

Developments in food processing and increasing gaps in consumers competence of food handling—the challenge for nutrition policy in Europe

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Received 21 October 2001

Abstract

Human evolution is accompanied by innovations in food processing. The results are remarkable: there is food security, as there is surplus on cheap, safe and high quality food. Despite this situation nutritional studies reveal that there are still nutritional problems in the world. Food security is only a precondition but no guarantee for nutrition security.

The causes of nutritional problems are complex. In industrialised societies the importance of the last links of the food chain, being the competence of consumers regarding food and nutrition, is ignored. Whereas the global knowledge on food processing is increasing continuously, a reverse trend regarding consumer competence can be observed. The consequences of these trends have to be observed and studied. People with less food and nutrition competence are susceptible to disorientation and misguided behaviour. It is likely that the trend accelerates since the traditional ways to learn food and nutrition competence are diminishing; even in the case of food professionals, like cooks or bakers, there is clear evidence of lack of practical experiences.

Nutrition and food policy has to focus on this gap. The most important nutritional problems are no longer those of food quality, but related to consumer behaviour. Today's consumers need high qualification to use all the opportunities to manage the everyday tasks. Without fostering such training (not only for the general population, but also for food professionals) we in Europe are in danger of becoming a food illiterate population.

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Keywords: Nutrition behaviour; Consumer; Competence; Food processing; Nutrition policy

1. Introduction

Humans are omnivores; they have the possibility to ingest a huge variety of biological matters; pure substances like water and glucose, but also micro-organisms, plants and animals. Man can eat whole organisms and part of them; raw or prepared. There are a few people eating raw foods only for a long period of life (*german* “Rohköstler”); but it is accompanied with some health risks (Hoffmann, Koebnick, & Leitzmann, 2000).

Human evolution is accompanied by innovations in food selection and food processing. Empirical knowledge was used to find out proper handling, tools and

equipment to convert food resources into palatable meals. Major innovations related to food had major implications to human society and development. Such historical important evolutionary steps are:

- The controlled use of fire increased the food resources; e.g. improved tools for hunting and storing and preparing foods.
- Domesticating of plants and animals (in the neolithic revolution) made human settlements and townships possible. Humans cultured the nature; agriculture and forestry shaped the landscape (Makowski & Buderath, 1983).
- In 19th century applications of scientific research results along the whole agro-food chain and professional technical applications (establishment of first agricultural research stations and of food industry) were part of the industrial revolution and the basis

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Table 1
Availability of basic agricultural products in Germany according to Food Balance Sheet (for 1999) (FAO, 2001a)

Commodity	Energy (kcal) per day and person
Wheat	567
Beef (milk, butter)	447
Sugar (beet)	350
Pigmeat	255
Potato	142
Rape (oil seed)	141
Poultry (meat + egg)	98
Sum	1970 (or 58% of total availability)
Total availability	3411

for modern civilisation (IFIC, 2001; Kiple & Ornelas, 2000).

Every biological resource can be made palatable. Many plants are edible; a compilation identifies about 125,000 species which are known to be eaten by humans (Kunkel, 1984). All industrial developments are characterised by specialisation (Taylorism) and standardisation (Fordism), this is valid for modern food and nutrition situation in industrialised countries, which is characterised by features like that. Food availability is concentrated on rather few biological resources (e.g. for Germany, Table 1).

The concentration on food species is also seen in the organisation of food research in the world (e.g. <http://www.cgiar.org/> Consultative Group on International Agricultural Research (CGIAR) and <http://www.iu-fost.org/>) and in single countries (e.g. in Germany <http://www.bmvel-forschung.de/>). The whole agro-food chain is in the process of concentration; this is related to the levels of farmers, food industry and food trade. In industrialised countries rather few farmers produce the basic food sources with high input of energy and resources. At the end of the food chain one food energy unit is produced by an input of about ten energy units. Since every human being eats and drinks annually approximately 8.6×10^5 kcal an energy demand of 8.6×10^6 kcal i.e. 10 MWh is necessary for each individual in the industrialised countries.

A distinction of concentration processes is the progressive disintegration of the food chain into small specialised parts. There are many different special scientists working in the agro-food research area, this can be recognised by considering lists of scientific journals and those of related professions.

The results of this progress are remarkable. The food insecurity of former generations, originated by occurring imbalances in food production and food needs related to time (season) and region, seem to be disappeared. There is surplus on save and cheap food. We can eat every time everywhere in arm length. In Germany there are listed 230,000 different processed food items on

the market (EAN code), and in addition many fresh foods are sold in different food outlets. Practically no single food can be called as natural (wild or untreated); even unconventional produced (e.g. organic) foods have to be bred, planted, harvested, transported and prepared to meals. Modern food production is under professional control, and this is well regulated by food policy and food laws. Access to save food is a human right (FAO, 2001b).

Food Processing is an essential prerequisite for food security, and modern human lifestyle need processed food. The old dream of cockaigne (*german* “Schlaraffenland”) is fulfilled. The success of agricultural and food research is remarkable. First time in the world there are as many overfed people (1 billion) then hungry ones (Gardner & Halweil, 2000).

2. Today’s nutritional problems—deficiencies in surplus

Despite this situation of food security, the potential of the society to produce enough food for all, nutritional studies reveal that there are still nutritional problems in the world and in industrialised countries. Food security is only a precondition but no guarantee for nutrition security.

The causes of nutritional problems are complex. There is poverty, ignorance and social injustice, in short neglecting of basic human rights. Such causes lead to undernutrition, mainly the problem of the less developed countries; this topic will not dealt in this publication.

In industrialised countries the main nutritional problems are related to nutritional behaviour problems including neglecting food hygiene risks. Poor food quality and food contamination with toxic substances are of minor relevance. Current health problems are related mainly to modern life style. The lifestyle related health and nutrition problems in our society cannot be neglected. Since they can be prevented, it is an ethical obligation for a society to be concerned about it, and there are also economical reasons for it. The preventable health disorders have high costs. The society should aim nutrition security; and such orientation of food and nutrition policy have to have implication on food and nutrition research.

Current nutrition research reveals that the biological set-up of humans is not adopted to the modern surplus situation. We have biological signals for energy saving, that mean to eat when there is food; and only to move when it is necessary (Daniel, 2000, 2001). Nevertheless there should be nutrition programs to support changes in human behaviour to a lifestyle which is more healthy. A good example is the ABC of the Healthy People 2010 program of the U.S. government (WHO, 2000).

Goals to change behaviour and lifestyle appeal apparently on the individual, but there is evidence, that it is not enough to know the right things in order to behave in the right way. Individuals should not be blamed to have a wrong lifestyle and to be unsuccessful in adopting better ones; since human behaviour is not independent from socio-cultural conditions. Nutritional problems are indicating that there are problems within the society; eating disorders cannot be understood without knowing socio-psychological relationships. Surplus conditions and convenience offers are backgrounds for the observed increase in obesity (Willett, 1998). Nutrition security, reaching dietary goals, need efforts to adopt the conditions of the society, that people are enabled to reach the goal. If there are no roads to health, nobody can reach the health goal (White House, 2000).

In the following one aspect of nutrition security will be emphasised; that is the importance of the food and nutrition competence of consumers, since this is neglected by many.

3. Deficiency on food and nutrition competence despite of increasing knowledge

In industrialised societies the importance of the last link of the food chain, being the competence of consumers regarding handling of food and eating, is ignored. Whereas the global knowledge on food processing is increasing continuously, a reverse trend

regarding consumer competence can be observed. Despite the scantiness of relevant empirical data, it is obvious that the knowledge and experiences of consumers on food handling is decreasing in an accelerating way.

The background for this situation is part of the general trend that the knowledge of human mankind is increasing in an exponential way, but the capacity of knowledge of an individual remains almost constant, despite of all psychological and pedagogic efforts for information management (Nowotny, 1997; UNESCO, 2001). Due to the developments in information technology all information is available in principle always for everybody (e.g. 24/7—world wide webs are 24 h on 7 days/week active). In the ocean of the world wide information on all aspects, there is an increasing trend that the everyday, the normal information become a low ranking of importance. This is true also within the scientific community; everyday behaviour research has a low prestige value with a negative tendency. The multidisciplinary nutrition research in Germany called “Oecotrophologie” is declining instead of increasing.

For activities to reach dietary goals it is obligatory to understand consumer behaviour and to know models and frames for it. Basic capabilities to manage its own life are trained in long lasting processes from infancy to adulthood: that is to be able to communicate (speaking, walking, mobilisation) and to eat. Eating belongs to the essential basic needs; but there are more human needs and there are several different everyday activities (everyday settings); since man lives not only on bread. Eating is an everyday activity of everybody; it is

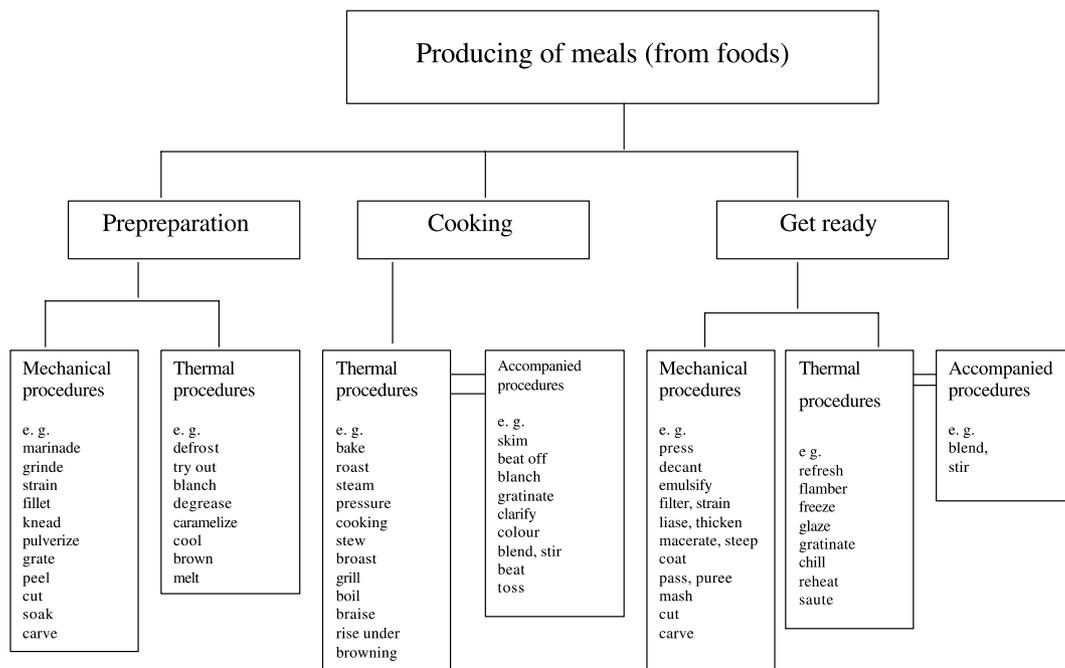


Fig. 1. Producing of meals from foods.

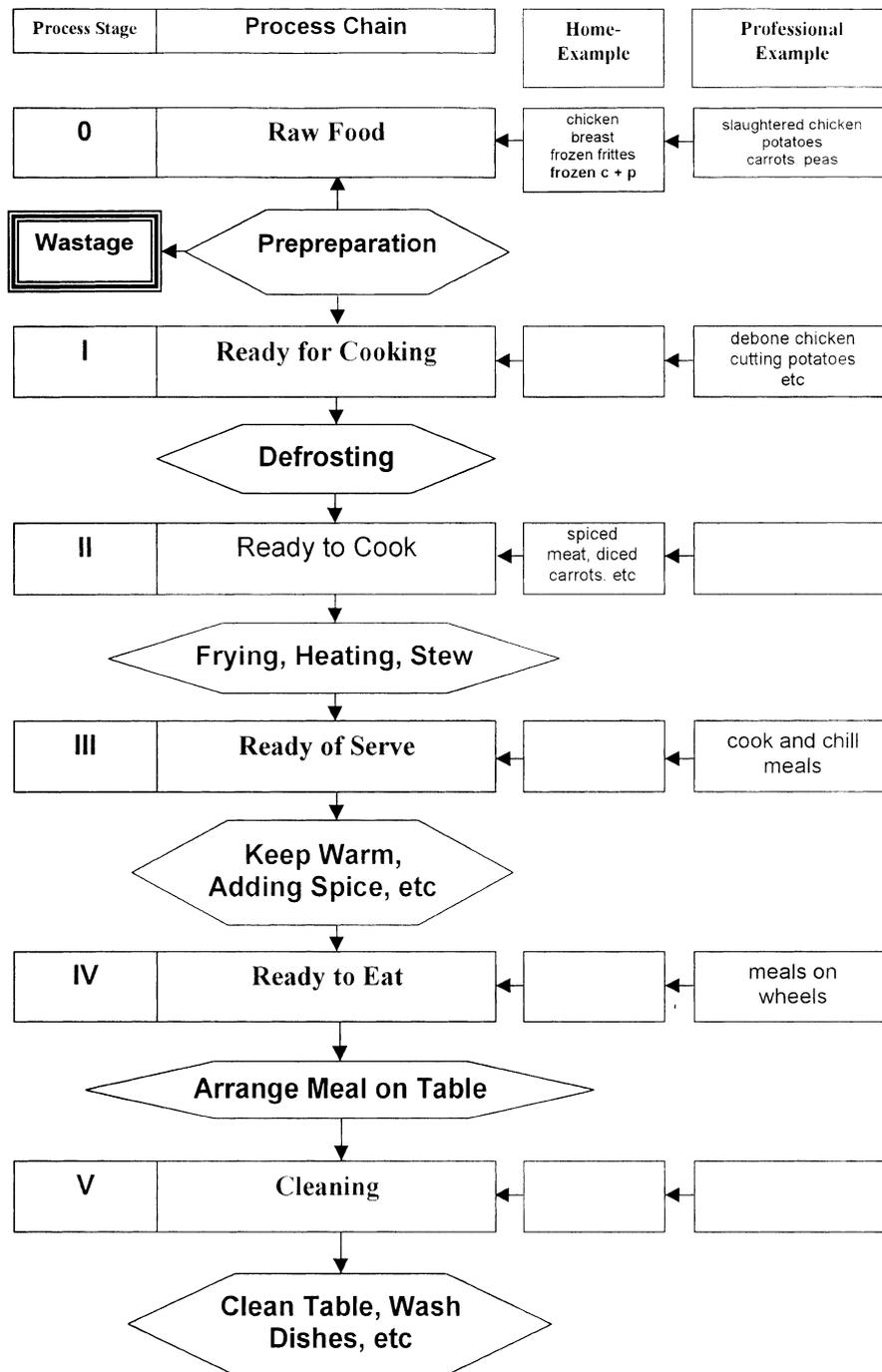


Fig. 2. Process chain to prepare a meal: Fried chicken breast; French fries; Carrots and peas.

common to have 3–4 meals a day; or 1000 times a year. Though everyday activities appear to be simple, they are all complex processes. They need to be organised and managed; the location for it is a household. The prerequisites for eating are a proper equipment, like store, stove, table and dishes. The time for eating has to fit into the other everyday activities. The necessary resources have to be considered; that are the economic and material bases, and also the human capital, that is to be competent to manage the household system.

Preparing a meal need the knowledge of many different food processes (Fig. 1). An important part of this research in Germany was done by the former Federal Research Centre for Home Economics, Stuttgart-Hohenheim, which is now integrated into the Federal Research Centre, Karlsruhe. The food preparation in the household (Zacharias & Dürr, 1984) uses many food processing techniques, all of them are up-scaled in technological processes. Consumer use for preparing meals at home also technical equipments and tools, such

processes are comparable principally with technological processes (Fig. 2), but there are substantial differences which should be acknowledged. The private household cannot specialise the need tasks; even in cooking there is expected to prepare different dishes at different meals. In professional food processing there is specialisation and standardisation.

In the past many private households kept small animals and there were home gardens (Andritzky, 1992). Today home production is disappeared almost. Knowledge on every single step in food processes (like those in Fig. 2) are accumulated globally to an enormous amount. Industrial up-scaling is well organised. The food quality of prepared dishes can be excellent; limits are not technologically ones, but economic constraints; in competition on a saturated market situation; price will beat quality in many cases, especially if consumer cannot recognise good quality. The sensoric quality of industrial-processes food can be as well excellent; but it is standardised. In comparisons on different aspects of cooking meals (Table 2), outsourcing from household is beneficial, it leads to lower costs, safes resources and time. On the other hand it lead to a loss of competence, creativity and eating culture.

A good description on the current consumers competence to handle food cannot be given, since there is a virtual lack of relevant socio-empirical studies, which is indicating the weak position of everyday research. The available studies and other indicators, e.g. increasing trend to buy convenience foods, point in the same direction. The expertise and competence of people who deal with food is becoming more narrowed. This applies to all sectors of live management. A survey on basic knowledge in household management in Saxonian population indicated big gaps (Steinel & Skaletzki, 2001), people with deficiencies in these areas are more likely for risky life situations.

Table 2
Comparisons on different aspects of cooking meals

	Do it yourself	Outsourcing
Procurement of foods	Higher costs	Lower costs (economy of scale)
Resources/equipment, utensils	Higher costs	Lower costs
Time expenditure	High	Low
Knowledge/competence	High	Low
Management	High	Low
Trust/safety	High	Low
Objective quality	Low	High
Subjective qualitative— taste	High	Low
Adaptation to individual requirement	High, individual preparation	Low, standardised to average
Communication	High	Low
Training of senses	High	Low
Creativity	High	Low
Eat art/culture	High	Low

Still the majority of food is eaten at home (85% of all meals); but there is an increasing tendency to use convenience foods and prepared meals. Preparing a fresh dish is decreasing. This is true all over Europe, as well in the famous Mediterranean regions (Rumm-Kreuter, 2001). In all European countries the set dietary goals are not reached; even amongst the children and adolescents there is an increase in risky lifestyles (British Nutrition Foundation, 2000; Hurrelmann, 2000).

The expertise to cook, to prepare a fresh meal from foods, is decreasing (Berg, 1997; Iglo-Forum, 1995). In the study of our institute presented as a poster in this symposium; it is indicated one third of the consumer have insufficient competence on appropriate storage of food (Pfau & Piekarski, 2001). Obviously the trend is accelerating; many children cannot deal with foods; they have beside eating, no practical real relationship to it. Everyday life cannot be learned virtually. The traditional learning processes are weakened; this relates to the informal way of transfer the experiences from the older to the younger generation, e.g. by living and working together in the private households. Today many young parents have low interest and competence on preparing food and many people live alone. There are aims and obligations of the society to educate children to become responsible citizens, who can manage their own life. The competence for everyday activities have to be part of education (DGH, 2001). Current studies show in German kindergarten and elementary schools training for food and nutrition competence is a diminishing element. (DGE, 2001; Hesecker, 2001; Hesecker, Schneider, & Beer, 2001).

But not only in private households, even in nutritional crafts (e.g. bakers and butchers) and catering services (cooks) there is decreasing competence to prepare foods and meals. It is convenient and economically advantageous to use prepared components. There are some movements of concerned professionals against this trend to “handicraft without hands”, like those of Eurotoques and Slowfood.

4. Conclusions

The described information showed the reciprocal trend that science produces more knowledge on food (processing) and nutrition; and there is less application and competence amongst the consumer and in the society.

What are the consequences? Looking strictly physiologically on human beings; the possible development could be regarded as positive. The nutritional needs can be determined individually by using nutrigenomic tools; for the customer's needs special foods and dishes are designed by the support of update information technology. Human life is controlled and supported by

external control. Such individual food prosumer-systems will be developed.

The current experiences on efforts to solve existing problems of the society only by economical and technological tools, indicate the insufficiencies. The rule of the economy of scale lead to concentration in all life sectors. In all aspects of life within the only apparent variety there is a trend to uniformity; e.g. in media, culture and also in food and eating culture. The problems of hunger, injustice and terrorism cannot be solved only by technological solutions. We have to observe the processes in our society; there is an obligation for it. It is a human right to have access to health service and good nutrition (Brom, 2000; FAO, 2001b). Since the potential is there, knowledge has to be applied also “down-scaled”. It is not only a cultural loss when we loose gastronomy and have food analphabets in the society. The French anthropologists Claude Fishler coined the word “Gastro-Anomie”; anomie is the lack of trust in the own’s behaviour. People with low competence are susceptible to disorientation, misguided behaviour and loosed chances in life. In other words if we want to reach the dietary goals the socio-cultural aspects have to be recognised in food and nutrition policy, in thus in food and nutrition research. The everyday situation of consumers have to be studied more intensively; indicators are needed for follow-up the developments toward dietary goals. There are needs for longitudinal surveys in Europe on food competence of the general population, but also on food professionals and multiplicators (e.g. teachers and politicians). The scientific knowledge on food processes and food handling has to be down-scaled to everyday situations of different consumer groups. Science and technology have important roles; the food have to be designed for consumer needs; the equipment in household have to be designed for consumer needs. This can only be done in interdisciplinary research; food technologist and food engineers have to communicate with the target group—the consumers. A prerequisite for communication is mutual understanding; social sciences support the communication processes. The distance between producer and consumer have to be shorter; in reality (e.g. distribution design) and virtually (e.g. communication, information design). The technological offers have to be applied in the reality of consumers (e.g. usability design; practicability design). Food competence has to be learned and trained with different methods. There is not only theory (using the “head”), but also practise (using “hands”; *german* “begreifen”) and even emotions (using the “heart”) in such training courses.

The challenge to reach dietary goals and to solve and prevent current nutritional problems is a challenge of the capability of the society to tear down barriers, in case of food and nutrition research bridges are needed for real interdisciplinary research on the consumers needs.

References

- Andritzky, M. (1992). *Oikos. Von der Feuerstelle zur Mikrowelle. Haushalt und Wohnen im Wandel*. Giessen: Anabas Verlag.
- Berg, I. (1997). Kochalltag in Deutschland. *Ernährungslehre und praxis*, 10, B37–B39.
- British Nutrition Foundation. (2000). *Report on the diets and nutritional status of young people (4–18 years)*. British Nutrition Foundation. Available: <http://www.nutrition.org.uk/News/pressinformation/nutyouth.htm>.
- Brom, F. W. A. (2000). Agricultural and food ethics from consumers concerns to professional ethics. *Italian Journal of Food Science*, 12(4), 395–401.
- Daniel, H. (2000). Ernährungswissenschaft in Lehre und Forschung: Standortbestimmung und Entwicklungsperspektiven. *Ernährungs-Umschau*, 47(7), 256–260.
- Daniel, H. (2001). *Personal communication*. Internet-URL: <http://www.nutrition.tum.de/insci/phys/millennium/sld010.htm>; <http://www.nutrition.tum.de/insci/phys/ppt/dge.ppt>; <http://www.nutrition.tum.de/insci/phys/de/Angst%20und%20Hoffnung.pps>; <http://www.nutrition.tum.de/insci/phys/ppt/innovativ.ppt>.
- DGE. (2001). *The nutrition report 2000*. Frankfurt/M: Deutsche Gesellschaft für Ernährung (DGE).
- DGH. (2001). *Memorandum für eine haushaltsbezogene Bildung: frühzeitig—aufbauend—lebenslang. Wege zu einer zeitgemäßen und zukunftsorientierten Bildung*. Aachen: Deutsche Gesellschaft für Hauswirtschaft (DGH) (Fachausschuss Haushalt und Bildung). Available: <http://www.dghev.de>.
- FAO. (2001a). *Food balance sheets*. Food and Agricultural Organisation (FAO). Available: <http://www.fao.org>.
- FAO. (2001b). *Food as a human right—ethics in food and agriculture*. Food and Agricultural Organisation (FAO). Available: http://www.fao.org/Ethics/index_en.htm.
- Gardner, G., & Halweil, B. (2000). Escaping hunger, escaping excess. *World Watch Magazine*, July/August.
- Heseker, H. (2001). *Arbeitstagung der Deutschen Gesellschaft für Ernährung Ernährungsprobleme im Kindes- und Jugendalter*. Bonn: DGE. Available: <http://www.dge.de>.
- Heseker, H., Schneider, L., & Beer, S. (2001). *Ernährung in der Schule. Forschungsbericht für das Bundesministerium für Verbraucherschutz, Ernährung und Landwirtschaft (BMVEL)*. Bonn: BMVEL.
- Hoffmann, I., Koebnick, C., & Leitzmann, C. (2000). Gesundheitliche Vorteile und Risiken einer dauerhaften Rohkost-Ernährung. *Zeitschrift für Ernährungsökologie*, 1(2), 141–146.
- Hurrelmann, K. (2000). *Health behaviour in school aged children (HBSC-Studie)*. Bielefeld: Fakultät für Gesundheitswissenschaften der Universität Bielefeld. Available: <http://www.uni-bielefeld.de/gesundhw/ag4/>, <http://www.ruhbc.ed.ac.uk/hbsc/download/hbsc.pdf>.
- IFIC. (2001). *Food insight—history of food development*. International Food Information Council Foundation (IFIC). Available: <http://www.ific.org/proactive/newsroom/release.vtml?id=18606>.
- Iglo-Forum. (1995). *Genussvoll essen, bewusst ernähren—Gemeinsamkeiten am deutschen Tisch*. Hamburg: Iglo-Forum.
- Kiple, K. F., & Ornelas, K. C. (2000). *The Cambridge world history of food*. Cambridge: Cambridge University Press.
- Kunkel, G. (1984). *Plants for human consumption*. Koenigstein/Taunus: Koeltz Scientific Books.
- Makowski, H., & Buderath, B. (1983). *Die Natur dem Menschen Untertan. Ökologie im Spiegel der Landschaftsmalerei*. München: Kindler.
- Nowotny, H. (1997). Transdisziplinäre Wissensproduktion—Eine Antwort auf die Wissensexplosion? In F. Stadler (Ed.), *Wissenschaft als Kultur. Österreichs Beitrag zur Moderne* (pp. 177–195). Wien/New York: Springer. Available: http://www.wiss.ethz.ch/publikationen.htm#nowotny_pdf.

- Pfau, C., & Piekarski, J. (2001). Consumers' competence in handling food. *Journal of Food Engineering* (Poster Contribution P4.3).
- Rumm-Kreuter, D. (2001). Comparison of the eating and cooking habits of Northern Europe and the Mediterranean countries in the past, present and future. *International Journal on Vitamin and Nutrition Research*, 71(3), 141–148.
- Steinel, M., & Skaletzki, C. (2001). Hauswirtschaftliches Wissen in der Bevölkerung im Freistaat Sachsen. *Hauswirtschaft und Wissenschaft*, 49(2), 71–76.
- UNESCO. (2001). *Communication and information in the knowledge society*. UNESCO. Available: <http://www.unesco.org/webworld/index.shtml>.
- White House. (2000). *Health 2010, national nutrition summit 30.+31. May 2000*. Washington: White House. Available: <http://www.health.gov/healthypeople/Document/tableofcontents.htm>.
- WHO. (2000). *First food and nutrition action plan for Europe 2000–2005*. Copenhagen: WHO-Europe. Available: <http://www.who.dk/nutrition/policy.htm>.
- Willett, W. (1998). Is dietary fat a major determinant of body fat? *American Journal of clinical Nutrition*, 67(Suppl), 556S–562S.
- Zacharias, R., & Dürr, H. (1984). *Lebensmittelverarbeitung im Haushalt*. Stuttgart: Ulmer-Verlag.