



SILESTONE INSTITUTE TECHNICAL NOTEBOOKS

01

SPSA

Passive Food Safety Systems
in Kitchens



Silestone Institute

Contents

Foundations of the 21st-Century Kitchen	page 5
Introduction	page 7
SPSA - A New Concept in Food Safety Management	page 8
Brief Comment on Food Safety	page 9
• What is food safety	page 9
21st-Century Kitchens	page 10
• Evolution of kitchens	page 10
• The kitchen: a healthy area	page 10
SPSA - Definition and Concept	page 12
SPSA Description of Systems	page 13
• Materials and coatings	page 14
• Refrigerators and small appliances	page 16
• Kitchen tools and utensils	page 18
• Hygienic kitchen	page 19
• Sensor-operated soap and water dispensers	page 20
• High-speed air jet dryers	page 21
• Hygienic infrared-sensor waste bins	page 22
The Silestone Institute	page 25



Foundations of the 21st-century kitchen

A full two thousand years have gone by between 1st-century Apicius' "**De Re Coquinaria**" ("On the Subject of Cooking") and the contemporary cuisine of the Michelin Guide chefs. Twenty centuries of evolution in kitchenware, cooking methods, equipment, ingredients and, naturally, humans. Food preparation has moved from spit roasting to molecular gastronomy, from wood fires to induction hobs, from Roman garum to spherification. Modern-day man has progressed from survival eating to savouring exquisite dishes and choice wines.

The art of gastronomy has also seen a qualitative leap in kitchen hygiene, however. We need only look back to the magnificence of Louis XIV's France, where lavish banquets for 1500 guests were served at Versailles with little regard for contamination-free conditions in food preparation areas. Leonardo da Vinci's inventions to sanitise renaissance kitchens seem rather primitive to us nowadays. In the ancient world, slaves scrubbed and scoured the patricians' kitchens in almost the same way that our mothers did until only recently.

But things are changing. And a lot! Leading-edge technologies in food safety are laying the groundwork for a new concept in kitchens. Novel materials and coatings plus new utensils and home appliances are enhancing safety and hygiene, which allows everyone to focus their gastronomic efforts on the creative aspect of the process.

The 21st century kitchen means plenty of things (as we've already seen in the 20th century), but should be built to attain hygienic levels not previously achieved in history. Whether humble fare such as sandwiches or sophisticated cuisine and elaborate dishes, food should always be handled with careful attention to hygiene. There's no use in preparing "Poultry Cream with Thyme Sabayon" or "Cucumber and Mint Foam with Trout Caviar" if meticulous care and hygiene cannot be ensured throughout the process. Cooking can't exist without hygiene, just as there can't be a meal without bread. Hygiene is a foundational value for the 21st-century kitchen.

Sergi Arola
Chef

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1. De Re Coquinaria is the main treatise on gastronomy from ancient times and has traditionally been attributed to Marcus Gavius Apicius, a famous 1st-century gourmet at the time of the Roman emperor Tiberius.
2. Key condiment of Roman cuisine that, although somewhat transformed, has survived to modern times.

Introduction

In keeping with the research and informative efforts undertaken by the Silestone Institute, we are now launching a new series of publications known as the **Silestone Institute Technical Notebooks**.

The purpose of this collection is to provide technical information on hygiene in the home and in professional settings to help improve the health and quality of life of people.

The first issue of our new publication takes a look at Passive Food Safety Systems - SPSA (Acronym in Spanish of *Sistemas Pasivos de Seguridad Alimentaria*), a new and innovative concept in food safety management that was developed for the Silestone Institute by Maite Pelayo Blas, a microbiologist specialising in food safety and a member of the Institute's Advisory Board.

SPSA is a fascinating line of research which covers all present and future technological utilities that, when applied to kitchens and related fields, help provide an area where food preparation is safer.

We are confident that both our first and our successive issues of the Silestone Institute Technical Notebooks collection will help accomplish the goal we have in mind.

Francisco Martínez-Cosentino

Chairman
Silestone Institute



SPSA

A new concept in food safety management

Self-preservation is a deeply rooted natural instinct in humans. Since ancient times, humans have endeavoured to protect themselves, albeit not always successfully, against the surrounding dangers, whether the inherent menaces of a continually changing planet or the hazards derived from co-existence with other organisms. Among the latter, indiscernible microorganisms have always been a latent threat unknown to our ancestors. At the present time, however, this threat can be largely controlled, thanks to the efforts and accomplishments of scholars and scientists. Certainly the fields where the presence of these microscopic organisms is felt include the food sector, a sphere that requires careful control and monitoring. Food can be a medium of microbial growth and development and therefore is a potential vehicle for disease transmission. The development and implementation of food safety systems throughout the entire food chain is a right and responsibility for every party involved, from the producer to the final consumer. Passive Food Safety Systems - SPSA (Acronym in Spanish of *Sistemas Pasivos de Seguridad Alimentaria*) are themselves an pioneering management system and valuable tool to successfully carry out this crucial task.

Passive Food Safety Systems - SPSA (Acronym in Spanish of *Sistemas Pasivos de Seguridad Alimentaria*)– is a new concept developed by the author, Maite Pelayo Blas, as a distinctive management tool in food safety systems. The concept represents a fascinating line of research which covers all present and future technological utilities that, when applied to kitchens and related fields, help provide an area where food preparation is safer.

The publication entitled “SPSA in Kitchens” is sponsored and published by the Silestone Institute.

Maite Pelayo Blas
Microbiologist, food safety expert

Brief comment on food safety

What is food safety

“Food safety” brings to mind terms such as quality control, toxic substances and microorganisms. Nevertheless, what we understand by these terms is often merely a partial view of the concept. According to the definition issued by the FAO (Food and Agriculture Organization), “food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life.”

In fact, food safety involves meeting the following conditions:

- Availability of a broad range of wholesome foods, without seasonal fluctuations or shortages
- Access to foods or the ability to acquire them
- High degree of safety and quality of foodstuffs

The first two conditions are typically met in developed countries, except under unusual situations. Therefore, the last point on safety and quality of foodstuffs is particularly important and is the target of all control mechanisms. In this context, the term “food safety” refers only to problems with food safety and hygiene.

Regulatory policies and quality control measures and processes alike are all intended to safeguard food and ensure that it reaches the consumer free of any contamination that could threaten health. These potential threats include microorganisms,

particularly bacteria, which is the type of contaminant most commonly implicated in food-related problems and which requires vigilance to prevent spreading.

21st-century kitchens

New technologies offer a wide range of possibilities that should be taken into consideration when designing a space where food safety is a priority.

Evolution of kitchens

Kitchens have evolved throughout human history because of the various activities undertaken therein and because of ongoing technological advances developed and implemented over time. In the 21st century, new technologies offer a far-reaching range of possibilities that should be considered when designing a space where food safety is a priority.

In modern kitchens, innumerable activities are carried out in very little space. In addition to cooking and eating, the area is often where people gather to chat, relax, help with kids' homework or even watch TV at breakfast time. The kitchen has certainly become a multipurpose area, but that does not mean the assorted tasks should thwart the main goal of food preparation. Modern kitchens have better equipment and more sophisticated appliances for food storage, processing and cooking and for utensil cleaning... but the question remains whether hygiene and food safety in kitchens has become significantly better over the past 50 years.

The kitchen: a healthy area

Growing concerns about a healthier lifestyle have led to sustainable homes where the designs, materials and energy sources used are more reasonable and environmentally friendly.

Although there is considerably more preoccupation and interest in anything related to healthy eating (including food safety) in recent years, modern kitchens often do not mirror the level of technological development seen in other areas of our lives, even within our own home.

The idea is to create a setting where the food handler—who plays a key role—finds it easy to maintain an acceptable degree of safety.

Healthy kitchens are designed to be a space to:

- Facilitate the use of proper handling practices, both in terms of design and outfitting
- Foster cleanliness, hygiene and maintenance

The idea is to create a setting where the food handler—who plays a key role **finds it easy to maintain an acceptable degree of safety**. The following aspects have traditionally been taken into consideration when designing and outfitting kitchens:

- Suitable ambient conditions (temperature, humidity, air flow, etc.)
- Suitable materials and equipment (non-toxic, non-porous, resistant, etc.)
- Different areas included in the kitchen: storage, handling, cooking, cleaning, waste, etc.
- Always forward" (no-return) work line that avoids crossover between the various activities and clearly delineates the areas to be used for each task.



Home kitchen in which Passive Food Safety Systems (SPSA) have been included:

1. Antibacterial switches.
2. Refrigerators with antibacterial treatment.
3. Automatic water economiser.
4. Sensor-operated soap dispensers.
5. Antibacterial countertops.
6. Air jet dryers.
7. Hygienic infrared-sensor waste bins.
8. Cutting boards with antibacterial treatment.

SPSA

Definition and concept

SPSA are late-generation materials and equipment that, when installed in the kitchen, improve kitchen safety and hygiene without significantly interfering with the user's habits

The concept is a new approach toward food safety developed by the use of Passive Food Safety Systems (SPSA by its Spanish acronym), defined as **all late-generation materials and equipment that, when installed in the kitchen, improve kitchen safety and hygiene without significantly interfering with the user's habits**. This concept is certainly an innovation in the food industry, but has been widely researched, developed and employed in other sectors such as the automotive industry, where safety is a high priority. Equipping cars with additional protection systems such as non-deformable interiors, safety belts or airbags has introduced radical changes in traffic safety.

By equipping kitchens with SPSA, the user, who plays a key role in the process, attains a higher degree of safety (mainly microbiological) as well as improved results and enhanced consumer pro-

tection without making changes in food handling habits.

SPSA keep kitchen contamination from starting or spreading and diminish its consequences if it occurs, but are not a substitute for proper habits: ongoing user information and training will always be necessary. Furthermore, SPSA are no excuse for laxity in a work system based on Hazard Analysis and Critical Control Points (HACCP) in professional kitchens, but do provide added protection against potential food dangers.

SPSA

Description of systems

The SPSA concept includes the following systems, all of them based on different approaches but pursuing the same goal of enhancing safety.

The table below lists several examples of Passive Food Safety Systems:

SPSA	Beneficio
Materials and coatings with bacteriostatic treatments	Safely protect against bacterial proliferation between cleanings
Refrigerators and small appliances with bacterial protection	Hinder microbe growth in hard-to-reach areas such as refrigerator interiors and small appliances
Kitchen tools and utensils with antibacterial treatment	Lower the risk of contamination
Hygienic kitchen towels	Reduce the risk of possible cross-contamination from the use of kitchen towels
Sensor-operated automatic soap and water dispensers	Save water while also minimising the transfer of microorganisms that inevitably build up on hands; can also be used in liquid soap dispensers
High-speed air jet dryers	Keep temperatures from rising and avoid stirring up dust and microorganism
Hygienic infrared-sensor waste bins	Prevent contamination from potential sources of infection

Materials and coatings

SPSA with bacteriostatic treatments

SPSA surfaces protect against bacterial contamination by inhibiting growth between cleanings and, therefore, are safer and more hygienic than traditional surfaces.

In both professional kitchens and household environments, the preparation of safe foods should be the result of a project planned from start to finish (both in the design and distribution of space and in the materials and equipment) with a set of conditioning factors that lessen the burden of ordinary tasks and help the user to develop proper practices to ensure product safety.

The materials used in kitchens and work facilities should be strong, smooth (preferably with no joints), impermeable, non-porous, non-absorbent and easy to clean and disinfect. It is important that these surfaces stay clean and dry. Additionally, it is essential that materials in direct contact with foods be non-toxic and avoid any alteration in the original organoleptic properties of the food. The marketplace offers bacteriostatic materials and coatings that, in addition to meeting these requirements, minimise microorganism development as an additional means of prevention to periodic cleaning with other types of disinfectants.

If kitchen surfaces are not well cared for, they can become a source of contamination for the foods and utensils with which they come into contact. The high humidities and warm temperatures present in kitchens are key factors in bacterial multiplication and can convert

any surface, such as countertops, into a major source of contamination.

Various technological advances are now being made, which means we now have countertops that incorporate bacteriostatic principles, giving them unique properties that help inhibit the growth of bacteria and other potentially harmful microbial forms, all using an approach that is completely harmless for the user. These SPSA surfaces are safer and more hygienic than traditional surfaces and are ideal for use in areas where food or other hygiene-related products are handled, such as kitchen and bathroom countertops, professional kitchens, hospital or laboratory facilities, all areas where utmost hygiene should be used and maintenance work should be facilitated.

Various technological advances are now being made, which means we now have countertops that incorporate bacteriostatic principles

Bacteriostatic agents are natural or synthetic, organic or inorganic substances that inhibit the growth of microorganisms (mainly bacteria but also other types of microbes such as fungi and yeasts, viruses and protozoa). The effectiveness of these agents depends on several parameters, among them, concentration, type of microorganism and substrate, temperature, pH, humidity and oxygen levels. They differ from bactericidal substances, as the latter do not prevent growth but destroy it, which means they are harsher for both bacteria and the general environment. Because of their effects, these types of bacteriostatic and bactericidal substances are also known as antibacterial or antimicrobial agents.



Professional kitchen with bacteriostatic surfaces and coatings



Professional kitchen: countertop with bacteriostatic protection



Materials with bacteriostatic treatment over the entire structure

Refrigerators and small appliances

Other elements such as light switches

SPSA based on SILVER ION antimicrobial therapy

This hinders microbial development in spots as crucial as refrigerator interiors

In these kinds of refrigerators, the inner walls and door have a special silver ion treatment or coating to prevent microbial growth and colony formation in the hard-to-reach inside corners. The film or treatment does not come off with cleaning, but does prevent bacterial and microorganism growth and the development of unpleasant odours inside the appliance, keeping food fresh and healthy for longer. The SPSA system lengthens the time that food can be stored in the refrigerator and enhances hygiene in an area that is often hard to clean (need to remove food, turn off the appliance and defrost, etc.), making a significant improvement over traditional refrigerators.

In the food industry, silver ion treatments are also being used in refrigerators and small home appliances such as icemakers and water filters

and in agri-food machinery and conveyor belts, as well as other non-kitchen items often used in such areas, such as computer keyboards or air conditioning systems. In order to enhance hygiene throughout the entire home (not just the kitchen), another development is that of light switches that effectively protect against microbe transmission.

This innovative approach is based on the antimicrobial properties of silver ions, which are mixed with the parent material or coating. When the ions come into contact with ambient humidity, they cause an antibacterial reaction on the switch surface. To be effective, the silver ions must interact with the microorganism, altering its vital functions and eliminating its ability to grow and replicate.

Silver ions: Along with their other advantages, silver ions are a broad-spectrum antimicrobial, although less active against resistant microbial forms, such as spores. Studies have also shown that microorganisms are unlikely to develop any kind of resistance to the treatment. The ions are safe, ecological,

permanent and non-contaminating for other living beings and are not eliminated when the treated product is cleaned.

This innovative approach is based on the antimicrobial properties of silver ions, which are blended into the parent material or coating



Refrigerator with silver ion antimicrobial treatment



Refrigerator interior that minimises microbial multiplication



Switch with antibacterial treatment (mechanism and cover)

Kitchen tools and utensils

SPSA based on SILVER ION antimicrobial treatment or other bacteriostatic treatment

These systems lower the risk of contamination, providing an effective precautionary measure in addition to regular cleaning.

Kitchen tools and utensils are items where microorganisms can develop because of contamination. Because these items are crafted of suitable materials and subject to careful hygiene with appropriate cleansing and disinfecting products, the antibacterial protection treatments ensure good hygiene in between cleanings, a step that should however be done after use and whenever the type of food is changed. Kitchenware materials in contact with food should meet several stringent requirements; for instance, they must be completely non-toxic and not alter the sensory properties of the product or deteriorate with repetitive

cleaning and disinfection. Additionally, in items that are easily contaminated (cutting boards, knives and utensils) and prone to microbial growth, SPSA based on the use of antimicrobial agents such as silver ions in the parent material or coating or the application of bacteriostatic additives provides an additional effective precautionary measure to periodic cleaning with other types of disinfectants.



Kitchenware with bacteriostatic treatment

Although silver may seem like a novel technological discovery, it has actually been used for protective purposes against infections for thousands of years. Throughout history there have been numerous reports that silver could protect against infections: for instance, the metal has been used in ointments and tooth fillings. However, it was not until the late 19th century that early research proving its antimicrobial properties was first made public. **Bacteriostatic additives** have also been used for decades as antibacterial protectors in other products such as toothpastes, shampoos, bath gels, deodorants and pharmaceutical and hospital items.

Hygienic kitchen towels

SPSA with bacteriostatic treatment to prevent the growth of microorganisms

This system reduces possible cross-contamination from the use of kitchen towels

Kitchen towels pose a high risk of cross-contamination. Indiscriminate use after handling raw and cooked foods as well as different kinds of products makes them a common source of contamination in kitchens. Kitchen towels are used in the course of food handling, as well as for other kitchen chores such as drying or wiping tools and utensils, and therefore present an enormous potential risk for the spread of any infection. Hygienic towels have a bacteriostatic and fungicidal application that prevents bacterial and fungal proliferation when contamination occurs, minimising its impact. The towels have no seams where microorganisms could build up and are normally for single use only, which means they are more effective and hygienic for kitchen use than traditional textile items. In the case of reusable towels, the antibacterial treatment with silver ions lasts for a great number of high temperature wash cycles without losing effectiveness. In some cases, the variety of colours means that the different uses can be readily distinguished within the kitchen, lowering the risk of cross-contamination.



Hygienic kitchen towels

Sensor-operated automatic soap and water dispensers

SPSA to prevent any recontamination or cross-contamination

SPSA help minimise recontamination and cross-contamination and also help save water

Hand-washing is one of the recommendations most heavily stressed in Good Handling Practices (GHP) manuals: before cooking, when switching the type of food, after going to the bathroom, etc. However, if this step is not properly done, it not only fails to sanitise (i.e., eliminate any harmful element that could contaminate food during the work), but will recontaminate hands and be the source of possible cross-contamination, hence its effect will be precisely the opposite.

In professional kitchens, water taps should be automatically actuated to avoid this type of contamination and soap should be dosed through a dispenser. Current trends in the field of hygiene point to

a much more effective system, where the handler's hands never come into contact with the washing mechanism. This SPSA avoids potential recontamination of hands after washing as well as cross-contamination because both soap and water are automatically sensor-dosed by simply placing the hands below the water tap. Saving water is simply an added advantage.



Toilet faucet with sensor technology

Cross-contamination is the transmission of microorganisms from a contaminated food (usually raw) to another that was not contaminated (usually cooked). This type of contamination is one of the most common causes of food poisoning in kitchens and can occur by direct contact between two foods or indirectly from the handler's hands or from kitchen items such as utensils, towels or surfaces.

High-Speed Air Jet Dryer

SPSA to keep temperatures from rising and avoid stirring up dust and microorganism

These SPSA help keep temperatures from rising and avoid stirring up dust and microorganism

Automatic dryers are nothing new and have, in fact, been used for many years along with paper towels as a hygienic alternative for hand-drying in both public bathrooms and kitchens. However, some people question the two systems, one as non-ecological and the other as a heat source that produces air currents, spreading airborne dust and microorganisms throughout the room. The innovation of these late-generation automatic hand-dryers lies in their use of high-speed air jets for drying. The jets do not raise the temperature of the area or stir up particles or microbes, which are a potential source of contamination. An additional advantage of this SPSA hand-drying system based on high-speed jets is that, along with being fast and energy-saving, water splashing on the floor or clothing is avoided.



Air jet dryer

High temperatures in a kitchen can exacerbate the risk of bacterial contamination, a risk further accentuated by circulating air that propagates bacteria throughout the area.

Hygienic infrared-sensor waste bins

SPSA to prevent contamination
through sources of infection

These SPSA prevent contamination through infection sources resulting from rubbish

Professional kitchens are arranged and furnished to ensure that waste is set apart and controlled between generation and removal, in order to avoid threatening food safety. Rubbish containers should have airtight seals and an automatic operating mechanism (to prevent contact) and should be easy to clean and disinfect, constructed of strong materials and kept in good working order. However, automatic opening systems are often unable to prevent all container contact or contamination from the handler's hands. SPSA infrared-sensor waste receptacles are an excellent hygienic option to avoid contact between hands and the source of contamination. Bringing the hands or another object close to the receptacle will open it automatically to receive the rubbish and then close tightly, preventing the container from jamming open with any resulting risk.



Hygienic infrared-sensor waste bins

Kitchen waste or rubbish is an important source of microbial contamination due to its high organic matter content, which makes it an excellent medium for the development of both microorganisms and pests and the ensuing health risks involved.

The Silestone Institute

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The **Silestone Institute** contributes to boosting awareness of the important role of hygiene and ensuring that the general public and professionals have access to comprehensive information on hygiene in the kitchen and bathroom, focusing specifically on the practices, products and processes to protect against all types of bacteria. Hygiene in the kitchen and bathroom comprises an overarching concept that ranges from cleaning, disinfection and food safety to the choice of materials and furnishings, space distribution, habits, uses, presentation, relationships and technology.

All information published by the **Silestone Institute** is vetted by its Advisory Board, comprised by experts in various fields such as food safety, professional cuisine, scientific communication, cleaning products, architecture and design, hospitality and food services. These experts make their knowledge available to consumers, professionals and society at large. The Institute also boasts involvement from government agencies, health professionals, experts, environmentalists, immunologists, regulatory agencies and the private sector, all of whom work together to develop an integrated approach to hygiene.

Aim: To increase public awareness of the importance of hygiene in the kitchen and bathroom

The various parties involved in the **Silestone Institute** work in harmony to:

- Foster not only a change public behaviour, but a more positive attitude toward hygiene as a means to achieve health and well-being
- Provide the opportunity to gain a balanced understanding about how to protect from bacterial growth in kitchens and bathrooms
- Adopt an approach based on the 'target' objective of hygiene in the home, which should be adopted as the basis for developing hygiene standards for the home and everyday life. This will make it possible to effectively break the chain of infection transmission.



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- Merten/Schneider Electric / light switches
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