UNIVERSIDADE DE SÃO PAULO
Faculdade de Zootecnia e Engenharia de Alimentos
Departamento de Engenharia de Alimentos

ZEA – 1001 – GESTÃO DA QUALIDADE NA INDUSTRIA DE ALIMENTOS

https://www.freedomsphoenix.com/News/113613-2013-04-30-food-as-a-political-weapon-the-usdas-suicide-seed-the.htm

FOOD DEFENSE e FOOD FRAUD

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Engenheira de Alimentos
ZEA / FZEA / USP

Estamos preparados para uma situação de terrorismo Alimentar?

O que nos falta?

Introdução

- Gestão da Qualidade
  - HACCP
  - Food Defense
  - Food Fraud

Os acontecimentos recentes têm enfatizado a importância de se proteger a cadeia de suprimentos de alimentos de contaminação acidental ou intencional, **necessitando mais do que nunca** atenção à alimentação e manipulação de alimentos!

Portanto: coordenar esforços para a segurança/defesa alimentar oferecendo a melhor proteção possível.

Introdução

Amerithrax, 2001 – ***Bacillus anthracis***

Amerithrax 2001

Ação:

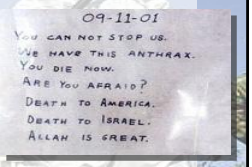
1) Número total de **casos**: **18** confirmados; **4** suspeitos.

2) Mortes por antrax inalado: **5**

3) Sobreviventes de **antrax inalado : 6**

4) Casos de **antrax cutâneo**: **7**

5) Método de dispersão: **5 envelopes postais**



Reação:

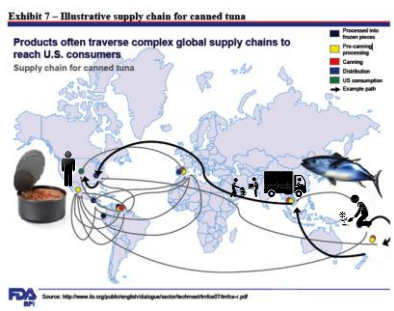
1) Falsos **alarmes**: **4.000** nos EUA e **3.000** no resto do mundo.

2) Custo da resposta a falsos alarmes nos EUA : **100 milhões** de dólares.

3) Custos previstos das medidas preventivas no **sistema postal** dos EUA: **5 mil milhões de dólares.**

4) Pessoas que procuraram **antibióticos : 11 milhões** (4% dos habitantes dos EUA).

Contaminações intencionais



(KENNEDY e BUNKO, 2007)

Casos de contaminações intencionais

- **Uvas contaminadas com cianeto.**
- **O incidente gerou US $200 milhões em receitas perdidas.**
- **Entre 2 a 3 milhões de caixas de frutas destruídas.**
- **Proibição de importações de frutas e verduras .**
- **Consumidores desconfiados (FDA, 2015).**

Extorsão

- **Contaminados com vidro, pinos, soda cáustica e lâminas de barbear. O autor do crime exigia para a marca HJ Heinz, US $1.7 milhões para não continuar contaminando mais produtos.** (*The New York Times*,1989)

Funcionário insatisfeito Michigan (USA) - 2003

- **765 kg de carne contaminados para prejudicar o supervisor.**
- **111 pessoas intoxicadas**
- **Inseticida "Black Leaf 40" nicotina**

(FDA, 2015)

Fraude no leite

Amostras de leite

ANO	2009	2010	2011	2012	2013	2014
TOTAL DE AMOSTRAS COLETADAS	2.722	4.224	4.151	3.332	5.427	2.636
TOTAL DE AMOSTRAS FORA DOS PADRÕES REGULAMENTARES	429 (15,8%)	551 (13,0%)	579 (14,0%)	375 (11,3%)	451 (8,3%)	326 (12.4%)

Amostras de leite em pó

ANO	2009	2010	2011	2012	2013
TOTAL DE AMOSTRAS COLETADAS	617	850	582	483	850
TOTAL DE AMOSTRAS FORA DOS PADRÕES REGULAMENTARES	87 (14,1%)	123 (14,5%)	103 (17,7%)	38 (7,9%)	50 (5,8%)

Ministério da Agricultura, Pecuária e Abastecimento

Leite compensado

2013 - 2018
Brasil

Mascarar problemas de má qualidade e aumentar o volume.

↓

Neutralizantes da acidez (Bicarbonato de sódio)

↓

Inibidores de crescimento bacteriano (cloro, formol, peroxido)

↓

Água, soro de leite + reconstituintes da densidade:
Álcool etílico, compostos nitrogenados, sal, açúcar, amido, citrato.

https://www.jornaldocomercio.com/_conteudo/2017/03/economia/551557-operacao-leite-compensado-flagra-adulteracao-em-leite-de-tres-laticinios-gauchos.html

Fraude mais comum

Mascarar problemas de má qualidade e aumentar o volume.

↓

Neutralizantes da acidez
(Bicarbonato de sódio)

↓

Inibidores de crescimento bacteriano
(cloro, formol, peroxido)

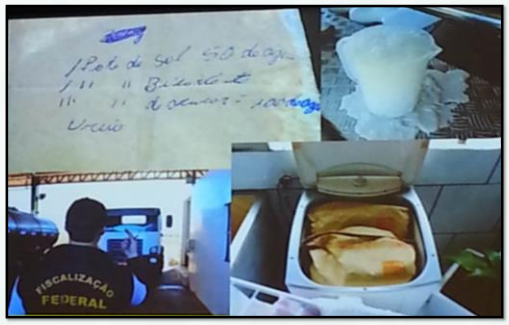
↓

Água, soro de leite + reconstituintes da densidade:
Álcool etílico, compostos nitrogenados, sal, açúcar, amido, citrato.

Ações conjuntas do programa nacional de combate de fraude no leite

- Laboratorista :"Chegou uma amostra aqui do Melati, esta puro bicho dentro do leite, de podre que está o tanque. A gente tirou as mostras e veio os bichinhos brancos, de podre. Esse leite nao era nem de analisar, era de condenar"
- As investigações mostram que um transportador lançou na conta de uma produtora rural até o triplo do leite coletado, o que disfarçaria o aumento no volume do leite a partir da adição de água, indicando, inclusive, um escritório de contabilidade para ajeitar o imposto de renda da produtora.

Envolvidos



QUE TAL ISTO???

ISTO???

OU ISTO???

FOOD DEFENSE

É o termo coletivo utilizado pelo FDA, USDA (U.S. Department of Agriculture), DHS (Department of Homeland Security = Departamento de Segurança Interna), etc, para englobar as atividades associadas com a proteção de abastecimento alimentar do país a partir de **atos deliberados ou intencionais** de contaminação ou adulteração.

Food Defense PLAN

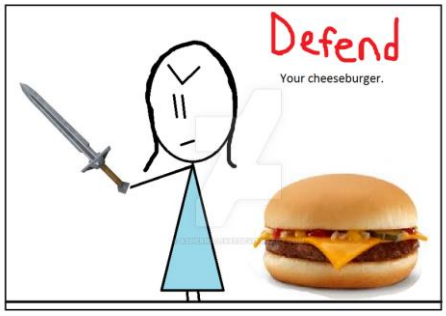
Documento que cada empresa deve preparar e usar para orientar as práticas implementadas para controlar/reduzir o potencial de que um evento como esse possa ocorrer em suas operações e, assim, reduzir a **vulnerabilidade** global à uma contaminação.

Outros termos:

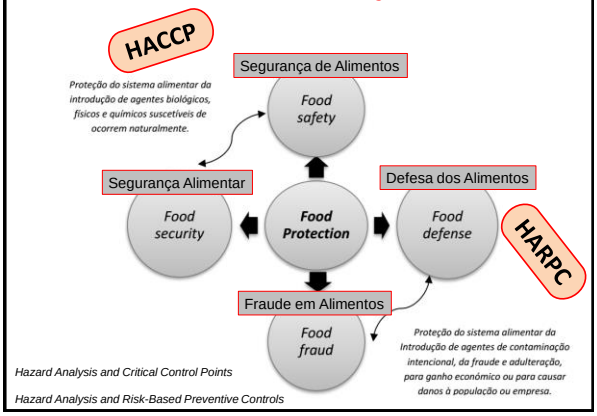
- Food Policy
- Bioterrorism
- Biovigilance
- Biodefense

Food Policy Action

Food Defense



Antes de mais nada: definição de termos



FSMA

Risco das adulterações motivadas economicamente

(**EMA** - *economically motivated adulteration)*

Engloba Food Fraud e Food Defense

Lei FSMA

Food Safety Modernization Act (FSMA)


PUBLIC LAW 111–353—JAN. 4, 2011 124 STAT. 3885

Public Law 111–353
111th Congress

An Act

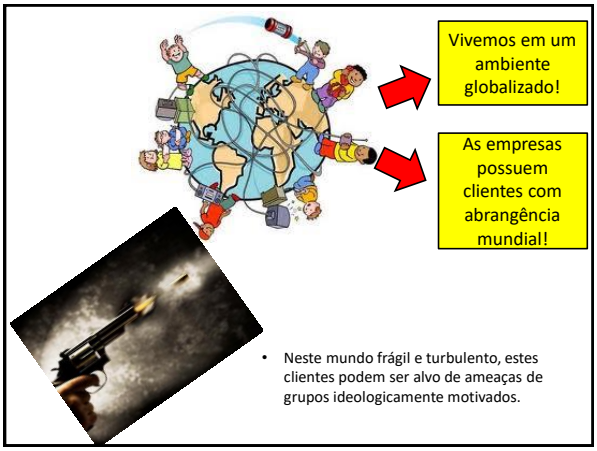
SECTION 1. SHORT TITLE; REFERENCES; TABLE OF CONTENTS.

www.regulation.gov.

- Reforma mais abrangente em temas de leis de seguridade dos alimentos que não existia há mais de 70 anos.
- Aplicada= manufaturam, processam, embalam ou manipulam quaisquer tipos de alimentos.

(FDA, 2015).

AFINAL, POR QUÊ TUDO ISTO É IMPORTANTE PARA O BRASIL???



- Neste mundo frágil e turbulento, estes clientes podem ser alvo de ameaças de grupos ideologicamente motivados.

Brasil-país exportador

Os maiores parceiros comerciais são a China, os E.U, U.E.

(FAO-OECD, 2015).

Justificativa:

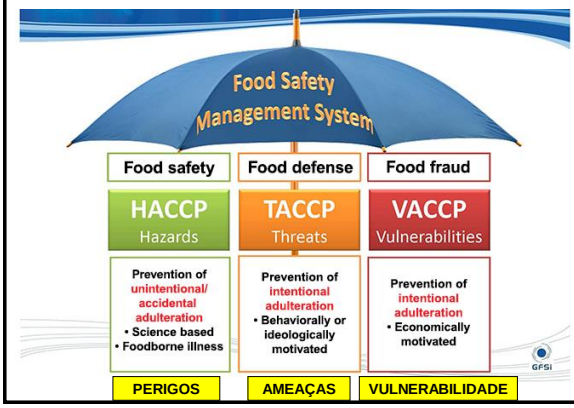
- Fraudes e adulterações podem causar problemas sérios de saúde.
- Brasil pode ser fácil acesso para o terrorismo.
- Industrias alimentícias que exportam para o EUA devem ter a ferramenta Food Defense implantada.

COMO FAZER ANÁLISE DE RISCOS???

Como fazer Análise de Riscos?

- **FSSC 22000/2016** (norma internacional ISO/TS 22002-1)
  - (FFSC - *Foundation for Food Safety Certification)*
- **PAS 96:2014 -** Guia para a Prevenção Contra Bioterrorismo nas Indústrias de Alimentos, Bebidas e sua Cadeia de Abastecimento definidos pela BSI.
- **TACCP** (Threat Assessment Critical Control Point)
  - (Avaliação de Ameaças e Pontos Criticos de Controle)
- **VACCP** (Vunerability Analysis Critical Control Point)
  - (Análise de Vulnerabilidade e Pontos Criticos de Controle)
- **CARVER + Shock**

Abordagem para prevenção de fraude alimentar

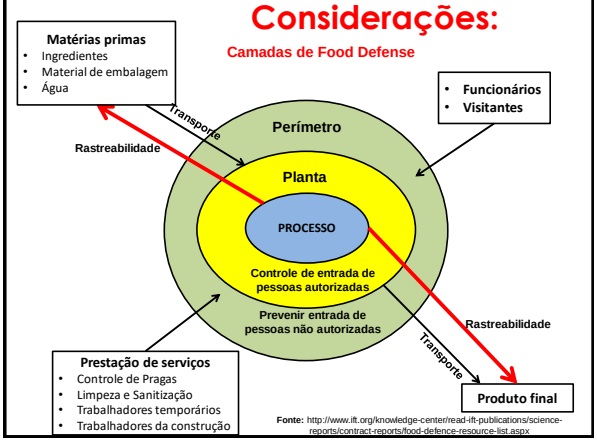


Novos padrões-FSSC 22000

(FSSC, 2015).

Considerações:

Camadas de Food Defense



Fonte: http://www.ift.org/knowledge-center/read-ift-publications/science-reports/contract-reports/food-defence-resource-list.aspx

SISTEMAS DE BIOVIGILÂNCIA: PROTEGENDO SUA EMPRESA DE CONTAMINAÇÃO INTENCIONAL

Gestão da Segurança de Alimentos

- Os diversos padrões certificáveis de gestão da segurança de alimentos vêm incorporando requisitos de biovigilância, bioterrorismo e contaminações intencionais.

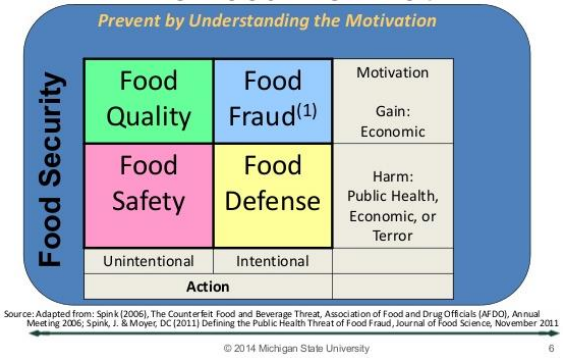
≠

Food **Defense**™

Food Safety x Food Defense

X

Matrix de Risco aos Alimentos



Source: Adapted from: Spink (2006), The Counterfeit Food and Beverage Threat, Association of Food and Drug Officials (AFDO), Annual Meeting 2006; Spink, J. & Moyer, DC (2011) Defining the Public Health Threat of Food Fraud, Journal of Food Science, November 2011

Sobreposição nos 4 elementos da proteção dos alimentos

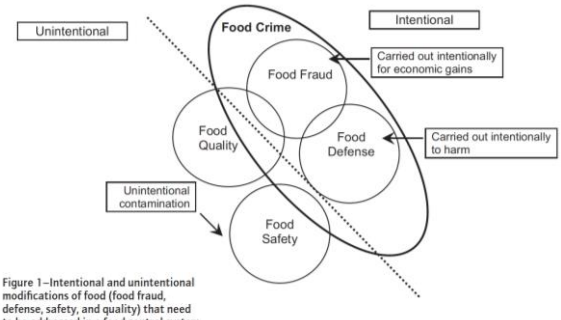
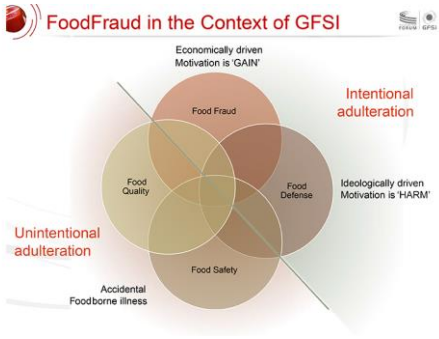


Figure 1–Intentional and unintentional modifications of food (food fraud, defense, safety, and quality) that need to be addressed in a food control system (adapted from Moyer 2011; GFSI, 2014; FSIS 2014; Leathers 2014; Spink and Moyer 2011).

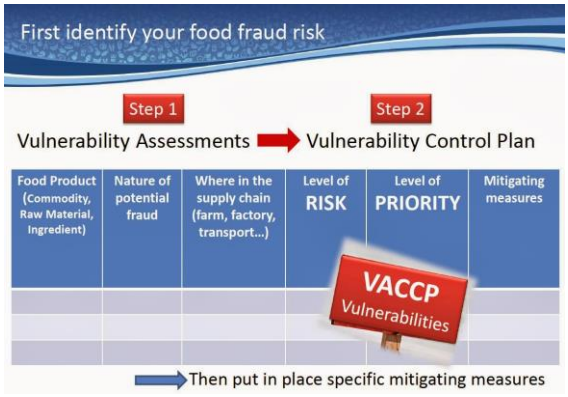
(Manning & Soon, 2016)



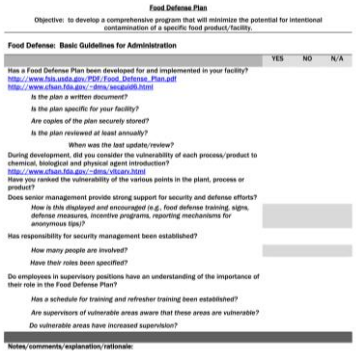
http://www.foodengineeringmag.com/articles/95205-vaccp-haccp-for-vulnerability-assessments

Food Protection

Figure 1. The interconnection of food safety, defense and quality result in comprehensive food protection.



Food Defense: Basic Guidelines for Administration



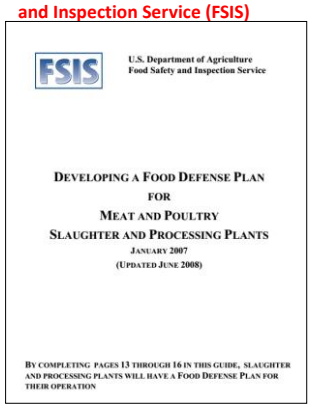
Food Defense Plan

Objective: to develop a comprehensive program that will minimize the potential for intentional contamination of a specific food product/facility.

Food Defense: Basic Guidelines for Administration

	YES	NO	N/A
Has a Food Defense Plan been developed for and implemented in your facility? http://www.fsis.usda.gov/PDF/Food_Defense_Plan.pdf http://www.cfsan.fda.gov/~dms/secguid6.html			
Is the plan a written document?			
Is the plan specific for your facility?			
Are copies of the plan securely stored?			
Is the plan reviewed at least annually?			
When was the last update/review?			
During development, did you consider the vulnerability of each process/product to chemical, biological and physical agent introduction? http://www.cfsan.fda.gov/~dms/vtcanv.html			
Have you ranked the vulnerability of the various points in the plant, process or product?			
Does senior management provide strong support for security and defense efforts?			
How is this displayed and encouraged (e.g., food defense training, signs, defense measures, incentive programs, reporting mechanisms for anonymous tips)?			
Has responsibility for security management been established?			
How many people are involved?			
Have their roles been specified?			
Do employees in supervisory positions have an understanding of the importance of their role in the Food Defense Plan?			
Has a schedule for training and refresher training been established?			
Are supervisors of vulnerable areas aware that these areas are vulnerable?			
Do vulnerable areas have increased supervision?			
Notes/comments/explanation/rationale:			

Guidance from the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS)



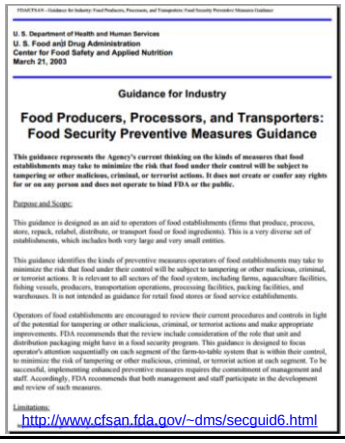
FSIS

U.S. Department of Agriculture
Food Safety and Inspection Service

DEVELOPING A FOOD DEFENSE PLAN
FOR
MEAT AND POULTRY
SLAUGHTER AND PROCESSING PLANTS
JANUARY 2007
(UPDATED JUNE 2008)

BY COMPLETING PAGES 13 THROUGH 16 IN THIS GUIDE, SLAUGHTER AND PROCESSING PLANTS WILL HAVE A FOOD DEFENSE PLAN FOR THEIR OPERATION

http://www.fsis.usda.gov/PDF/Food_Defense_Plan.pdf



U. S. Department of Health and Human Services
U. S. Food and Drug Administration
Center for Food Safety and Applied Nutrition
March 21, 2003

Guidance for Industry

Food Producers, Processors, and Transporters: Food Security Preventive Measures Guidance

This guidance represents the Agency's current thinking on the kinds of measures that food establishments may take to minimize the risk that food under their control will be subject to tampering or other malicious, criminal, or terrorist actions. It does not create or confer any rights for or on any person and does not operate to bind FDA or the public.

Purpose and Scope:

This guidance is designed as an aid to operators of food establishments (firms that produce, process, store, repack, relabel, distribute, or transport food or food ingredients). This is a very diverse set of establishments, which includes both very large and very small entities.

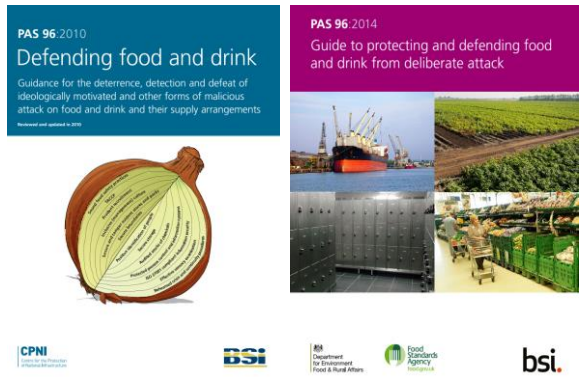
This guidance identifies the kinds of preventive measures operators of food establishments may take to minimize the risk that food under their control will be subject to tampering or other malicious, criminal, or terrorist actions. It is relevant to all sectors of the food system, including farms, aquaculture facilities, fishing vessels, producers, transportation operations, processing facilities, packing facilities, and warehouses. It is not intended as guidance for retail food stores or food service establishments.

Operators of food establishments are encouraged to review their current procedures and controls in light of the potential for tampering or other malicious, criminal, or terrorist actions and make appropriate improvements. FDA recommends that the review include consideration of the role that unit and distribution packaging might have in a food security program. This guidance is designed to focus operator's attention sequentially on each segment of the farm-to-table system that is within their control, to minimize the risk of tampering or other malicious, criminal, or terrorist action at each segment. To be successful, implementing enhanced preventive measures requires the commitment of management and staff. Accordingly, FDA recommends that both management and staff participate in the development and review of such measures.

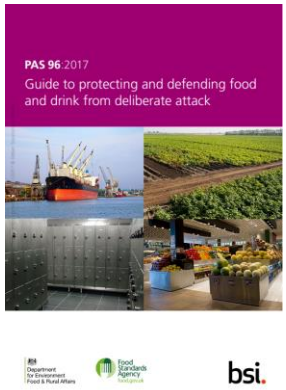
Limitations:

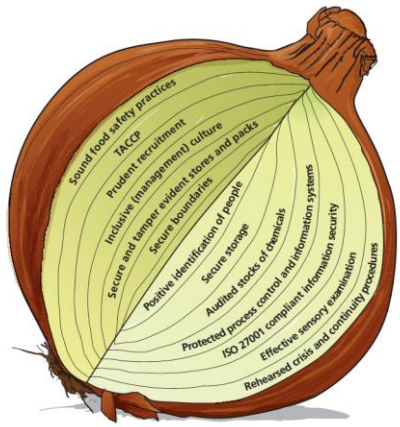
http://www.cfsan.fda.gov/~dms/secguid6.html

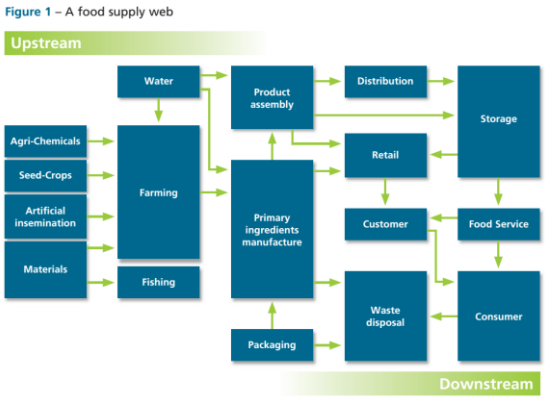
PAS 96:2014 - Guia para a Prevenção Contra Bioterrorismo nas Indústrias de Alimentos, Bebidas e sua Cadeia de Abastecimento



PAS 96:2017 - Guia para a Proteção e Defesa de Alimentos e Bebidas de Ataques Intencionais







Threat Assessment Critical Control Point "TACCP"

(Avaliação de Ameaças e Pontos Criticos de Controle)

- PRESSUPOSTO:
  - A intenção maliciosa precisa vir de uma pessoa, por isso o procedimento é focado nas pessoas.
  - Pode ser um indivíduo ou parte de um grupo, e podem ser **empregados** ou **contratados** que têm **acesso autorizado**, mas a motivação contrária aos interesses da organização!

A estrutura da norma TACCP

- Escopo
- Termos e definições
- Ameaças
- Pressupostos
- TACCP

- Avaliando as ameaças
- Garantindo a segurança do pessoal
- Controle de acesso
- Veículos
- Controlando o acesso de materiais
- Controlando o acesso ao processo
- Plano de contingência
- Auditoria e revisão crítica

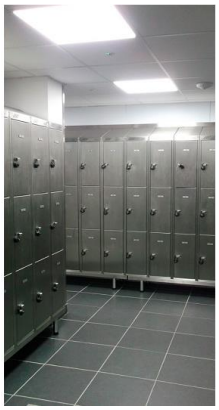
Algumas ações sugeridas:

Event activated lighting is a familiar feature

Even modest perimeter fencing can deter intruders

Secure doors are available for the widest of doorways

CCTV can monitor access to restricted areas



Clear labelling is essential to ensuring traceability

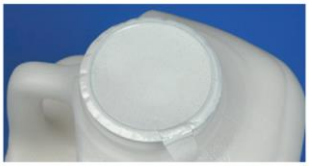
Tamper-evidence provides an important protection against damage and harm

Distribution and storage containers should be tamper-evident

Effective lot (batch) coding facilitates product recall

Storage and effective stock control are essential

The integrity of packaging is core to product protection



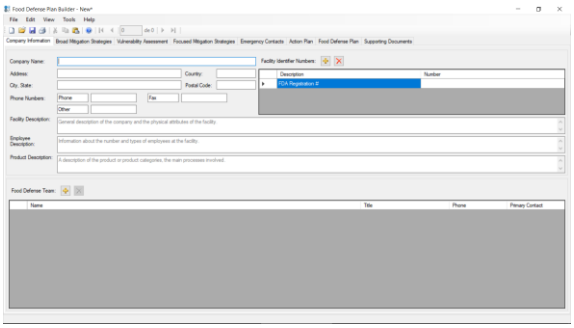
Diaphragm seals can give effective tamper-evidence for packs of liquid and solid foods

Being close to point-of-consumption puts employees in food service outlets into a position where they could attack the food and see the impact almost immediately

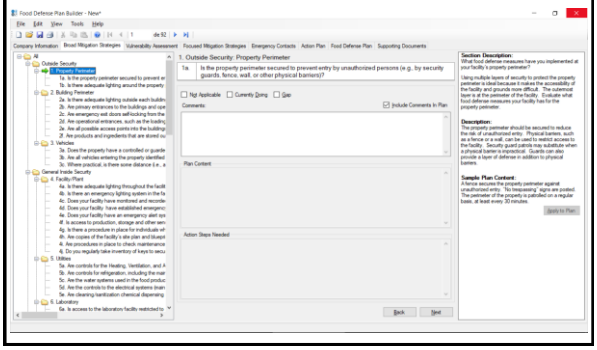
Software Food Defense Plan Builder

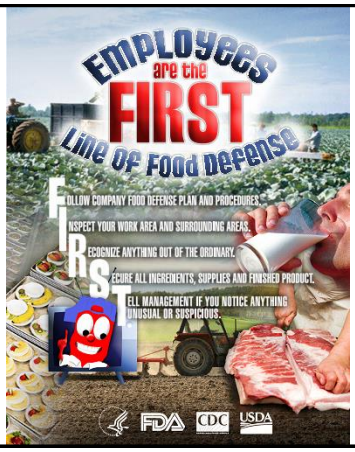
FD PB
FOOD DEFENSE PLAN BUILDER

Software Food Defense Plan Builder

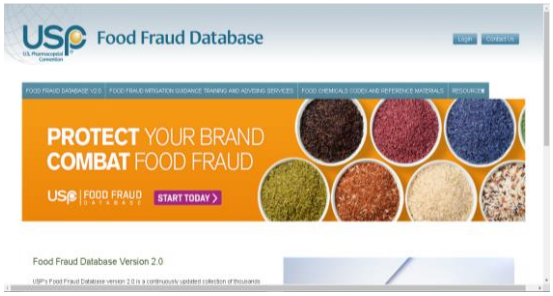


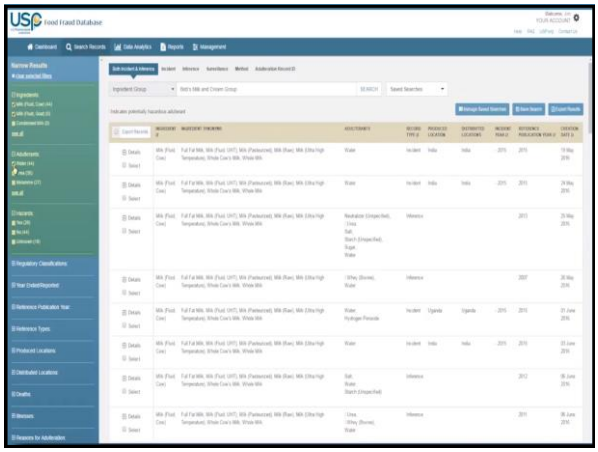
Software Food Defense Plan Builder

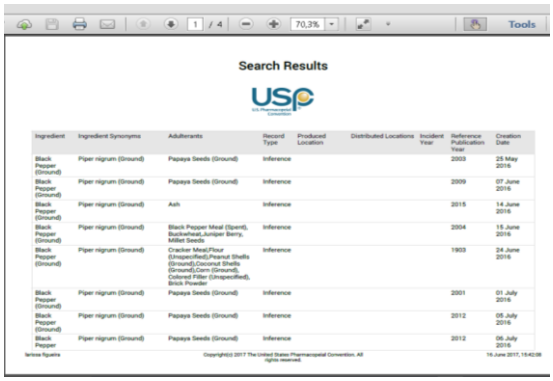




FOOD FRAUD







Software CARVER + Shock

Software CARVER + Shock

- Prevenir, preparar-se e responder frente a incidentes de contaminações deliberadas.

- Avaliar, identificar e analisar as áreas vulneráveis que poderiam ser alvo dentro de um sistema ou infraestrutura para um ataque.
- Ele permite ao usuário pensar como um invasor, identificando as áreas criticas e alvos de fácil acesso.

(FDA 2013).

Método CARVER + shock

- CARVER originalmente desenvolvido por U.S. military = identificar áreas que poderiam ser vulneráveis a um ataque.
- Food and Drug Administration (FDA) = utilizou o método para avaliar as vulnerabilidades potenciais na cadeia de suprimentos de alimentos (Pohl 2007).

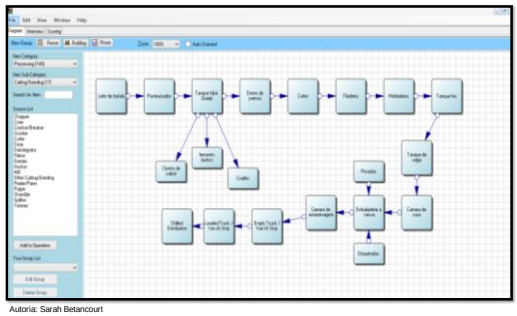
CARVER = acrônimo de 6 atributos usados para avaliar a atratividade de um alvo sofrer ataque:

- **Criticality** – medida de saúde pública e impacto econômico de um ataque;
- **Accessibility** – Facilidade de acesso físico a um alvo;
- **Recuperability** – Habilidade de um sistema se recuperar de um ataque;
- **Vulnerability** – facilidade de se realizar um ataque;
- **Effect** – quantificação de perdas diretas devido a um ataque por medida na perda de produção;
- **Recognizability** – facilidade de se identificar o alvo.

- O 7º atributo – Shock = para avaliar os impactos econômicos, psicológicos e na saúde devido a uma ataque na Indústria de Alimentos (USFDA 2005)

Descrição e estrutura do CARVER +Shock

Fluxograma de produção que simula todo o processo produtivo.



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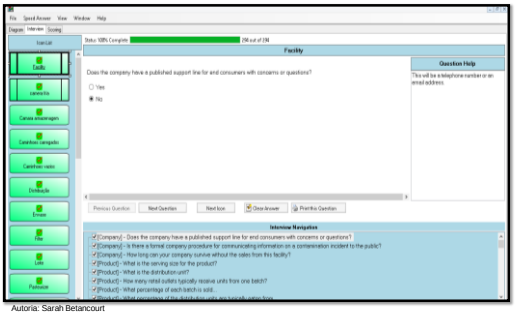
Entrevista

Perguntas realizadas pelo software para identificar pontos vulneráveis.



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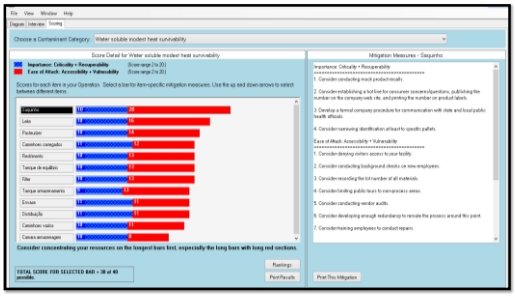
Pontuação

Resultados e as diretrizes para construir o plano de Food Defense.



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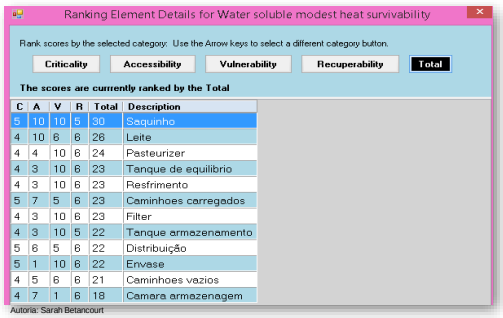
Avalição de cada atributo



Ranking Element Details for Water soluble modest heat survivability

Rank scores by the selected category. Use the Arrow keys to select a different category button.

Criticality | Accessibility | Vulnerability | Recuperability | Total

The scores are currently ranked by the Total

C	A	V	R	Total	Description
5	10	10	5	30	Saquinho
4	10	6	6	26	Leite
4	4	10	6	24	Pasteurizer
4	3	10	6	23	Tanque de equilíbrio
4	3	10	6	23	Resfrimento
5	7	5	6	23	Caminhoes carregados
4	3	10	6	23	Filter
4	3	10	5	22	Tanque armazenamento
5	6	5	6	22	Distribuição
5	1	10	6	22	Envase
4	5	6	6	21	Caminhoes vazios
4	7	1	6	18	Camara armazenagem

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Quadro 1 - Criticidade

Criticality: A target is critical when introduction of threat agents into food at this location would have significant health or economic impact. Example metrics are:

Criticality Criteria—Use this scale to assess: An individual food processing facility	Scale
Loss of over 10,000 lives OR loss of > 90% of the total economic value.	9-10
Loss of life is between 1,000-10,000 OR loss of between 61% and 90% of the total economic value.	7-8
Loss of life is between 100 and 1000 OR loss of between 31% and 60% of the total economic value.	5-6
Loss of live is less than 100 OR loss of between 10% and 30% of the total economic value.	3-4
No loss of life OR < 10% of the total economic value.	1-2
Criticality Criteria—Use this scale to assess: An individual crop or animal agriculture facility	**Scale**
Loss of > 90% of animal lives or total economic value.	9-10
Loss of 61% - 90% of animal lives or total economic value.	7-8
Loss of 31% - 60% of animal lives or total economic value.	5-6
Loss of 10% - 30% of animal lives or total economic value.	3-4
Loss < 10% of animal lives or total economic value.	1-2

Exemplo escala de criticidade

Critério de criticidade	Escala
Perdas demais de 10.000 vidas ou perda de mais de US$ 100 bilhões (nota: as perdas são calculadas a nível total da empresa, perdas de > 90% do valor econômico)	9-10
Perdas entre 1.000 e 10.000 vidas ou perda entre $10 e $ 100 bilhões (nota: as perdas são calculadas a nível total da empresa, perdas entre 60% e 90% do valor econômico total).	7-8
Perdas entre 100 e 1.000 vidas ou perda entre $1 e $ 10 bilhões (nota: as perdas são calculadas a nível total da empresa, perdas entre 30% e 60% do valor econômico total)	5-6
Perdas de vidas inferiores a 100 ou perda entre $100 milhões e $ 1 bilhão (nota: as perdas são calculadas a nível total da empresa, perdas entre 10% e 30% do valor econômico total)	3-4
Nenhuma perda de vida ou perda inferior a $100 milhões (nota: as perdas são calculadas a nível total da empresa, perdas < 10% do valor econômico total)	1-2

Adaptada por Sarah Betancourt

Quadro 2- Acessibilidade

Accessibility: A target is accessible when an attacker can reach the target to conduct the attack and egress the target undetected. Accessibility is the openness of the target to the threat. This measure is independent of the probability of successful introduction of threat agents. Example metrics are:

Accessibility Criteria	**Scale**
Easily Accessible (e.g., target is outside building and no perimeter defense). Limited physical or human barriers or observation. Attacker has relatively unlimited access to the target. Attack can be carried out using medium or large volumes of contaminant without undue concern of detection. Multiple sources of information concerning the facility and the target are easily available.	9-10
Accessible (e.g., target is inside building, but in unsecured part of facility). Human observation and physical barriers limited. Attacker has access to the target for an hour or less. Attack can be carried out with moderate to large volumes of contaminant, but requires the use of stealth. Only limited specific information is available on the facility and the target.	7-8
Partially Accessible (e.g., inside building, but in a relatively unsecured, but busy part of facility). Under constant possible human observation. Some physical barriers may be present. Contaminant must be disguised, and time limitations are significant. Only general, non-specific information is available on the facility and the target.	5-6
Hardly Accessible (e.g., inside building in a secured part of facility). Human observation and physical barriers with an established means of detection. Acces generally restricted to operators or authorized persons. Contaminant must be disguised and time limitations are extreme. Limited general information available on the facility and the target.	3-4
Not Accessible. Physical barriers, alarms, and human observation. Defined means of intervention in place. Attacker can access target for less than 5 minutes with all equipment carried in pockets. No useful publicly available information concerning the target.	1-2

Quadro 3 - Recuperabilidade

Recuperability: A target's recuperability is measured in the time it will take for the specific facility to recover productivity. Example metrics are:

Recuperability Criteria	Scale
> 1 year	9-10
6 months to 1 year	7-8
3-6 months	5-6
1-3 months	3-4
< 1 month	1-2

Quadro 4 - Vulnerabilidade

Vulnerability: A measure of the ease with which threat agents can be introduced in quantities sufficient to achieve the attacker's purpose once the target has been reached. Vulnerability is determined both by the characteristics of the target (e.g., ease of introducing agents, ability to uniformly mix agents into target) and the characteristics of the surrounding environment (ability to work undoserved, time available for introduction of agents). It is also important to consider what interventions are already in place that might thwart an attack. Example metrics are:

Vulnerability Criteria	Scale
Target characteristics allow for easy introduction of sufficient agents to achieve aim.	9-10
Target characteristics almost always allow for introduction of sufficient agents to achieve aim.	7-8
Target characteristics allow 30 to 60% probability that sufficient agents can be added to achieve aim.	5-6
Target characteristics allow moderate probability (10 to 30%) that sufficient agents can be added to achieve aim.	3-4
Target characteristics allow low probability (less than 10%) sufficient agents can be added to achieve aim.	1-2

Quadro 5 - Efeito

Effect: Effect is a measure of the percentage of system productivity damaged by an attack at a single facility. Thus, effect is inversely related to the total number of facilities producing the same product. Example metrics are:

Effect Criteria	Scale
Greater than 50% of the system's production impacted	9-10
25-50% of the system's production impacted	7-8
10-25% of the system's production impacted	5-6
1-10% of the system's production impacted	3-4
Less than 1% of system's production impacted	1-2

Quadro 6 - Reconhecibilidade

Recognizability: A target's recognizability is the degree to which it can be identified by an attacker without confusion with other targets or components. Example metrics are:

Recognizability	Scale
The target is clearly recognizable and requires little or no training for recognition	9-10
The target is easily recognizable and requires only a small amount of training for recognition	7-8
The target is difficult to recognize or might be confused with other targets or target components and requires some training for recognition	5-6
The target is difficult to recognize. It is easily confused with other targets or components and requires extensive training for recognition	3-4
The target cannot be recognized under any conditions, except by experts.	1-2

Quadro 7 - Shock

Shock: Shock is the final attribute considered in the methodology. Shock is the combined measure of the health, psychological, and collateral national economic impacts of a successful attack on the target system. Shock is considered on a national level. The psychological impact will be increased if there are a large number of deaths or the target has historical, cultural, religious or other symbolic significance. Mass casualties are not required to achieve widespread economic loss or psychological damage. Collateral economic damage includes such items as decreased national economic activity, increased unemployment in collateral industries, etc. Psychological impact will be increased if victims are members of sensitive subpopulations such as children or the elderly.

Shock	Scale
Target has major historical, cultural, religious, or other symbolic importance. Loss of over 10,000 lives. Major impact on sensitive subpopulations, e.g., children or elderly. National economic impact more than $100 billion.	9-10
Target has high historical, cultural, religious, or other symbolic importance. Loss of between 1,000 and 10,000 lives. Significant impact on sensitive subpopulations, e.g., children or elderly. National economic impact between $10 and $100 billion.	7-8
Target has moderate historical, cultural, religious, or other symbolic importance. Loss of life between 100 and 1,000. Moderate impact on sensitive subpopulations, e.g., children or elderly. National economic impact between $1 and $10 billion.	5-6
Target has little historical, cultural, religious, or other symbolic importance. Loss of life less than 100. Small impact on sensitive subpopulations, e.g., children or elderly. National economic impact between $100 million and $1 billion.	3-4
Target has no historical, cultural, religious, or other symbolic importance. Loss of life less than 10. No impact on sensitive subpopulations, e.g., children or elderly. National economic impact less than $100 million.	1-2

Software Installation and Startup

- The software CARVER + Shock is copyrighted by Sandia National Laboratories and FDA. Its version 1.0.0.0 is available for usage for free.
- CARVER + Shock runs on hardware systems with the following minimum performance characteristics:
  - (1) Pentium I processor
  - (2) 256 MB RAM
  - (3) 120 MB available hard disk space
  - (4) CD ROM drive
  - (5) Video card displaying 1280×1024 desktop area.
- The software is compatible with the following operating systems
  - (1) Windows NT Service Pack 4
  - (2) Windows 98
  - (3) Windows 2000
  - (4) Windows XP

CARVER is available on FDA's Web site at:
http://www.fda.gov/Food/FoodDefense/CARVER/default.htm .

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- Vedpal YADAV; Alka SHARMA. A Free Software for Food Industries to Ensure Food Safety: CARVER+Shock. **Comprehensive Reviews in Food Science and Food Safety.**V. 10, . 109-117, 2011.