Whether produce is sold directly by the farmer to the consumer, or animal protein is processed, packaged and delivered via a complex supply chain, there are risks at every point. From viruses wiping out flocks to water contamination to antibiotic resistance and cross-species contamination to E. coli and salmonella outbreaks, the potential costs to the food industry in terms of life, assets and reputation are significant, requiring thoughtful prevention, preparedness, and if necessary, rapid response to mitigate nascent threats.



Challenges Facing a Growing Global Animal Protein Market

Large-scale, industrial production has effectively increased yield, reduced the cost of food and enabled greater nutrition for many, yet brings a number of challenges. According to the World Health Organization, the world's livestock sector is growing at an unprecedented rate, and the driving force behind this enormous surge is a combination of population growth, rising incomes and urbanization. Annual meat production is projected to increase from 218 million tons in 1997-1999 to 376 million tons by 2030.

Increased bio-density from commercial farming increases risks related to the introduction of an array of biological contaminants into the local environment, from wastewater to odors to increased potential for rapidly-spreading disease. Downstream impacts exist as well. Whether animals themselves are transported for breeding, meat is served in a restaurant, or processed meat products are sold through grocers, animal proteins are at risk for spoilage and contamination unless the full supply chain is protected. The costs are difficult to quantify in the short term but may have severe long-term impact on public health, physical assets and corporate good will.

Avian Influenza: Example of an Evolving Global Threat

Highly pathogenic avian influenza illustrates the size and potential cost to farmers of a specific naturally-occurring pathogen, which as it continues to evolve and mutate, threatens bird populations and increases costs to producers.



According to a December 29, 2015, USA Today interview with U.S. Secretary of Agriculture, Tom Vilsack, “The deadly bird flu virus that devastated the poultry industry last spring and sent egg prices soaring could reappear, even though no new cases have been detected for months.” The article cites that in early 2015, “the disease destroyed nearly 50 million farm birds. Iowa, the nation’s largest egg producer, lost 31.5 million birds across 18 counties, including about 30 million laying hens and pullets and 1.1 million turkeys. The virus cost the state’s economy \$1.2 billion through lost egg, chicken and turkey production, as well as lost wages and tax revenue, according to a study commissioned by the Iowa Farm Bureau Federation.”

Further, the article indicated that “The USDA spent about \$1 billion on the outbreak. That included costs for surveillance, testing, cleaning, disinfecting and disposal as well as \$200 million in indemnity payments helping farmers cover their losses.” Among the most successful treatment programs was the patented DiKlorSM oxidant treatment, offered by BioWALL, noted for disinfecting 11 of the largest egg producing barns in the U.S., delivering a highly-effective (100% “No Growth Standard”), safe and environmentally-friendly solution. In early 2016, other avian influenza strains are appearing in Europe, Asia and in the U.S. Midwest.

Other food-related pathogens with the potential to negatively impact food producers’ bottom line are highlighted in the table below. As you can see, despite ongoing efforts, there has been little reduction in incidence.

Other Food-Related Pathogens (incidence per 100,000 people) 2002-2014

PATHOGEN	2002	2006	2010	2014
Salmonella	16.24	14.76	17.55	15.45
Campylobacter	13.38	12.73	13.53	13.45
Shigella	10.86	6.10	3.77	5.81
Cryptosporidium	1.32	1.94	2.75	2.44
E. coli O157:H7	1.69	1.30	0.95	0.92
Vibrio	0.27	0.34	0.41	0.45
Yersinia	0.45	0.36	0.34	0.28
Listeria	0.25	0.28	0.27	0.24

Source: Centers for Disease Control and Prevention

The Power of DiKlorTM Oxidant Technology:

Chlorine dioxide is among the most powerful broad-spectrum sterilants available.

BioWALL delivers powerful DiKlorSM solutions including large-scale facility, wastewater and localized food production decontamination.

- The only registered sterilant that is non-carcinogenic and provides broad-spectrum decontamination with the capability to address the toughest biological contaminants on porous and non-porous surfaces, structures and contents
- Achieves the highly-stringent “no-growth” treatment standard in biological remediation
- Scalable to large structures up to and exceeding 20 million cubic feet
- Chlorine dioxide (ClO₂), a water-soluble gas, destroys biofilm, and bacteria and viruses cannot develop resistance
- Rapid natural breakdown of ClO₂ coupled with CONSYSTM scrubbing systems allow for safe and quick application
- As a selective oxidant, ClO₂ reacts with targeted contaminants with insignificant or zero effect on other materials such as metal and building components
- Treatment produces neither post-remediation residue nor toxic or carcinogenic by-products, leaving only trace background residual salt
- ClO₂ is capable of eliminating widespread and embedded pathogens
- At low levels, in water it is effective at personnel and surface decontamination and rapidly dissipates, leaving no residue

BIOWALLSM SOLUTIONS: A SCALABLE PROTECTION SOLUTION FOR THE ENTIRE FOOD INDUSTRY SUPPLY CHAIN

For those in the food industry, the ability to prepare for, prevent and mitigate risks, and if necessary, quickly remediate naturally-occurring or intentional contamination events, is critical to protecting their people, assets and reputation. Our comprehensive BioWALLSM services provide a critical tool in the arsenal, delivering state-of-the-art, patented technology solutions to address the full spectrum of pathogens impacting our food supply – from farm to production to table.



BioWALL is uniquely positioned to proactively address a broad range of challenges across the food industry supply chain, including: improving biosecurity and mitigating cross-contamination at facilities; disinfecting barns between crops and repopulations; treating grain, water, waste and byproducts; sterilizing eggs and protein during production and processing to kill contaminants such as E. coli and salmonella; and preventing contamination at packing and distribution centers.

BioWALLSM comprehensive bioprotection services set the highest standard for efficacy and performance, and also offer significant cost advantages. Engaging BioWALL prevention and preparedness services or complete, rapid decontamination services, saves significant time and expense, safeguards human health, and protects physical assets and brand value. BioWALL helps prevent and eradicate contamination across the food supply chain, using proven, superior technology.

At the core of BioWALLSM service solutions are patented DiKlorTM chlorine dioxide (ClO_2) generation systems, methods, and treatment processes. ClO_2 is a powerful water-soluble gas that destroys harmful and potentially deadly biological and chemical contaminants. ClO_2 is a broad-spectrum sterilant, highly effective in remediating a vast array of pathogens, purifying drinking water, destroying mold and mold spores, and sterilizing large spaces, including large-scale barns, food processing plants, commercial kitchens and livestock transportation.

The BioWALL team of experts has mastered the use of ClO_2 as a microbial sterilant, developed proven technology for effective large-scale, on-site production of ClO_2 gas, and gained recognition for responding quickly to the world's toughest biological and chemical public health threats. As an example, in March 2016, BioWALL conducted and executed a successful field test of its technology in rapidly and cost-effectively mitigating HPAI from barns. Participants in this government-sponsored Cooperative Research and Development Agreement included Daybreak Foods, USDA, EPA, University of Minnesota, Iowa State and participants from National Guard, FEMA, US Air Force and Homeland Security.

INDEPENDENT VALIDATION

- A portfolio of patents surrounding DiKlorTM oxidant technology and treatment services
- U.S. EPA-registration (No. 73139-3) for the only non-carcinogenic sterilant that provides broad-spectrum decontamination with the capability to address the toughest biological contaminants on porous and non-porous surfaces
- National Academy of Science recognizes it as the 'standard' for large-scale decontamination
- The U.S. Department of Agriculture recognizes this technology as an approved method for remediation of HPAI infection

BIOWALL DIKLORSM FLUID & FUMIGATION TREATMENTS ARE PROVEN "GREEN" TECHNOLOGY

DiKlorTM ClO_2 , generated in its purest form using the patented ChemGenTM generator, leaves neither residual toxicity nor carcinogens. The health, safety and environmental performance of BioWALLSM treatment processes are unparalleled for use not only in physical structures but with food products, in municipal drinking water, municipal waste water and direct food contact process water. Conventional biocides are regulated and prohibited for use in addressing contaminated drinking water supplies and aquifers because of their inherent toxicity. Only chlorine dioxide, ozone, ultraviolet light, chloramine and chlorine are allowed for use in the potable water supply. Compared with alternative methods of disinfection, DiKlorTM chlorine dioxide has marked environmental and human health advantages because it does not form dangerous, potentially carcinogenic brominated or chlorinated by-products during the disinfection process.

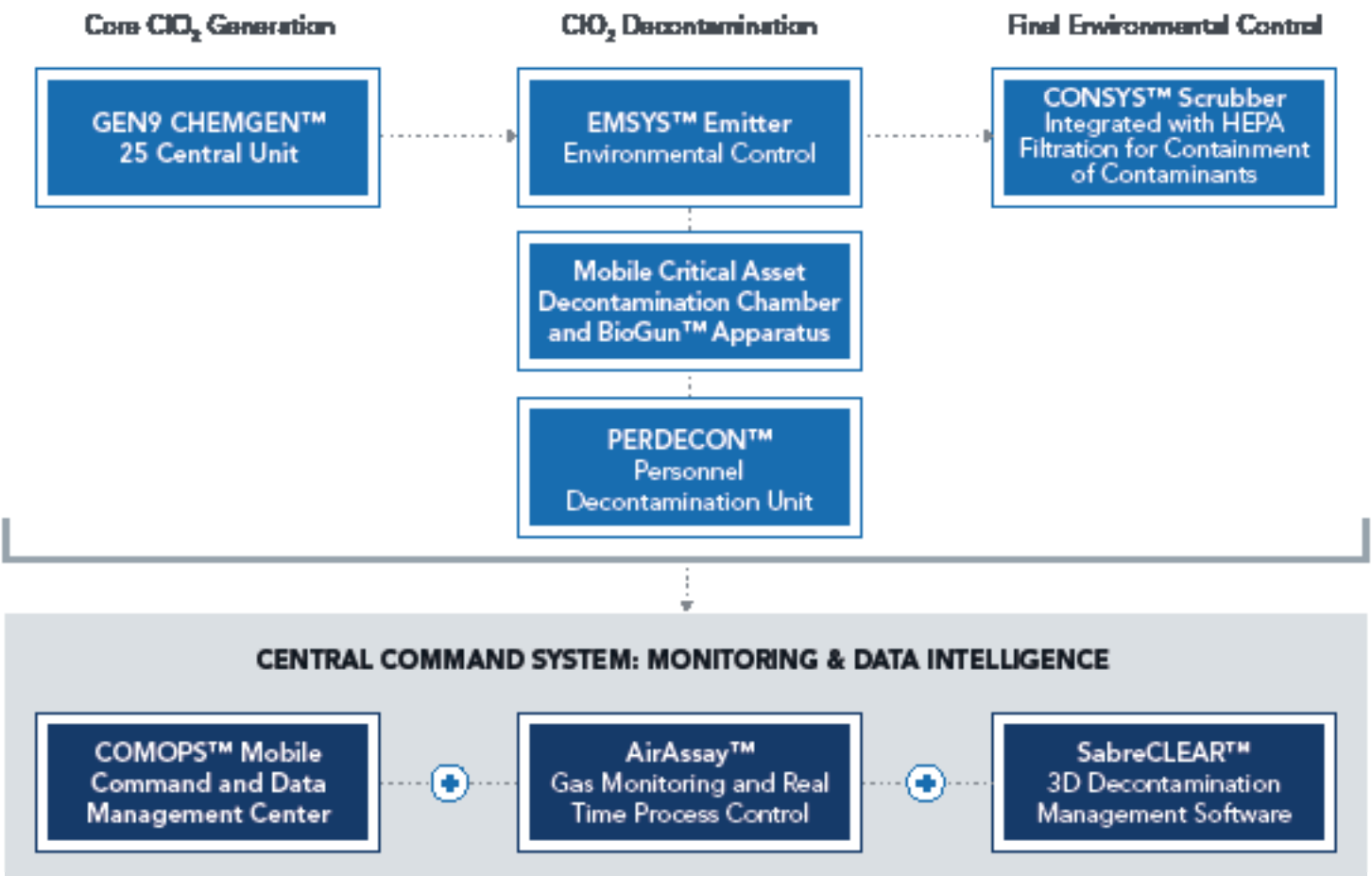
INDUSTRY LEADING EFFICACY

BioWALL has a proven record of rapidly delivering complete disinfection across all operations ever performed – from weaponized anthrax to deadly mold to avian influenza. Following the 2001 anthrax attacks, the federal government and private parties recruited BioWALL’s affiliate, SabreSM service experts to remediate all contaminated structures, ranging in size and complexity up to the 17,000,000 cubic foot Brentwood postal facility. These highly-contaminated structures required complete kill on all surfaces within, including carpeting, drywall, air ducts, electronics, furniture, and archives. Anthrax, as a spore, is recognized as one of the most difficult-to-kill pathogens. After Sabre’s treatments, thousands of samples were tested – the most comprehensive testing program on this scale ever administered – and not a single active spore remained.

FULLY CONFIGURABLE, INTEGRATED SOLUTION

BioWALLSM service solutions offer scalable, end-to-end mobile deployment systems employing patented apparatus and treatment processes, data intelligence and operational controls. The patented technology and related trademarks referred to herein (DiKlor, ChemGEN, EMSYS, CONSYS, BioGun, PERDECON, COMOPS, AirAssay, Sabre^S, and SabreCLEAR) are owned by Sabre Intellectual Property Holdings, LLC and used pursuant to a license.

INTEGRATED TECHNOLOGY & ENVIRONMENTAL CONTROL SYSTEM



For more information on BioWALL and its capabilities in preparing for, preventing and remediating contamination across the food industry, please contact Adam Oesterle at 917-273-3975 or visit biowall.com.