THE BENEFITS OF THE GENETIC CHANGES ON STARTERS

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Rezumat

Modificările genetice nu trebuie efectuate asupra culturilor starter dacă poate fi descoperită în natură o cultură cu proprietăţile căutate. Sunt prezentate trei exemple ce prezintă modul de acţiune al metodelor de inginerie genetică asupra culturilor starter.

Résumé

Il n'est pas nécessaire de faire des modifications génétiques sur les cultures starter s'il est possible de trouver dans la nature une culture avec les propriétés désirées. Trois exemples sont présentés qui présentent la manière d'action des méthodes d'ingénierie génétique sur les cultures starter.

Riassunto

Non deve fare delle modificazioni genetiche sulle colture starter si è possibile di trovare nell'ambiente una coltura con le proprietà richieste. Ci sono presentati tre esempi che presentano il modo d'azione dei metodi d'ingegneria genetica sulle colture starter.

The determinative genetic properties can be changed throughout different ways: Mutation is a genetic change without any precise target that appears naturall

- y very rare. For bacteria mutation can be artificially induced by UV light or by exposing them to mutating chemicals (as nitrite).
- In case of a natural gene transfer, the new properties are exchanged between closely genetic related microorganisms.
- In case of a targeted gene transfer isolated genes are transferred using specific techniques and the gene transfer is not restricted to microorganisms belonging to the same species. Also, the genes can be exchanged between animals, plants, and microorganisms using genetic engineering.

Before attempting to improve the starters using genetic means, we have to be sure that there are nowhere in the nature microorganisms fit to satisfy the requests from the starter. Only if there are no fit microorganisms in the nature, man can try to optimize the starter properties using genetics.

The applied genetic changes to the starters are as follows: the transfer of new genes that are responsible for the proteases, lipases, catalases, and nitrate reductases, to starters that do not have these properties. In case of protective cultures there can be transferred new genes for the bacteriocin production. There is also possible that new genes to be transferred to microorganisms in order to produce enzymes, vitamins, useful for the processing of food products. Finally, it is possible to remove the genes responsible for the micotoxin production of the fungi that produces antibiotics, etc.

Preventing the development of the *Listeria monocytogenes* by *Lactobacillus sake*

An isolated strain[1] of *Lactobacillus sake* that was able to prevent the growth of *Listeria monocytogenes* can produce a bacteriocin (saccacin A) and also proved to be promising in preventing the apparition of that contaminant at sliced vacuumed frankfurter sausages[2]. The table 1 presents an experiment in which were prepared frankfurter sausages that were contaminated with 10^3/g *Listeria monocytogenes*.

Four Petri plates were inseminated with *Lactobacillus sake* (Bac+) that produces saccacin A and other four Petri plates were inseminated with *Lactobacillus sake* (Bac-) that cannot produce saccacin A, and the Petri plates were kept at 2, 4, 7 and 10°C.

Listeria monocytogenes does not grow at 2°C in the Petri plate with (Bac+) culture and also in the Petri plate with the (Bac-) culture. When counting the *Listeria monocytogenes* cells in the Petri plates kept at 4°C there was noticed a growth only in the Petri plate that contained *Lactobacillus sake* (Bac-) and no growth in the Petri plate with *Lactobacillus sake* (Bac+). Both Lactobacillus cultures grew at 10^6 cells/g but didn't produced a sour taste, not specific for the product (pH>5,6). When counting the *Listeria monocytogenes* cells in the Petri plates kept at 7°C there was noticed a clear growth after 7 days in the Petri plate containing the (Bac-) culture while the (Bac+) culture prevent the development of the *Listeria monocytogenes*.). When counting the *Listeria monocytogenes* cells in the Petri plates kept at 10°C there was noticed a clear growth after only 3 days in the Petri plate containing (Bac-) and after 7 days in the Petri plate containing (Bac+). This experiment proved that the *Lactobacillus sake*(Bac+) culture was able to prevent the development of the *Listeria monocytogenes* in between 4°C and 7°C for the vacuumed frankfurter sausages.

Table 1

The influence of saccacin on *Listeria monocytogenes*[6]

2° C			4° C			7° C			10° C		
Time (weeks)	Bac–	Bac+	Time (weeks)	Bac–	Bac+	Time (weeks)	Bac–	Bac+	Time (weeks)	Bac–	Bac+
1	0	0	1	0	0	3	0	0	3	+	0
2	0	0	2	0	0	7	+	0	7	+	+
3	0	0	3	0	0	14	+	0	14	+	0
4	0	0	4	+	0	21	+	0	21	+	0
5	0	0	5	0	0						
6	0	0	6	0	0						
7	0	0									

0 = *Listeria monocytogenes* does not grow

\+ = *Listeria monocytogenes* grows.

The developement of a non toxic mutant of *Penicillum camemberti*

All the cultures of *Penicillum camemberti* can produce a micotoxin, ciclopiazonic acid, in the cheese[1]. This was confirmed also by other laboratoires. It seems that all the strainso of *Penicillum camemberti* are able to produce ciclopiazonic acid. For this reason there were some attempts to develop a strain using the genetic engineering that is unable to produce the ciclopiazonic acid. The conidia of a culture of *Penicillium cammemberti* that produces ciclopiazonic acid were treated with a nitrite solution and then examined if they produce ciclopiazonic acid. In 7000 mutants examined were discovered 2 that could not produce ciclopiazonic acid, or can produce only in traces[2]. These cultures were proved non toxic by other laboratoires[3].

The transfer of the lisostaphin producing gene to *Penicillum nalgiovensis*

Staphilococcus aureus can develop in the marginal area of the raw salami because of the relatively high pH and can produce enterotoxins[4]. Its developement can be stopped by lisostaphin[5], that is produced by a strain of the *Staphylococcus staphyloliticus*. The gene that contains the code of lisostaphin production was transferred to *Penicillium nalgiovensis* using the genetic engineering. This mutant produces lisostaphin and is capable to prevent

of the *Staphylococcus aureus* in the raw salami. The gene was integrated in the cromosom and also the mutant is stable.

References

1. Junker, M., Liepe, H., U., Untersuchungen zur Activitatbestimmung von Startenkulturen, Die Fleiscwirtschaft, 59, 1880 – 1881, 1979.
2. Kuusela, K., E., Poulanne, E., Petaja, F., P., Niivaara, F., P., Schnellverfahren zur Bestimmung der Aktivitat von Startenkulturen, Proc – 24 European Congress Fleischforscher Kulmbach, 1978.
3. Leistner, Lothar, Geisen, Rolf, Bockle, Brigitte, Possibilities and limits to genetic change in starter cultures and protective cultures, Ffleischwirtschaft International, 4, 18 – 24, 1991.
4. Liepe, H., U., Taschenbuch fur die Anwendung von Starterkulturen , Rudolf Muller & Co., Polheim, S. 45, 1989.
5. Rodel, W., Kriespieren, K., Leistner, R., Die Wasseractivitat von Fetten tierischer Herfunkt, Die Fleischwirtschaft, 60, 642 – 650, 1980.
6. Skelkvale, R., Fyhn, P., G., Slynde, E., Hozem, T., Process Control in the Production of Fermented Sausages, European Meeting of Mesat Research Workers, 25, II, L2, 116 – 119, 1980.