

Innovation for redesigning SFSCs to face off SARS-CoV-2 pandemic

Coronavirus disease (COVID-19), which is caused by severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2), was first identified in December 2019 in Wuhan, China, and has since spread rapidly, evolving into a full-blown pandemic.

SARS-CoV-2 is spread through personal contacts and different routes including air, and contacts with different surfaces. The main protective measures are keeping personal distance, and hygiene measures. For the protection of the health of the consumers from the SARS-CoV-2 virus infection during purchasing, several measures have to be applied in all food chains including the short food chains.

Different types of food chains represent different levels of concern and risk of SARS-CoV-2 infection. As a consequence of the pandemic, the trust in local products has been increased compared to the imported products from the global food trade, leading to increasing demand in certain types of SFSCs. Particularly increased demand has taken place from all types of home delivery services. At the same time in other types of SFSCs, the demand was dropped significantly. This was caused, by the fear of consumers from visiting crowded places, including shops and markets, where the possibility for keeping a safe distance is not possible or limited.

There is a need for a method for systematic assessment of the vulnerability of the consumers from SARS-CoV-2 infection from purchasing in short food chains that can be used for redesigning SFSCs to reduce this risk.

A method was developed for assessing the vulnerability of the consumers from food purchasing in SFSCs. Through a systematic step-by-step analysis of the risk of the infection of the consumers by COVID-19 at each organization the high-risk infection steps can be determined, where the necessary corrective action should be applied. Through the application of an appropriate intervention at the high-risk steps, the risk can be eliminated or reduced. A database is provided on the SARS-CoV-2 infection risks, that is regularly updated since the currently available information is still fragmented.

The method of the implementation of the Risk Assessment on the infection of the consumers by SARS-CoV-2 during the purchase in the Short Food Chains, developed by CBHU in collaboration with WUR and KIS

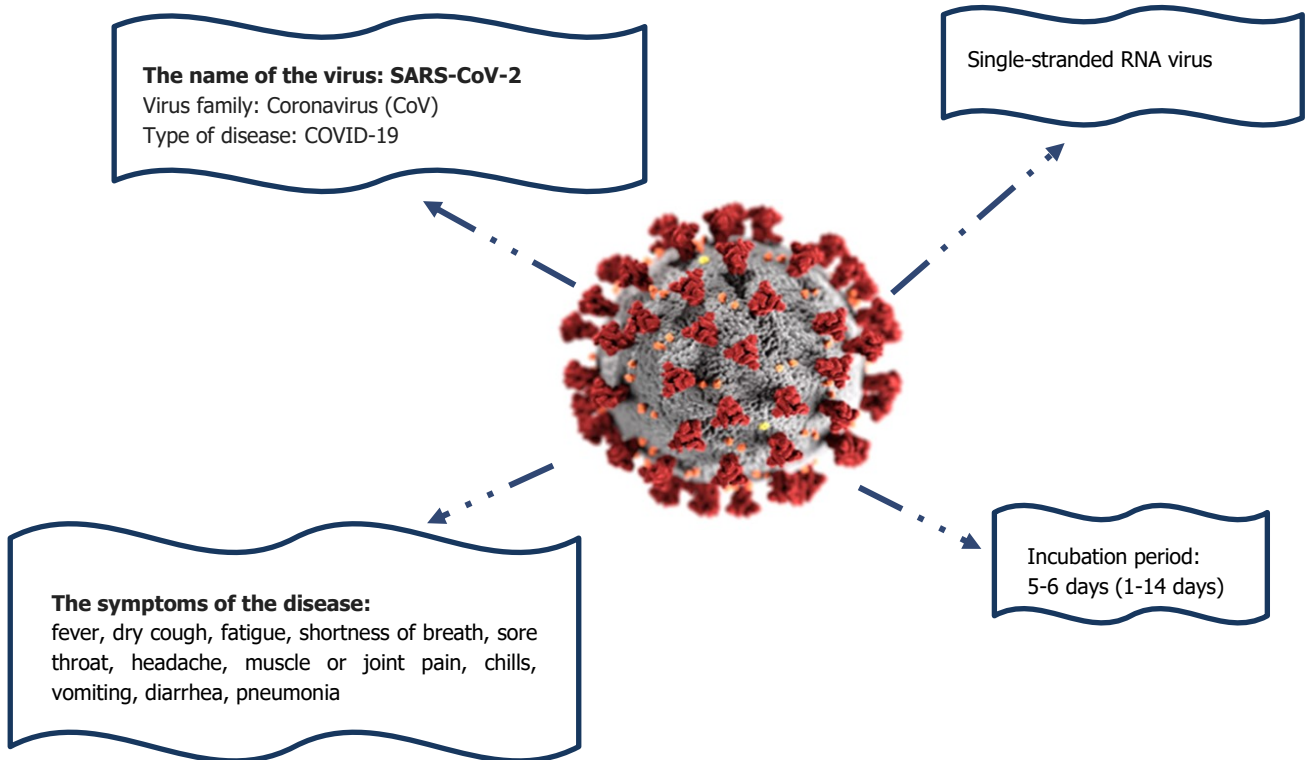
The method is based on the combination of the Simplified Microbiological Risk Assessment developed by Campden BRI (P. Voysey 2001.), with a HACCP study. A simple scoring system was developed, based on that the risk of the infection of the consumers by SARS-CoV-2. Based on the scores the risks associated with the different steps of an SFSC can be identified, which can be used for identification, where interventions have to be applied, and their impact on the consumers'safety can be evaluated. The risks associated with different SFSCs can be compared.

- Risks are calculated for each step of each type of SFSCs following in the flowchart.
- The higher the risk the higher the score.
- The steps in an SFSC representing high risk can be identified
- The specific SFSC can be redesigned to reduce the risk and the impact on the risk of the infection of the consumers can be easily evaluated and compared with the initial set up.



The tool is made of:

- Method for the Risk Assessment of infection of consumers
- Inventory of hazards and guideline to good practices
- Redesigning the conventional SFSCs



Method of the risk assessment

During the risk assessment, the frequency of the occurrence of the Coronavirus during the steps of 19 types of short supply chains was evaluated considering the vulnerability of the protection against the ingress of the virus to the human body, and the severity of the hazard. During the study, the steps of a flow chart of the processes were followed.

The following aspects should be considered during the study:

1. A flowchart of the steps of the SFSC should be prepared.
2. The hazard of infection of the consumers during the step with SARS-CoV-2 and potential causes is analyzed at each step.
3. Control measures currently in use should be described.

Risk Assessment:

4. The frequency of occurrence of Coronavirus (F) at this step shall be identified;
5. The vulnerability of the level of protection against the ingress of the virus to the human body (V) shall be identified.
6. The severity of the hazard (S) shall be identified.

7. Expected control measures to reduce the risk during the acute Coronavirus pandemic shall be described.
8. Expected control measures to be maintained after the Coronavirus pandemic shall be described.

Instruction for implementation

1. Define the flowchart of the operation of your Short Food Chain
2. Assess the risk of infection of consumers by the SARS-CoV-2 virus through purchasing food from your Short Food Chain.
 - 2.1. List the hazards and all potential causes of the contamination leading to the SARS-CoV-2 virus infection of the consumers for each step.
 - 2.2. Define the currently available control methods for this hazard and the causes of SARS-CoV-2 infection.
 - 2.3. Evaluate the frequency, the vulnerability of the protection of the human body, and the severity of the hazard by using the scoring tables here.

The frequency of occurrence of the hazard (F) shall be scored on a 6-point scale, where

- 1 means "negligible": so rare that it does not merit to be considered;
- 2 means "very low": very rare but cannot be excluded;
- 3 means "low": rare, but does occur;
- 4 means "medium": occurs regularly;
- 5 means "high": occurs very often;
- 6 means "very high": occurs almost certainly.

The vulnerability of the protection of the human body against the ingress of the virus (VI) shall be scored on a 5-point scale, where

- 1 means "very small": water, food, or negligible route;
- 2 means "small": from the surface to people and from people to surface (metal, plastic, paper, glass, etc.) (without protection tools);
- 3 means "medium": person to person, except respiratory spread;
- 4 means "high": from people to people through the air in the open area, through droplets (without protection tools);
- 5 means "very high": from people to people through the air in the closed area, through droplets (without protection tools).

The severity of the hazard (S) shall be scored on a 4-point scale, where

- 1 means "negligible": an asymptomatic condition or so mild that they are not worthy to be considered;
- 2 means "low": weak symptoms, mild illness, rapid recovery at home;
- 3 means "medium": heavy symptoms, moderate illness, longer recovery requiring hospitalization;
- 4 means "high": heavy symptoms, severe illness, hospital care is needed. In some case leads to death;

2.4 The risk for each step by multiplying the scores of the Risk Assessment should be calculated

The method of calculation of the risk:

- 1 method: **F x V x S** (it is used for human-to-human infection and human-to-object or object-to-human infection)

The frequency of occurrence of the hazard (F)	x	The vulnerability of the protection against the ingress of the virus to the human body (V)	x	The severity of the hazard (S)	=	Risk	for human-to- human infection and human-to- object or object-to- human infection
---	---	--	---	--	---	-------------	---

2.5. Identify those steps in your current SFSC, that are associated with a higher risk of SARS-CoV-2 infection.

2.6 Redesign your Short Food Chain, identify those changes in the operation in your current Short Food Chain which can result in the reduction of the risk score at these steps during an acute SARS-CoV-2 period.

2.7. Redesign your Short Food Chain, describe those changes in the operation in your current Short Food Chain which can result in the reduction of the risk score at these steps during a less intensive SARS-CoV-2 period.

Generic models:

19 generic models of the different types of short food chains can be distinguished during the SARS-CoV-2 Risk Assessment.

All of the 19 generic models can be classified into the 5 reference exploitation models specified in the SmartChain project:

1. Cooperative producers
2. Individual producers
3. Community-supported agriculture
4. Online and offline marketplace
5. Promotion of farm selling

These reference models have unique characteristics, generic schemes per model, considering the economic, social, cultural, organizational context.

The 19 generic models of the Short Food Supply Chain:

1. Farmer shop
2. Moving shop
3. Retail shop
4. Shop in the farmer's courtyard
5. Box delivery community
6. Fair market
7. Market
8. Events, Programs
9. Door-to-door selling
10. Community-supported agriculture
11. Temporary outdoor purchase
12. Catering, restaurant
13. Institutional catering
14. Village guest table
15. Food and drink vending machine
16. Local product vending machine
17. Pick your own
18. Home delivery
19. Webshop

The risk assessment and the risk scores according to the professional judgment of the organization shall be modified as necessary.

Example: Conversion of the conventional open-air farmers market to a drive-in one at Dunakeszi, Hungary

Control measures in a virial period of an open-air farmers market through the application of a non-technological innovation:

The available offer of the small producers and SFSCs is put to the website. Customers can select the products remotely in advance.

Each customer gets an ID number at the purchase.

The customer can book a time slot for a segregated drive-in service when she/he wants to get the product.

Pre-payment, payment by card, and cash payment in place can be applied. The keyboard of the payment tool is disinfected regularly.

If the customer pays with cash, the necessary amount of money should be pre-calculated and put in a plastic bag and should be handed over.

The ordered goods are always commissioned by that time when the time slot was previously booked at the dedicated, segregated place.

The consumer can drive-in with her/his car at the booked time to the place/market with the ID of the order she/he got before.

The takeover of the products needs no personal contact. The products are loaded directly into the boot of the car by the local staff.

The safe distance is kept, the driver/customer rolls away with the car c.a 10 m and can check the pack received.

When the dedicated place for the product takeover is empty, the next consumer can drive-in to that place with her/his ID number in the previously booked time.



The traditional farmer market has **high risk on SARS-CoV-2** (crowded with people in a small area)



Drive-in market

	Frequency (F)	x	Vulnerability (V)	x	Severity (S)	=	Risk
Conventional farmers market	4	x	4	x	4	=	64 (high)
Drive-in farmers market	1	x	2	x	4	=	8 (low)

1. Figure: Risks before and after the redesign

Lessons learned:

An easy to use method is available for evaluation for the risk of the SARS-CoV-2 infection of the consumer from the purchase in SFSCs. The risk of the consumers of the SARS-CoV-2 infection can be reduced through a systematic step-by-step risk assessment and by redesigning the operation with the application of necessary control measures.