

Tab. 6 Polyphenolgehalte der Heidelbeerfruchtweine (mg/l, Mittelwerte aus Doppelbestimmungen, 2a = geschönte Variante 2)

Variante	1	2	3	4	5	6	7	2a
Procyanidin B1	75,7	14,0	10,4	22,0	15,1	35,5	10,4	10,0
Catechin	105,8	110,6	89,7	103,2	89,2	142,2	127,1	103,1
Chlorogensäure	305,6	136,9	49,2	215,4	409,6	839,6	246,5	125,0
Kaffeensäure	57,3	165,1	67,6	30,8	71,7	128,8	274,8	152,5
Quercetin-3-rutinosid	36,2	53,4	40,4	149,5	70,1	91,3	102,8	49,8
Quercetin-3-galactosid	0,0	10,8	36,7	43,7	15,1	18,1	15,6	10,1
Quercetin-3-glucosid	9,8	15,4	12,8	10,0	4,0	3,8	5,1	11,1
Quercetin-3-arabinosid	11,3	12,7	39,2	28,2	3,5	26,8	10,7	11,5
Quercetin-3-rhamnosid	35,3	28,0	5,3	2,2	1,4	24,7	9,4	26,1
Quercetin	34,5	25,5	29,4	19,2	21,4	4,5	13,6	23,1
Summe	671,5	572,4	380,7	624,0	701,2	1315,4	816,0	522,3

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Microbiological Specifications for Dry Soups and Bouillons, and Ingredients to be used for Dry Soups and Bouillons (2007) – New AIIBP Guidelines

Korrigierte Fassung

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Vorbemerkung

AIIBP (Association Internationale de l'Industrie des Bouillons et Potages) und FAIBP (Fédération des Associations de l'Industrie des Bouillons et Potages de la CEE), der internationale und der EU-Verband der Suppenindustrie, haben die im Jahr 1992 veröffentlichten *New Microbiological Specifications for Dry Soups and Bouillons* (Alimenta 4, 62–65 [1992]) überarbeitet und die gute industrielle Herstellungspraxis auf der Grundlage von Gesetzgebung und Leitlinien neu beschrieben.

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Summary

This document represents a consolidation of industry best practice, guidance and legislation. Following a review of emerging legislation coupled with the increasing application of HACCP principles across the industry it was determined that a review of previous AIIBP documents was appropriate. A Microbiological Working Group was established and subject matter experts from a range of soup manufacturers collaborated together to prepare an update of the 1992 AIIBP Microbiological Specifications for Dry Soups. This document includes a review of the specific microorganisms of interest. The new AIIBP microbiological guidelines apply to all types of dry soups, bouillons and semi-finished soup base and provide specific guidelines for ingredients to be used in all such dry soups.

Résumé

Spécifications microbiologiques des potages et bouillons déshydratés et de leurs ingrédients (2007)

Ce document représente une consolidation des bonnes pratiques industrielles, des guides et de la législation. Prenant en compte la récente évolution de la législation, et le fait que les principes de l'HACCP sont de plus en plus largement appliqués en industrie, il est apparu qu'une révision du précédent document de l'AIIBP était souhaitable.

Un groupe de travail a été constitué, avec les experts en microbiologie de différents fabricants de potages, qui ont collaboré à la mise à jour du document édité en 1992 par l'AIIBP. Cette nouvelle version inclut une discussion sur les microorganismes concernés.

Ce nouveau guide s'applique à toutes les catégories de potages déshydratés, ainsi qu'aux bouillons et préparations déshydratées pour soupes.

Ce guide inclut également des recommandations concernant les spécifications microbiologiques des ingrédients qui constituent ces potages déshydratés.

Zusammenfassung

Dieses Dokument beschreibt die gute industrielle Herstellungspraxis auf der Grundlage von Gesetzgebung und Leitlinien. Gesetzesentwicklung und zunehmende Anwendung des HACCP-Prinzips in der industriellen Produktion machten eine Überprüfung der früheren AIIBP-Spezifikationen erforderlich. Eine Arbeitsgruppe aus Mikrobiologie-Experten verschiedener Unternehmen der Suppenindustrie aktualisierte deshalb die mikrobiologischen Spezifikationen der AIIBP für Trockensuppen aus dem Jahr 1992. Die vorliegende Arbeit behandelt die relevanten Mikroorganismen. Die neuen AIIBP-Leitlinien gelten für alle Arten von Trockensuppen und -brühen (Bouillons) sowie Zubereitungen hierfür. Sie geben Empfehlungen mikrobiologischer Richtwerte für die in den genannten Produkten eingesetzten Zutaten.

Introduction

The Technical Commission of the International Association of the Bouillon and Soup Industry (Association Internationale de l'Industrie des Bouillons et Potages, AIIBP) published in 1977 microbiological specifications for dry soups¹⁾. These were based on extensive analysis of microbiological

data for “instant” and “regular” dry soups produced by member companies throughout Europe, combined with an expert assessment of levels of specific organisms that are acceptable in dry soups, taking account of how such soups would be handled and prepared for consumption.

In 1992, AIIBP reviewed and updated the specifications to comply with the format proposed by the International Commission on Microbiological Specifications for foods²). The review took into consideration the microbiology of soups as reflected in semi-official limits for dry soups and bouillons. Also included was a discussion of the impact of new legislation regarding fumigation, and of inconsistent EU legislation regarding new technologies for decontamination of certain ingredients. The 1992 AIIBP Microbiological Specifications for Dry Soups are shown in Table 1.

In 2006, the Regulation (EC) No 2073/2005 on microbiological criteria for foodstuff entered into force³). Following the strategy for setting microbiological criteria for foodstuffs in Community Legislation, the criteria laid down in the Regulation are relevant for consumer health protection, and were developed in accordance with internationally recognised principles, such as those of Codex Alimentarius⁴).

Additional industry microbiological guidelines supplement EC Legislation addressing specific elements for ensuring product safety and quality. Some Member States maintain national criteria for certain microbes in foodstuffs not covered by EC legislation, thus providing for a more precise legal framework for both food business operators and authorities. However, it has to be ensured that industry guidelines as well as national criteria do not contradict EC Legislation.

To foster the free movement of goods within the internal EU market, stakeholders should strive for microbiological guidelines that are accepted throughout the EU wherever there is a recognised need to establish harmonized criteria. All setting of criteria should in general be based on formal risk assessment, and take account of available risk profiles and current scientific information. Criteria that do not meet these requirements, whether they have been set by food industry as self regulation or by national non-official bodies, should be revised or withdrawn.

France and Switzerland have now withdrawn specific legislation while Spain retains its requirement for microbiological levels in the dry soup once prepared and ready to eat⁵). The moisture content of dry soups is such that microorganisms are not able to grow during storage. There are however differences between instant soups which are reconstituted with boiling water and simmer soups which are brought to the boil and simmered for a few minutes. These differences are particularly important with regards to any spores present in the dry soup which may be activated during reconstitution.

In the light of evolving scientific knowledge on the relevance of certain microorganisms for ensuring food safety, their occurrence in certain food categories and ingredients and the ongoing developments in food safety management,

it has been agreed among the members of AIIBP to revise the 1992 Microbiological Specification.

Decontamination update

After the EU-wide ban of ethylene oxide as a decontamination agent for herbs, spices and dried vegetables⁶), physical treatment of food with high-energy ionising radiation became an alternative to reduce levels of microorganisms. Community Directives 1999/2/EC and 1999/3/EC provided a harmonised legal framework for the technical aspects for carrying out food irradiation, labelling of irradiated food and conditions for authorising food irradiation, and established a Community list of food and food ingredients which may be irradiated in all member states^{7,8}). This list contains one single food category relevant to dry soups and bouillons: *dried aromatic herbs, spices and vegetable seasonings*. National authorisations allowing irradiation of foods are maintained by Belgium, France, Italy, the Netherlands and the UK; some of these foods have relevance for use in dry soups and bouillons.

Despite the authorised treatment of some food and food ingredients with ionising radiation, such processes are not commonly applied. The reason for this is the fact that irradiation triggers labelling (*irradiated* or *treated with ionising radiation*) which must be placed next to the corresponding ingredient in the ingredient list of compound foods. As the irradiation process is often misunderstood and as a result may not be accepted by consumers, food manufacturers fear refusal of such labelled food in the market.

Every year Member States forward to the Commission the results of checks carried out on retail units of product to detect unlabelled irradiation of foods. The 2002 report indicated that “about 1.4 % of products (without dietary supplements) on the market were found to be irradiated and not labelled. These products are herbs and spices or compound foods containing herbs and spices, frog legs, aquatic animal products, mushrooms, fresh fruits, tea, coffee, sauces and similar products”⁹). The situation in 2003 was similar to 2002¹⁰), whereas the 2004 report identifies food products imported from Asia (especially Asian-type noodles and dried prepared noodles) as a new focus of unlabelled and unauthorised irradiation¹¹).

Herbs and spices to a significant extent originate from outside the EU. Where producers determine that irradiated ingredients are not to be used, supplier management programs should include a specification of the non-use of ionising radiation in addition to periodic monitoring to verify compliance¹²).

The herbs and spice industry has identified other ways to reduce the microbial load of herbs and spices. Many companies have developed their own solutions but details regarding these techniques are not available due to competitive considerations. Such techniques generally make use of heat treatment while conserving the sensory properties.

Tab. 1 1992 AIIBP Microbiological Specifications for Dry Soups²⁾

Microorganism	n	c	Limit per g	
			m	M
<i>Clostridium perfringens</i>	5	3	10 ²	10 ⁴
<i>Bacillus cereus</i>	5	3	10 ³	10 ⁵
<i>Staphylococcus aureus</i>	5	2	10 ²	10 ³
<i>Salmonella</i>	5	0	absent in 25 g	

The specific treatment methods will vary widely between ingredient type and supplier and may be subject to patent.

Food Safety Management Approach

Microbiological criteria provide guidance on the acceptability of foodstuffs and their manufacturing processes. However, the application of microbiological criteria has certain limitations. Due to reasons related to sampling, methodology and uneven distribution of microorganisms, microbiological testing alone can never guarantee the safety of a foodstuff tested. Therefore the safety of foodstuffs is principally ensured by a structured preventive approach, such as good product and process design (GMP) and the application of good hygiene practice (GHP) and the Hazard Analysis Critical Control Point (HACCP) principles⁴⁾. Such requirements may be supported through the adoption of a third party accredited quality standard such as The Food Safety Management System ISO22000.

Microbiological criteria can be used as reference points in validation and verification of HACCP based procedures and other hygiene control measures based on GHP and GMP. They should not be used in the traditional way to assess the acceptability of batches of foodstuffs.

Food business operators in the EU must have a well functioning food safety management system according to the HACCP principles. For the sector of the dry soup and bouillon manufacturing industry, this has been introduced with Directive 93/43/EEC¹³⁾. Maintaining a consistent HACCP approach remains the basic food safety management requirement with the entry into force of the new EU Food Hygiene Regime in 2006¹⁴⁾. Consequently, for some years critical control points are well established in the manufacture of dry soups to prevent the contamination of the soup ingredients during processing and packaging¹⁵⁾.

The manufacture of dry soups and bouillons typically involves dry mixing, and in many cases no microbiological kill step is applied in the process. Control of the factory environment involves the prevention of moisture, through the exclusion of water from the manufacturing processes and the use of dry cleaning procedures. The level and nature of microorganisms found in dry soup and bouillon mixes is directly impacted by the microbiological quality of the raw materials and effective supplier management is critically important. In addition to on-site audits of supplier controls, microbiological analysis of raw materials by

the supplier, and periodic analysis of incoming raw materials against specified microbiological criteria can be used to verify their hygienic status.

Reliable sampling and testing procedures should be applied in order to verify compliance of raw materials with the specified microbiological criteria. Both specifications and compliance controls should take account of the risks associated with specific raw materials, and controls should be carried out regularly and with an appropriate frequency¹⁶⁾. When adequate attention is given to the quality of raw materials, sampling of end products is restricted to a verification of the effectiveness of GMPs through the evaluation of appropriate indicator microorganisms. Trends in analytical data obtained from raw materials, finished products and environmental monitoring should be analysed, as they help to reveal unwanted developments in the manufacturing process enabling the food business operator to take corrective actions before the process runs out of control.

HACCP and Raw materials

In 1993 the AIIBP published a useful reference “Assurance of the Microbiological Safety of Dry Soup and Bouillons”, which provides guidance on the safe production of dry soups, dry bouillons, bouillons paste and semi-finished soup base, and on selection of raw materials to be used in the product formulation¹⁷⁾.

AIIBP Microbiological Specifications for Dry Soups and Bouillons, and Ingredients to be used for Dry Soups and Bouillons (2007)

The 2007 AIIBP Microbiological Specifications for Dry Soups and Bouillons are represented in Table 2 and are valid for all types of dry soups, bouillons and semi-finished soup base, which are to be prepared by cooking or by addition of boiling water. Products meeting these guidelines can be considered as prepared under GMP conditions.

AIIBP Microbiological Specifications for Ingredients to be used in dry soups and bouillons (2007)

The AIIBP has proposed three risk categories for raw materials used in dry soups and bouillons¹⁷⁾.

Risk Category 1: no pathogen hazard – e.g. *salt, sugar, chemicals, glutamate, modified starches...*

Risk Category 2: pathogen hazard known and in control – e.g. *milk powder, meat extract, dried meat, decontaminated spices & vegetables, noodles ...*

Risk Category 3: possible pathogen hazard – e.g. *natural herbs & un-decontaminated spices and vegetables.*

The application of microbiological specifications in the management of these raw materials, including the need to evaluate products against their specifications must be determined by each manufacturer based on the product, process applied and history of the supplier.

Tab. 2 2007 AIIBP Microbiological Specification for Dry Soups and Bouillons

Microorganisms	Sampling plan		Limits		Action in case of unsatisfactory results
	n	c	m	M	
Food Safety Criteria					
<i>Salmonella</i>	5	0	absence in 25 g		Product to be destroyed, identify cause and initiate corrective action
Staphylococcal enterotoxin[#]	5	0	not detected in 25 g		Product to be destroyed, identify cause and initiate corrective action
Process criteria					
Coagulase positive staphylococci	5	2	100	1000	– Improvement in production hygiene – Selection of raw material <i>If values > 1000 cfu/g are detected, consider testing for the presence of enterotoxin[#]</i>
<i>Bacillus cereus</i>	5	3	10,000	100,000	– Improvement in production hygiene – Selection of raw material

[#] If coagulase positive staphylococci > 1000 cfu/g are detected

To assist in the establishment of criteria the AIIBP has developed recommendations for ingredients used in all types of dry soups and bouillons presented in Table 3 below.

Microorganisms of interest in dry soups and bouillons

1. *Salmonella*

Salmonella is an infectious enteric pathogen associated with the faecal material of wild and domestic animals. The organism may contaminate the ingredients used in the production of dry soups and bouillons through direct or indirect contact with faecal material. *Salmonella* may also reside in niches in processing environments, particularly where water is present. Although not common, *Salmonella* contamination has been reported in dry soups and gravy¹¹⁻²⁰.

While low levels of *Salmonella* may be inactivated during the cooking of dehydrated soups, the organism may survive during reconstitution at lower temperatures. As relatively low numbers of *Salmonella* can cause illness, it is important to ensure their absence in foods. A two-class sampling plan is applied for *Salmonella*, specifying an absence of the organism in 5 samples of 25 grams.

Control of *Salmonella* in raw materials is achieved through supplier GMP/GHP and can be verified through supplier audits and the analysis of ingredients to verify compliance with raw material specifications.

2. *Staphylococcus aureus*

Staphylococcus spp. is associated with the skin, nasal passages and mucous membranes of animals, including humans. Coagulase-positive *Staphylococcus* strains are able to produce heat stable enterotoxins which can cause food poisoning when the organism is allowed to grow to high numbers. The presence of *Staphylococcus aureus* in dried soup or bouillon products can be mainly attributed to improper GMP/GHP or contaminated ingredients used in the manufacture of the final product and the organism may be used as a hygienic indicator for these products.

Surveys of dry soups and bouillons have shown that *S.*

aureus is rarely present even in low numbers. In addition, the low water activity of dry soups and bouillons will not allow for the outgrowth of *S. aureus* or any other microorganism. *S. aureus* is a poor competitor and where conditions allow growth in foods, it will most likely be overgrown by other microorganisms in a food matrix. Therefore, the overall likelihood of *Staphylococcus* food poisoning resulting from consumption of a reconstituted dry soup or bouillon is low. No such incident of *S. aureus* poisoning has been reported in the literature for a dry soup or bouillon product^{21,22}.

Since dry soups and bouillons are formulated foods, made up of blended dry ingredients with no further processing in many cases, the microbial flora of the final product will depend on the load coming in on the ingredients. The main concern is the abuse of raw materials during their production storage or distribution which may result in growth and toxin formation. Any toxin formed in the raw materials is heat stable and will not be destroyed by subsequent processing.

The best approach to minimise this hazard in dry soups and bouillons is to control the incoming ingredients. There have been incidences of food borne illness resulting from improper time/temperature holding of ingredients during their manufacture that have led to food poisoning by *S. aureus*. Some of the more noteworthy examples include dry milk powders and egg-based noodles. These products were manufactured and dried in a manner that allowed the outgrowth of *S. aureus* and subsequent toxin formation. Since the toxins are stable and are not destroyed by the type of heat processing usually applied in food processing, reconstitution of these ingredients was unable to deactivate the toxin and illness resulted²². These examples show the importance of HACCP and hygienic control during the manufacturing of ingredients used in dry soup and bouillon assembly²¹.

A microbiological criterion governing the acceptable level of coagulase positive Staphylococci in specific ingredients used to manufacture dry soups and bouillons is necessary to verify that these controls are in place during manufacturing.

Setting a 3 class plan criterion for coagulase positive Staphylococci in dry soups as a hygiene indicator with 1000 cfu/g at the upper limit could be beneficial to verify that ingredients meet their specifications. Testing for toxin should be considered when levels exceed 1000 cfu/g.

As appropriate, the consumer should be instructed in proper cooling and hot-holding guidelines for dry soups and bouillons.

3. *Bacillus cereus*

Bacillus cereus is a spore-forming bacterium that is widely distributed in nature and is commonly found in soil, dust, water, and vegetation. Toxin produced by *B. cereus* can cause a diarrhoea or emetic food borne illness in humans following growth to high numbers in food. Studies of food borne outbreaks have quantified levels of 10^5 – 10^9 cfu/g for emetic incidents and 10^5 – 10^7 cfu in total for diarrhoeal incidents^{23–26}. The main risk of outgrowth is due to temperature abuse after reconstitution with water. In the case of delayed cooling and consumption, *B. cereus* will grow if the product is held at an extended period of time at elevated temperatures.

Given their distribution throughout the environment, *B. cereus* spores may be expected to be present in raw materials used to produce dry soups and bouillon. The application of good agricultural and manufacturing practices during the harvesting and production of raw materials can minimize the levels of *B. cereus* present. There is no effective inactivation step during the blending of dry soup products. Control of *B. cereus* in such products is applied through effective supplier programs. Microbiological specifications have been established for *B. cereus* to verify the microbiological quality of raw material and the control of processes in which growth could occur. Specifications are particularly important for ingredients produced under processing conditions that would allow growth if not controlled (e.g. starchy ingredients, rice, pulses etc).

The AIIBP conducted a review of available data to assess the relevance of the specification limits established in the 1992 specifications; specifically the limits established for m (1000 cfu/g).

Studies have reported a prevalence of *B. cereus* in specific foods ranging from 0 to $\sim 10^4$ cfu/g^{25, 27–29}. ICMSF reported levels of $<10^2$ cfu/g in foods under normal growing and handling practices³⁰. Data offered by a soup industry stakeholder³¹ listed in Table 4 shows 98 % of over 1500 dry soup, bouillon and gravy blends were well under 1,000 cfu/g of *B. cereus*. Only one sample resulted in 13,400 cfu/g which remains below the level needed to cause a food borne illness.

Modeling of *B. cereus* growth^{32,33} demonstrates that product containing 100 cfu/g of *B. cereus* could potentially reach levels of concern for toxin production (10^5 cfu/g) if held continually at 30 °C for 6.7 hours. Similarly, if the product begins with a 1,000 cfu/g load of *B. cereus*, level of concern could be reached within 5.5 hours. If the product begins with a 10,000 cfu/g load of *B. cereus*, a toxic level could be reached within 4.5 hours. Growth in a reconstituted dry soup product is likely to take considerably longer since the holding temperature would be variable and growth would start from the spore state (vegetative cells killed by boiling water) which would have a longer lag phase.

Additionally the Pasteur Institute conducted a study of the microbiological quality of dehydrated and concentrated soups at reconstitution and after abuse conditions of storage before consumption³⁴.

One hundred packages of dehydrated soups and ten concentrated bouillons were examined. After suitable reconstitution (boiling), spores of bacilli survive and were found in 93 % of the samples:

< 100 /ml in 54 % of cases, < 1000 /ml in 85 % of cases. The maximum level was 6000/ml in one case. Growth of *B. cereus* was demonstrated in reconstituted soups left at room temperature. After 24 hours their number passes 1 000 000/ml in 32 % of the cases and > 1000000 /ml

Tab. 3 AIIBP Microbiological Specifications for Ingredients to be used in dry soups and bouillons (2007)

Microorganisms	Sampling plan		Limits		Categories of ingredients
	n	c	m	M	
Food safety criteria					
<i>Salmonella</i>	5	0	absence in 25 g		All ingredients of Risk Categories Risk 2 & 3
Coagulase positive staphylococci	5	2	100	1,000	For ingredients where processing demonstrates a possible risk of presence and growth if lack of GMP (manual steps), e.g. pasta, egg products, milk powders and milk based powders like cream, caseinate, milk protein
Hygiene/GMP criteria					
<i>Bacillus cereus</i>	5	3	10,000	100,000	For ingredients where processing could lead to the selection of spore formers and where growth is possible due to its ability to digest starch: e.g. cooked/pre-cooked vegetables containing starch, potatoes, lentils, beans, corn, rice
<i>Escherichia coli</i>	5	3	100	1,000	All ingredients of Risk Categories Risk 2 & 3 regarded as indicator of faecal contamination
Enterobacteriaceae , and optionally Aerobic Plate Count and Yeasts & Moulds can be relevant for GMP purpose					

Tab. 4 Results of *B. cereus* testing in dry blends³¹⁾. Method ISO 7932

<i>B. cereus</i>	Number of Analysis	Number positives	Count levels [cfu/g]			
			< 100	100–1,000	1,000–10,000	> 10,000
TOTAL	1630	172 10.5 %	1458 89.5 %	135 8.3 %	36 2.2 %	1 <0.1 %
DETAILS						
Vegetable Based Mixes	750	76 10.1 %	674 89.8 %	56 7.5 %	19 2.5 %	1 ⁽¹⁾ 0.1 %
Beef Based Mixes	580	71 12.2 %	509 87.8 %	55 9.5 %	16 2.8 %	0
Chicken Based Mixes	300	25 8.3 %	275 91.7 %	24 8.0 %	1 0.3 %	0

⁽¹⁾ 13,400 cfu/g

in 7 % of the samples and in some cases has high as 15 million.

The outcome of the growth models and the Pasteur Institute study indicate that a limit, m, of 1,000 cfu/g or lower, does not provide significant consumer protection over a limit, m, of 10,000 cfu/g. It should be noted that the model predicted growth of vegetative cells, held in a culture broth at optimal growth conditions. As a result the AIIBP has established a limit of 10 000 cfu/g in the 2007 specification.

4. *Escherichia coli*

E. coli is a natural inhabitant of the gastro intestinal tract in both man and animals. Its presence in food thus indicates contamination from a faecal origin. There is no direct correlation between *E. coli* and specific pathogens such as *Salmonella* and *Campylobacter*. However, the presence of *E. coli* does imply a risk that a pathogen may be present²¹⁾. It is also a tool to assess the efficacy of the controls set in place through the HACCP system or sanitation and GMP/GHP programs.

A microbiological criterion governing the acceptable level of *E. coli* in ingredients used to manufacture dry soups and bouillons is recommended as indicator of the manufacturing facilities' sanitation and GMP/GHP programs.

5. *Enterobacteriaceae*

Enterobacteriaceae is a family of bacteria which are widespread in the environment. They are heat sensitive and are often used as process hygiene indicators related to recontamination risk for foods that are produced with a thermal process. The family includes *E. coli* and *Salmonella*; however, the presence or level of Enterobacteriaceae cannot be directly correlated with the presence of these organisms. Monitoring and trending of the levels of Enterobacteriaceae in products and production environments can be a useful tool as unusually high levels of Enterobacteriaceae can indicate the presence of hygienic conditions that could also lead to the presence of *Salmonella*.

A microbiological criterion governing the acceptable levels of Enterobacteriaceae in ingredients used to manufacture dry soups and bouillons may be beneficial as an indicator

of the manufacturing facilities' sanitation and GMP/GHP programs and should be assessed on a case by case basis.

6. *Clostridium perfringens*

Illness from *C. perfringens* is most commonly associated with the consumption of cooked, uncured meat products that have been cooled slowly or stored under inadequate refrigeration and then consumed without thorough reheating. Control of *C. perfringens* relies almost entirely on adequate cooking and cooling procedures³⁵⁾. Large numbers of cells (10^6 to 10^8 cells of a food-poisoning strain) must be ingested to cause food poisoning^{26,36)}.

The 1992 guideline established a specification for *C. perfringens* based upon a concern of the outgrowth of the organism during mishandling of reconstituted soup. Table 5 shows the results of *C. perfringens* testing of dry soup, bouillon and gravy blends performed by a soup industry stakeholder. It demonstrates that *C. perfringens* is not likely to be detected (<10 cfu/g) in the majority of samples. Only 5 samples (0.3 %) had levels between 10–30 cfu/g. All samples were <100 cfu/g³¹⁾.

In the study on Microbiology of dehydrated and concentrated soups conducted by Pasteur Institute, it is demonstrated that *Clostridium perfringens* do not multiply significantly in the reconstituted soups left at room temperature³⁴⁾.

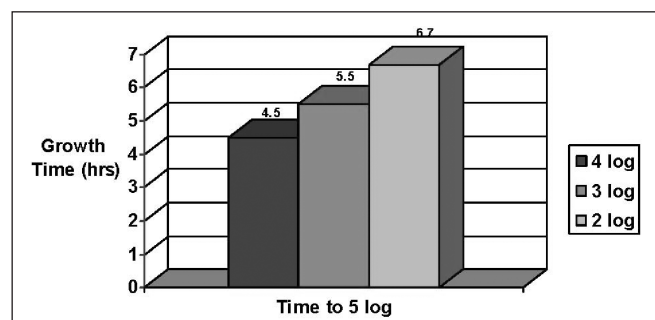


Fig. 1 Predicted growth rate of *B. cereus* with varying initial counts (30 °C, pH 7.0, 1.0 % NaCl); Growth Predictor Software version 1.01³²⁾

After reconstitution, spores of *C. perfringens* were found in 3 % of the soups at low levels: 1–5/10 ml

In the soups left at room temperature, their number reached maximum 16/10 ml after 24 hours.

A previous survey that looked for presence or absence of *C. perfringens*, reported that only 2.1 % of ingredients (8 positive out of 377 samples) and 0.9 % of dried soups (2 positive out of 214 samples) contained *C. perfringens*³⁷. This microorganism is not likely to be a health risk for dry soups. In common with any perishable food, consumers should be instructed in proper cooling or hot-holding guidelines after reconstitution. The AIIBP working group has concluded that *C. perfringens* is not a necessary criterion for both dry soups and bouillons and ingredients.

7. Moulds

It is important to note that Aflatoxins produced by moulds are frequently detected in certain dry soup ingredients and in particular in spices. It is recommended that monitoring of such ingredients for aflatoxins is considered.

Recommended methods of analysis

The International Organisation for Standardisation (ISO) has produced a complete set of standard methods for all microorganisms which are relevant for dry soups, bouillons and their ingredients. The AIIBP microbiological working group has reviewed the available ISO methods at the time of publication and comes to the conclusion that these are suitable for dry soups, bouillons and their ingredients, and their use is therefore recommended.

Standard microbiological techniques can take several days for species identification. Traditional methods for bacterial isolation and identification at the species level are based on secondary characteristics of the bacteria and can be time consuming. The reduction of the time conventional microbiological culturing methods require can be achieved by means of several systems available on the market.

If the food business operator wishes to introduce a particular technique not officially accepted by the local authorities, the method shall be validated according to internationally accepted protocols, and their use should be authorised by the competent authorities.

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Tab. 5 Results of *C. perfringens* testing in dry blends³¹. Method ISO 7937

<i>C. perfringens</i>	Number of Analysis	Number positives	Count levels [cfu/g]		
			< 10	10–30	> 30
TOTAL	1630	5 0.3 %	1625 99.7 %	5 0.3 %	0
DETAILS					
Vegetable Based Mixes	750	1 0.1 %	749 99.9%	1 0.1 %	0
Beef Based Mixes	580	0	580 100 %	0	0
Chicken Based Mixes	300	4 1.3 %	296 98.7 %	4 1.3 %	0

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Tab. 6 AIIBP recommended methods* for the microbiological analysis of dry soups, bouillons

Parameters	ISO Methods Reference N°	Technique
General Aspect		
General rules for microbiological examinations General guidance for the preparation of dilutions for microbiological examination	ISO 7218 ISO 6887 and following editions	Microbiology of food and animal feeding stuffs
Specific Microorganisms		
General guidance on methods for detection of <i>Salmonella</i>	EN/ISO 6579	pre-enrichment in non selective liquid medium, enrichment in selective liquid media, plating out and recognition confirmation
General guidance for enumeration of <i>Bacillus cereus</i>	ISO 7932	Colony count technique 30 °C – MYP Agar Confirmation: haemolysis test
General guidance for enumeration of Staphylococcus Coagulase positive	EN/ISO 6888-1/2	Colony count technique 37 °C Confirmation: coagulase test
General guidance for enumeration of presumptive <i>E. coli</i>	ISO 16649-1/2	Colony Count technique 44 °C

*Note: Recommended methods and references accurate at time of publication. New ISO methods should be evaluated for suitability as appropriate

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