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## **1. COMPARATIVE ANALYSIS OF TACCP METHODOLOGY ACCORDING TO PAS 96:2017 AND CARVER+SHOCK**

### **Introduction.**

TACCP (Threat Assessment Critical Control Point) – prevention of harmful threats to food products, such as sabotage, extortion or terrorism. Currently, the implementation of TACCP by national market operators is carried out voluntarily, for example, within the framework of the FSSC 22000 certification scheme implementation.

### **Materials and methods.**

Methodologies according to PAS 96:2017 and CARVER+Shock [1].

### **Results and discussion.**

The critical control points in the TACCP plan are not analogous to the critical control points in the HACCP plan. The HACCP plan is the stages of the technological process. The TACCP plan is a phase of the supply chain.

In the US, the FDA has developed vulnerability assessment software that uses the CARVER+Shock methodology, and in the UK, the British Standards Institution (BSI) has published a publicly available standard, PAS 96 «Guide to protecting and defending food and drink from deliberate attack».

The food protect supply chain the roles of all stakeholders must be clearly defined:

- emergency planners, responders and receivers;
- food manufacturers, distributors and other related industries;
- health care, laboratories and state institutions at all levels [2].

The TACCP methodology according to PAS 96:2017 provides for the formation of a permanent TACCP team, which may include persons with the following experience:

- security;
- human resources;
- food technology;
- technological processes;
- production and operations;
- purchases and procurement;
- distribution and logistics;
- information technology;
- communications;
- commercial/marketing.

The TACCP team is usually a standing group capable of constantly revising its decisions.

Risk assessment is carried out in accordance with the requirements of the table.

**Table. Risk assessment scoring**

| Likelihood of threat happening | Score | Impact       |
|--------------------------------|-------|--------------|
| Very high chance               | 5     | Catastrophic |
| High chance                    | 4     | Major        |
| Some chance                    | 3     | Significant  |
| May happen                     | 2     | Some         |
| Unlikely to happen             | 1     | Minor        |

This is an example scoring matrix, organizations may choose their own ranking scheme. Likelihood of a threat happening could be judged, for example, over a period of 5 years. Impact could consider death or injury, cost, damage to reputation and/or public and media perceptions of these consequences.

The figure shows the threat assessment matrix.

|               |                        |                 |                 |                 |                 |                 |
|---------------|------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| <b>Impact</b> | <b>5</b>               |                 |                 |                 | <b>Threat A</b> |                 |
|               | <b>4</b>               |                 | <b>Threat C</b> |                 |                 |                 |
|               | <b>3</b>               |                 |                 |                 |                 | <b>Threat B</b> |
|               | <b>2</b>               | <b>Threat E</b> |                 |                 |                 |                 |
|               | <b>1</b>               |                 |                 | <b>Threat D</b> |                 |                 |
|               |                        | <b>1</b>        | <b>2</b>        | <b>3</b>        | <b>4</b>        | <b>5</b>        |
|               | <b>Likelihood</b>      |                 |                 |                 |                 |                 |
|               | <b>Very high risk</b>  |                 |                 | <b>Threat A</b> |                 |                 |
|               | <b>High risk</b>       |                 |                 | <b>Threat B</b> |                 |                 |
|               | <b>Moderate risk</b>   |                 |                 | <b>Threat C</b> |                 |                 |
|               | <b>Low risk</b>        |                 |                 | <b>Threat D</b> |                 |                 |
|               | <b>Negligible risk</b> |                 |                 | <b>Threat E</b> |                 |                 |

**Figure. Risk scoring matrix**

The figure shows an example of a risk assessment matrix, but organizations can choose different criteria for different risk categories. On the one hand, it is very good that the proposed regulatory document provides an opportunity to adapt the assessment for each market operator. However, each market operator must approach the gradation of threats quite deliberately and reasonably.

The TACCP system according to PAS 96:2017 provides for determining the following aspects in the work of the market operator:

1. Critical means of control:

- 1.1. Control of employee access to the stages of the technological process, documentation, etc;
- 1.2. Interference detection;
- 1.3. Ensuring personnel safety.

2. Reaction to the incident:

- 2.1. Management of the food products protection from crisis situations;
- 2.2. Cyber attack management;
- 2.3. Contingency planning to recover from an attack.

3. Revision of the food products protection mechanisms.

Any changes that may affect the TACCP assessment, such as breaches and suspected breaches of security or authenticity, should be reported immediately to the TACCP team leader, who will decide whether a full review is required. The TACCP team should monitor updates of national threat assessments and information on new risks on official websites.

CARVER is an acronym for the following six attributes (discussed in further detail later) used to evaluate the attractiveness of a target for attack:

- **Criticality** - measure of public health and economic impacts of an attack
- **Accessibility** – ability to physically access and egress from target
- **Recuperability** – ability of system to recover from an attack
- **Vulnerability** – ease of accomplishing attack
- **Effect** – amount of direct loss from an attack as measured by loss in production

- **Recognizability** – ease of identifying target

In addition, the modified CARVER tool evaluates a seventh attribute, the combined health, economic, and psychological impacts of an attack, or the **SHOCK** attributes of a target.

Step 1 – Establishing Parameters. Before any scoring can begin, the scenarios and assumptions you wish to use in the analysis must be established in order to guide all further steps.

Step 2 – Assembling Experts. A team of subject matter experts should be compiled to conduct the assessment.

Step 3 – Detailing Food Supply Chain. The analysis begins by developing a description of the system under evaluation.

Step 4 – Assigning Scores. The rationale for a particular consensus score should be captured.

Step 5 – Applying What Has Been Learned. A plan should be developed to put countermeasures in place that minimize the attractiveness of the nodes as targets/

### **Conclusions.**

Therefore, both methodologies focus their attention on the supply chain of raw materials and materials to the market operator. The criteria for assessing risks and consequences are somewhat different, as well as the effect of the perception of the consequences of the threat.

### **Reference**

1. An official website of the United States government. CARVER+Shock Primer. Режим доступу. Режим доступу – <https://www.fda.gov/food/food-defense-initiatives/carver-shock-primer>

2. Novakovic, B., & Grujic, R. (2018). The specifics of the insurance system to protect food from intentional contamination in the production of powdered food products. *Journal of Hygienic Engineering and Design*, 23, 46-53.