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Editorial

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Importance of Field Research

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It has now been over 10 years that I started my journey as a researcher in Bangladesh. Coming from a Medical and a Public health background, I thought I was prepared for how research should work. Ten years later, I admit that my academic knowledge would have remained sorely limited had I not been a part of this exciting journey of field research. Through my exposure in the field – I realised how much one fails to absorb, see and understand if they are not close to the field. I would like to share what I learned with you in this editorial.

Frequently researchers like to get others to collect data and work with these inanimate numbers to come up with theories and prove hypotheses. What we fail to comprehend is that each faceless number represents one human being who has given the time to respond to our questions with some hope that his response may provide an answer to their suffering. Giving these numbers a human face instils the true meaning of being a researcher.

There is great enthusiasm for community participation among scientist and policy makers with regard to action research. How often do we consider what participation actually means to those for whom we conduct our research? Do we actually value their opinion enough to create an enabling environment for them to voice their opinion in a manner that enables actual participation? I bring up the topic of community mobilization because this is one area of research where one needs to understand ones participants and let them guide the research agenda to a certain extent. I began to work in this area about three years back. Through my work I observed that community knowledge, while ill-defined, gave insights into complex areas of societal hierarchy that would be impossible to appreciate through the eyes of an external observer.

Another example I would like to cite is the Public Health students that we take to the field for conducting research who come to Bangladesh from a wide range of countries across the world. Their first exposure of working in the field amidst language difficulties is one of curiosity and amazement. I relish the expressions on their face as they go through the stages of realization of what their research questions actually mean to the lives of their respondents. I then see them working not to find an answer for that one research question which they thought up by toiling many hours over literature but working for those people who shared with them their problems, their thoughts and their sufferings.

In conclusion, I may have spoken little about the importance of Meta-analysis and review papers; but my aim was to suggest the importance of field exposure in research and not to suggest that one is necessarily better than the other. There may well be differences of opinion, but I strongly believe that my research agendas are many a times shaped by what I observe and see in the field.

Editorial

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The Importance of Open Access Journals in the Area of Public Health

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According to the World Health Organisation (WHO), “public health refers to all organized measures – whether public or private – to prevent disease, promote health, and prolong life among the population as a whole”. Thus, public health should be perceived as a system with three main functions: 1) assessment and monitoring of the communities’ health and populations at risk, 2) formulation of public policies designed to solve identified local and national health problems, 3) assuring that all populations have access to appropriate and cost-effective care, including health promotion and disease prevention services. Some examples of public health campaigns include: vaccination and control of infectious diseases, safety workplaces, safe and healthy food, safe drinking water, access to family planning, recognition of tobacco use as a health hazard. As a result of globalization, factors affecting public health in one country may come from outside state boundaries. Thus, special measures and attention are required to manage cross-border health risks, such as dangerous products.¹ Access to research on various aspects of public health is a key to successful implementation of public health policies and measures.

On the ISI Web of Knowledge (presently Thomson Reuters Web of Science) there are 23 journals with keyword “public health” in the title; among them, the highest 5-year Impact Factor is 7.365. The editors often recommend narrowing the research subject, linking in the titles public health with disaster medicine, environmental research, veterinary medicine, policy, dentistry, management and practice, ethics, nutrition, nursing, genomics, social work, tropical medicine. It reflects a broad spectrum of research aspects concerning public health problems. Some titles indicate focus on a selected region, e.g. “American”, “Asia-Pacific”, “Canadian”, “Central-European”, “Iranian”, “Scandinavian”, “Australian”, “New Zealand”, while some other are widened to “Pan-American” or even “global” scope. It shows that public health problems may have both local/specific and global/universal characters.

Now-a-days, most of the scientific work is disseminated in peer-reviewed journals. There are over 2.5 million papers published each year in 24,000 peer-reviewed journals. However, access to this research is closed to a large number of potential readers who cannot afford download payment. For example, a typical, single research paper costs about \$30 to \$50 to read, one journal issue - \$100-\$400, while the subscription costs may reach hundreds of dollars. Open access guarantees free and unrestricted online availability. The refereed journal articles are deposited in open online archives, and new journals do not invoke copyright to restrict access to the published material.² According to Francis and Taylor survey (conducted around the world amongst over 14 thousand authors of 2011 *via* email), the major advantages of open access include: wider circulation (38% strongly agreed, 33% agreed), faster publication times (23% strongly agreed, 38% agreed) and higher visibility than publication in a subscription journal (27% strongly agreed, 28% agreed).³

The importance of open access scientific journals in the area of public health has been recognized by many sources, as it can bring substantial benefits not only to academics, but also to the society and patients. There are several, real-life examples illustrating the need for open access to knowledge on public health and medicine. One story was reported by the President of Global Strategies for HIV, Arthur Amman, who met a physician from southern Africa, engaged in perinatal HIV prevention. He only had free access to abstracts of the research papers. Based

solely on the abstracts' conclusions, he altered the HIV prevention program in a way it was not so effective. The full text articles revealed incomplete data, small group and no applicability to this country situation.⁴ Similar example was described by Yamey, who had met a professor of pediatrics during his trip to Africa.⁴ The professor was asked by the WHO to investigate a mysterious "nodding disease" in Sudan. Before starting his investigation, he wanted to read all the research published on this disease. However, when he went online for the crucial papers, he was unable to read them because of high download costs.⁵

At present, there are over many open access journals available, but 10% of them are in the area of biology and medicine,² which also includes public health. The new journal – Public Health – Open Journal by Openventio, aims to cover a variety of issues pertaining to public health systems around the world, such as risk, epidemics, education plans, monitoring and analyses, health programs, communication, outbreaks and subsequent containment. It will be available not only to scientists and academics, but also to practitioners – health professionals, students and even to patients and other lay people, whoever will be interested in latest knowledge and reliable information on public health.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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Short Communication

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Micropropagation Live Pharmacy for Chronic Non-Communicable Diseases Program: The Construction of a New Model Organic Food Production and Medical Plants in Urban Farms

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ABSTRACT

The Micropropagation live Pharmacy for Chronic Non-communicable Diseases (CND) Program (PFVMDCNT) arises as a new strategy to promote CNDs treatment by building green and healthy environments in order to improve public health through prevention by healthy diet and rational use of medicinal plants. Based on these assumptions, this article aims to reflect on the PFVMDCNT potential and contradictions in the changing process of the current agricultural production model of conventional living pharmacies for the micropropagation model here proposed. This study involves a descriptive-reflexive methodology, presenting two literature based themes: the origins of Brazil's living pharmacy programs historical review and new trends such as urban farms and vertical gardens, with special attention to the PFVMDCNT.

KEYWORDS: Living pharmacy; Micropropagation; NCD; Urban farm; Public health.

INTRODUCTION

The Micropropagation live Pharmacy for Chronic Non-communicable Diseases (CND) Program (PFVMDCNT) emerged in 2015 at the Faculty of Pharmaceutical Sciences of University of São Paulo, Brazil as a new strategy for reorienting the agricultural production model in conventional living pharmacies. It is believed that the search for new models of obtaining food and medicinal plants derives from a socio-historical moment where the technicalities/mechanized model no longer meets the emergency of the modern world changes and hence to organic food needs and accessible medicinal plants to all social strata. The city of Fortaleza was one of the pioneers in the development of herbal medicine, actions in public health and served as a model, along with other experiences in the country, to the guidelines formulation for "medicinal plants and herbal medicine" in the National Integrative and Complementary Practices Policy.^{1,2} Currently, the great demographic concentration in cities responsible to the urban exodus, makes one search for new technologies to combine a healthy life with the coexistence amidst the pollution and reduced physical space of the big cities. Conventional living pharmacies require a huge physical space which leave is restricted only to people who have such spaces. This generates exclusion, making it impossible for everyone to have access to green and healthy environments. Such fact accentuates the disease process of human beings due to air pollution and poor diet. Then, the PFVMDCNT presents itself as a new way of sustainability and public health working, having the feasibility of the mini urban farms and urban orchards creation and popularization, through technology transfer to the population, thus having not only a urban garden matrix construction isolated within the university, but the idea of introducing a new vision in the health intervention process so that it is not expect the population to get ill and look for hospitals, once it acts preventively on it from a healthy diet model and use of medicinal plants, improved air quality, and visual beauty of nature. Based on these considerations, this study aims to reflect on PFVMDCNT potential in the process of model

changing from conventional living pharmacies for the micropropagation model. To this end, we opted for reflective descriptive methodology, based on relevant literature on the subject, in order to contribute to a reflection of the transformations occurred in the conventional agricultural model and the emergence of new agriculture biotechnology techniques, particularly the PFVMD-CNT, that utilizes the micropropagation as a planting technique, with space reduction, greater results reproducibility and greater amount of organic foods and medicinal plants.

MICROPROPAGATION

Asexual reproduction is used to obtain a large number of seedlings from a single plant. Depending on the case, bulbs (onions), corms (gladiolus), rhizomes (ferns), tubers (English potatoes), stems (banana), roots (sweet potato, apple, blackberry), leaves (begonia, sword-of-saint-jorge), cuttings (vines) etc. can be utilized.³ The plants obtained by vegetative or asexual propagation are identical to the parent plant and identical to each other. In other words, they are clones. It is called totipotency the cell ability to generate replicas of the organism from which it derives. Restricted in animals, this characteristic property allows plants to survive in unfavorable environmental conditions or after herbivores, pests and pathogens attack.³ The *in vitro* culture or micropropagation begins with the extraction of small tissue fragments removed from various parts of the plant, such as leaves, roots, nodes and the axillary buds, floral and apical buds. Once cleaned and disinfected, the explants are aseptically transferred to a suitable culture medium. Periodic subcultures of these explants permit material amplification, and later, their differentiation in order to generate whole plants.³ As the *in vitro* culture can be developed initially in reduced space and regardless of climatic factors and seasons, it is possible to produce satisfactory amounts of food and medicinal plants all year. It is estimated that 10 m² shelves are sufficient for 20,000 seedlings growing (Malajovich, GUIA80). Therefore, the number of individuals produced by *in vitro* culture is much higher than the number of individuals that could be obtained by the traditional multiplying method. An eucalyptus gem cultivation can give 75 trillion seedlings a year instead of 100 or 200 which are normally obtained by cutting. These results are of great interest for the paper, pulp and wood industries.³ *In vitro* culture enables pathogen free plants from meristematic tissues production and distribution, which are not infected by viruses. An example is the virus-free potato tubers production for inclusion in potato-seed certification programs. It also allows the production of synthetic seeds, which consists of a embryoid formed from a mass of tissue obtained *in vitro*, wrapped in a nutrient gelatinous substance and covered by a biodegradable plastic.³ The set constitutes of an artificial seed which develops normally when planted in soil. Launched from aircraft, these seeds facilitate reforestation in difficult access degraded areas. Vegetables *in vitro* culture techniques were quickly assimilated by companies and research and development institutions, once they facilitate the commercial varieties genetic improvement and also they represent an indispensable step in obtaining a transgenic plant. Being techniques of public domain, relatively simple and inexpensi-

ve, many companies use them, worldwide, to ensure the genetic and phytosanitary quality of marketed seeds and seedlings. This technology is widespread in Latin America, where it is the second most traded commodity in agricultural biotechnology, with wide dissemination in oleiculture, in hortifruticulture, in floriculture and in ornamental plants propagation, as well as in industrial interest plants production (cane, coffee) and forest species seedlings for the paper industry.³

MICROPROPAGATION LIVE PHARMACY FOR CNDs PROGRAM

The study of new techniques to associate large cities development to sustainability is increasingly necessary. It must be take into account the respect for the environment and preservation of natural resources. The current issue is how to get quality organic food and medicinal plants having as limiting factors, the cities high degree of urbanization and reduced physical space. Inside the micropropagation living pharmacy for Chronic Non-communicable Diseases (CNDs) program are developed several research projects, each of which facing one CND affecting the population. All projects have in common the waste management, energy recovery through organic waste reuse, fruits and vegetables, and use of rainwater in drip irrigation system, and some projects also have the phytoremediation of soils and waters in its scope (Figure 1).

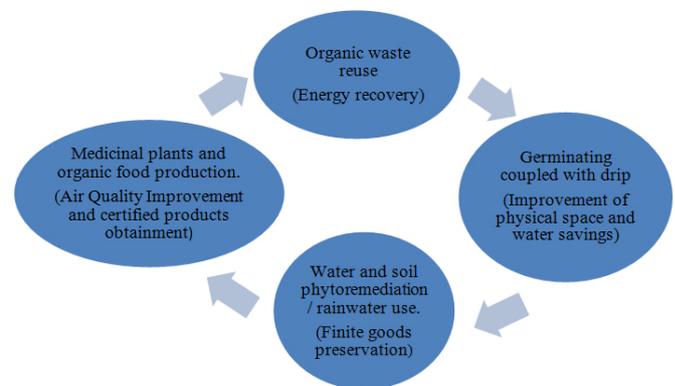


Figure 1: Production cycle.

The difference of the living pharmacy production system for CND is the seeding technique called micropropagation, which takes place *via* direct organogenesis, this being the wider applicability of the tissue culture technique and is routinely used to multiply large quantities of selected genotypes uniform plants retaining the genetic fidelity.⁴ The *in vitro* plants stock allows a continuous flow of production at all seasons of the year, and allows the production of seedlings from organs already developed what is, in general, not achieved in natural field conditions. Thanks to this technique it is possible to obtain large amounts of medicinal plants, fruits and vegetables ensuring the medicinal plants and organic food origin certification. This technique can be applied to large-scale medicinal plants production for herbal medicines production to supply the Unified Health System (SUS) in the primary care for chronic diseases program. The SUS is public health system in Brazil. It ensures comprehensive, universal and equal access to the Brazilian population, from simple outpa-

tient care to organ transplants. Regarding food production it will be possible to produce micro- and macroscale, both industries may employ the organic producing technique, as well as individuals or families, with maximum energy expenditure and physical space saving. The micropropagation success depends on the better understanding of the knowledge of the plant cells nutritional requirements specific for each plant species.⁴ Therefore, cultivate a living pharmacy by micropropagation ensures the obtained plants reproducibility and traceability, making it possible through micropropagation obtain organic food and medicinal plants larger amounts all year. Apart from intervene positively in the public health, PFVMDCNT contributes to the environment and environmental education, through organic waste management, and technology transfer to population (Figure 2).

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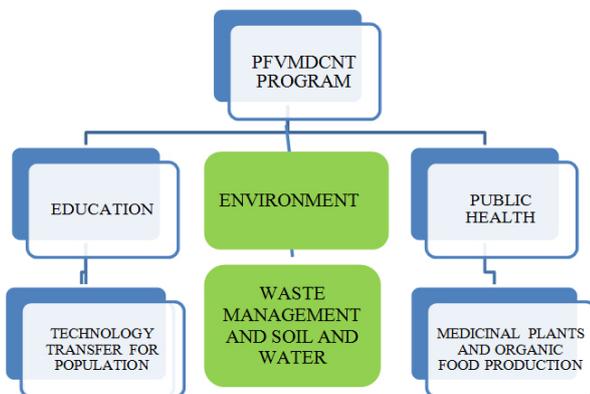


Figure 2: Chart of PFVMDCNT program.

FINAL CONSIDERATIONS

The light of the review presented here it is possible to understand that the PFVMDCNT brings a new strategy for the Chronic Non-communicable Diseases prevention and treatment. Cultivate a living pharmacy by micropropagation ensures reproducibility and traceability of the plants obtained, making it possible to obtain larger amounts of organic food and medicinal plants all year, thus being most auspicious compared to the conventional model. In addition to intervene positively in the public health, PFVMDCNT contributes to the environment and environmental education, through organic waste management, and technology transfer to population.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest in relation to this article.

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Research

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Is a Total Ban on Business and Consumption of Bushmeat a Sustainable End Game for Ebola Outbreak in West Africa: But Why Now?

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ABSTRACT

Background: Bushmeat has for time immemorial been a staple food and source of dietary protein for indigenous people around the world. Products from wildlife have enormous economic and medicinal value and native people use animal artefacts for personal adornment and as hunting trophies. Recently, wild fruit bats have been implicated in the human index cases of the deadly Ebola disease outbreaks. People became infected after getting in contact with secretions and meat from infected fruit bats.

Objective: To document the perception of the community on sustainability of total ban on bushmeat in West Africa in order to stop the 2014 Ebola outbreak.

Methods: Ethnographic data collection methods consisted of observation of practices associated to risk of Ebola infection and prevention. For example, we carried out observation of bushmeat markets with a focus on meat processing involving contact with blood and fluids from animals. Qualitative data collected was based on focus group discussions.

Results: One hundred and fifty persons participated in the study. Banning business and consuming of bushmeat was seen by the community as designed to serve ulterior motives by government. The community expected more emphasis to be attached to efforts at breaking the chain of human-to-human transmission. People who did not consume bushmeat thought they were protected from catching the disease thus giving them false security.

Conclusion: Communities considered the ban on business in bushmeat to be temporary. Emphasis should be put on social mobilization and communication focusing on human-to-human transmission. There is need for additional anthropological research to determine the sustainability of the ban after the Ebola outbreak is over and adoption of measures to prevent the future transmission of the disease from animals to humans.

KEYWORDS: Ebola, Bushmeat, Animals.

INTRODUCTION

Meat derived from wildlife has very significant traditional, economic, medicinal and cultural values to the indigenous people in diverse geo-ecological environments especially in tropical African rain forest terrains.¹ The commercial value of bushmeat is being felt everywhere. Bushmeat has a very sentimental and closely guarded social meaning as it is the most appreciated gift rural travelers and visitors offer relatives.²

Some of the wild animals often eaten in West Africa are monkeys, baboons, deer, rats,

bats, ground pigs, antelopes, squirrels, gorillas and chimpanzees.³ These animals are considered to have medicinal value and others such as baboons and chimpanzees are believed to transfer their strength and qualities to the humans who eat meat from them.⁴ The commercialization of traditional wildlife hunting has evolved largely due to rural urban migration, population growth and general economic transformation.⁵

The rate of wild animal hunting especially of large vertebrates is unsustainable. The recent public outcry in Zimbabwe and America over the killing of the famous lion, Cecil for hunting trophies is living testimony of the value put on wild animal and bushmeat artifacts.⁶ The large-scale wanton harvesting of wildlife has resulted in some species being endangered and leading to extinction of others.⁶

The Ebola disease outbreak in West Africa has been the largest in the history of the disease since the first case in 1976.⁷ The index cases in the neighboring Mano river states of Guinea, Liberia and Sierra Leone have not been conclusively determined. Circumstantial evidence points to the source of the current outbreak to physical contact with secretions from wild fruit bats and not actual consumption of meat of the suspected reservoir or infected animal.⁸ The commonest mode of transmission of Ebola disease is through person to person contact.⁹ Social mobilization and communication has however focused on banning consumption of wild meat instead of breaking the chain of transmission from human-to-human.¹⁰

The first epicentres of the Ebola outbreak in Sierra Leone were in the Eastern Regional area districts of Kailahun and Kenema. These two districts are bordering Guinea and Liberia. The first two Ebola treatment centers were also established in these two districts. Kailahun district is predominantly inhabited by the Mende and the Kissi communities sharing borders with Guinea and Liberia.

METHODS

The study was conducted between June and August 2014. Different research sites, participant populations and methods for data collection and analysis were used. The ethnographic data collection methods consisted of observation of practices associated to risk of Ebola infection and prevention. For example, we carried out observation of bushmeat markets with a focus on meat processing involving human contact with blood and fluids from a diverse range of wild animals.

STUDY POPULATIONS

In the Kissi community, research was conducted in the chiefdoms of Kissi Kana, Kissi Teng and Kissi Tongi, with a more in-depth focus on the villages of Koindu and Foindu. The urban sites focused on were Kailahun city and the suburban communities living around the Ebola treatment center. In Kenema district, investigations followed the pattern of the pre-

dominantly urban trend of the Ebola outbreak. We focused on the most affected neighborhood, that of Nyandeyama, and on the town center.

For validity and exhaustiveness-related stakes, we have combined several data collection methods, including those of ethnography, qualitative interviews and in-depth case studies. We also carried out observation of the use of the devices of chlorinated water buckets in rural communities. In urban settings, we also carried out observation of the search for suspected cases as well as of collection and transportation of the dead.

Qualitative data collection was based on informal and in-depth interviews and focus-group discussions. In-depth ethnographic case study investigation was conducted in 2 settings; the village of Njala representing the rural area, and the neighborhood of Nyandeyama representing the urban settings. The case studies consisted of taking the first documented case and following all the cases related to it, with a special emphasis on chronology and social link identification.

Key informants and focus-group participants were selected from among the following populations with numbers in brackets:

- Paramount chiefs, the section and village chiefs, and the elderly male heads of households (7)
- Women traditional leaders: female senior household members, the mammy queens, the female senior members of initiation societies (10)
- The “ordinary” female household members; adult and young women (10)
- The “ordinary” male household members; adult and young men (8)
- Children of both sexes (11)
- Religion leaders; Muslim imams, Christian pastors, catholic priests (9)
- Members of modern women’s organizations, women’s church organizations, women’s NGOs and women’s formal and informal community networks (11)
- Motorbike drivers (15)
- Musicians (3)
- Herbalists and traditional healers (7)
- Blacksmiths and traditional hunters (6)
- Teachers (8)
- Market vendors (6)
- Restaurant and hotel employees, managers and waiters (10)
- Health workers (nurses, physicians and ambulance drivers and members of burial teams, health supervisors and counselors (10)
- Mob in street protest during the Kailahun street demonstration (9).

RESULTS

One hundred and fifty participants played a part in the study. Bushmeat had very significant social meaning as it was perceived to be the most appreciated gift rural travelers and visitors offered to their urban hosts. In locations where the research was conducted, the theme of bushmeat appeared most recurrent. According to medical authorities, the same bushmeat was recognized as the cause of the deadly disease. This interpretation justified the closure of bushmeat markets, as was the case in Kailahun. Unprecedented community resistance characterized by wanton widespread destruction of public property targeting health provision followed the pronouncement.

The researchers found a bushmeat market that was still operating in Kenema in spite of the total ban and also witnessed arrival of a large stock consignment of game intended for sale and consumption in the town of Daru. Observations carried out in Kenema as in Daru clearly showed that women were exposed to blood and other fluids from wild animals while processing bushmeat. Some of the animals from which the bushmeat was harvested included chimpanzees, monkeys, antelopes and wild fruit bats.

These investigations revealed that very often there was no distinction made between contact with fluids from wild animals while processing and eating bushmeat, even cooked. This made it difficult to articulate the cause and effect relationships that would guide targeted intervention.

There were certain details and clarifications to be shared with community members especially their opinion leaders on the biological reasoning that led to incriminating contact with wild animals' fluids and spread of the infection. One participant had this to glorify the use of bushmeat "Bushmeat or wild animals are more pure than domestic animals, because God is the one who is taking care of them. Bushmeat is sweet. It has more taste than domestic animal's meat and is less expensive".

DISCUSSION

A total ban on consumption of all bushmeat was put in place in Sierra Leone especially in the initial epicentres of Kailahun and Kenema as means to break the chain of transmission of the disease. The communities studied questioned the justification and timing of total ban of bushmeat and consumption of bushmeat which have been the foundation of their livelihoods. The major transmission routes of the disease are through human-to-human through body secretions and especially through handling the dead during burials. Prevention messages emphasized wild animals as being the major cause instead of a more detailed explanation of how contact with fluids and blood may have led to catching the disease; such an explanation would certainly have led to a broader understanding and to prevention measures being taken by the people themselves.

The open-ended banning of the ubiquitous business in

bushmeat without engagement of the community leaders about the inevitable change in the prevailing traditional and cultural practices was bound to be faced with community resistance which could have manifested in a variety of ways. In this case resistance was profound with wanton destruction of property.

In reality, this ban was a risky approach that was applied instead of giving all the necessary information to the communities and to trust their ability to agree on safeguards. May be at this level, feasibility of a package of measures that would have been acceptable from a biomedical point of view could have been looked at, as it would have relied on rules of hygiene, the use of gloves and other protection and education means to avoid contact with fluids and blood from those animals in question.¹¹

The very existence and survival of rural lineage and family is being threatened for posterity through the open-ended implementation of the ban.² In other words, reflection on the issue of bushmeat gift abandonment could be a pretext to talk about the Ebola virus and renew the concept of family continuity between city and rural backgrounds.¹²

In any case, it seemed urgent to bring together vendors of bushmeat (in Kenema, most of them were women) and the women who took care of its processing in the households, to adopt the most appropriate range of prevention measures. In Kailahun, an almost general opinion was that the public expected a return of mass consumption of bushmeat as soon as the Ebola outbreak was over. The return of the outbreak, due to the renewal of the risk of animal to human transmission, did not seem to be envisioned. This theme should definitely be the subject of songs and other awareness making tools likely to renew attitudes of vigilance needed to fight against the epidemic's return, if it proved possible to currently get it under control.

Moreover, communication about bushmeat often proved to be misleading. Little importance was attached to human-to-human transmission on this occasion, so that those who did not consume bushmeat might have felt less at risk of catching the disease even if exposed to symptomatic Ebola infected patients. In some cases those who consumed bushmeat were stigmatized against whereas the main mode of transmission was definitely the one between humans. It would surely have been wise to distinguish in the prevention messages the two modes of transmission chronologically and in terms of their magnitude.

Finally, sensitization taking into account the above-mentioned precautions, though it must have emphasized transmission from animals to humans, should certainly also have addressed the issue of the ecological dangers of human pressure on the natural environment. Here, the traditional concepts of sacred forest and sacred wild animals could have been incorporated, to emphasize the need to reduce human pressure on wild life.^{13,14}

In Kailahun, the story went that the Ebola outbreak was preceded by the death of a famous ape killed by a hunter. Here, it was not only the contact with wild animal's meat, blood or fluids

that posed problem. It was the very act of killing them that posed a danger to humans. Outreach workers should organize meetings to initiate a dynamic of community consultation and debates between women vendors and women involved in bushmeat processing.

Anthropological research should be conducted to study possibilities of relapse, so that watch can be kept on such possibilities through the adoption by communities of measures to prevent the Ebola virus transmission from animals to humans.

CONSENT

All participants consented to the assessment.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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Short Communication

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Teachers-Centred Distribution of Praziquantel to Control Schistosomiasis in Gezira State, Sudan

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ABSTRACT

Schistosomiasis is a major public health problem in Gezira State, Sudan. The state-wide prevalence survey among school children showed that the prevalence reached up to 82% in some districts and the reported mean intensity reached up to 223 eggs/gm of stool for *S. mansoni* and 28 eggs/10 ml of urine for *S. haematobium*. Based on this, a plan was established to control schistosomiasis. A teacher-centered distribution of praziquantel was organized in 22 districts targeting school pupils only. This short communication describes the intervention, the coverage and lessons learnt. With negligible cost and minimal efforts the target coverage of school pupils with praziquantel was reached by teachers in a demonstrable short time. In the successive two rounds the coverage exceeded 90% of the target school enrolled children. This approach can be extended to target all school and preschool children plus children not attending school in the state, as they represent a very important reservoir for schistosomiasis and soil transmitted helminthes.

KEYWORDS: Schistosomiasis; Praziquantel; Teacher-centred; schistosomiasis control; Sudan.

BACKGROUND

Schistosomiasis is one of the neglected tropical diseases that constitute a major public health problem in many developing countries.¹ The first reported cases in Sudan dated back to 1920s with an increasing incidence over time.^{2,3} Recent surveys (unpublished data) showed that the disease is prevalent all over the country with varying intensity. Both *S. mansoni* and *S. haematobium* are present. The disease reflected itself at hospital level as cases of periportal fibrosis, oesophageal varices and ascites and a significant death rate.⁴

As part of the schistosomiasis control programme activities, a survey was conducted according to WHO guidelines¹ in Gezira State in November 2011 to map the disease prevalence. With exception of only 5 districts, the 37 remaining districts in the state reported either *S. mansoni* or *S. haematobium* or both. The overall prevalence reached up to 82% in some districts and the reported mean intensity reached up to 223 eggs/gm of stool for *S. mansoni* and 28 eggs/10 ml of urine for *S. haematobium*.⁵ Based on this a plan was established to control schistosomiasis. The grave situation was attributed to canals providing excellent habitats for snails, a lack of safe water supply and latrines in some areas, poor socioeconomic status of residents in the irrigated areas and interrupted control interventions.

LOCAL SETTING

Gezira state, located in central Sudan, is one of the 18 states in the country with an area of 26,075 square kilometer and a population of around 4 million. The state is divided into 8 localities that are further divided into 40 districts. People in the state are living in 2884 residential areas (villages, towns, cities and others). Those who are coming to the state as seasonal workers are living in unregistered villages (locally known as Kambo) near to villages and they are sharing health, education and other services with village communities. The main economic activities in the state are agriculture and animal breeding. There are 3 large agriculture schemes: ElGezira and ElManagil, ElRahad, and ElGineed. More small schemes are also there. In the state, there are over 2000 basic schools accommodating around one million pupils.

HISTORICAL PERSPECTIVES

Sudan and Egypt were the first countries who have tried to control schistosomiasis in Africa.⁶ Historically there were many attempts to control schistosomiasis in Gezira State; the most famous and most recent is the Blue Nile Health Project (BNHP, 1979-1989). BNHP was supported by WHO, World Bank, USAID, Japan, Kuwait and government of Sudan, and their activities succeeded to reduce the prevalence of schistosomiasis from over 50% to 61% by 1989⁷ in covered areas. Following the ending of external support, control activities were continued depending on local resources but they were scattered, unsustainable and inefficient.⁸ The Ministry of Health, Gezira State (MOH) recently decided to again focus on the problem and has developed a programme integrating praziquantel treatment with other control measures where enough evidence exists of their effectiveness.⁹ In 2012 and 2013 the programme was supported by the National Ministry of Health and its partners. The main intervention was preventive chemotherapy (mass distribution of praziquantel) targeting school pupils all over the state in addition to the whole population of communities in 18 of the 40 districts. Other control interventions addressed through collaboration with concerned partners include snail control, working with water sector to avail safe water supply, increasing access to proper disposal of excreta (latrines), improving diagnosis and case management in all health centres and rural hospitals, and health education.

CURRENT APPROACH AND RESULTS ACHIEVED

In line with the World Health Assembly resolution no. 54.19 in 2001 that at least 75% of school-age children in high-burden regions should be treated regularly with praziquantel¹⁰ and bearing in mind the past experience of schistosomiasis control in Sudan and in Gezira State, the State Ministry of Health involved school teachers in distribution of praziquantel to school children. The programme was implemented jointly between the Ministry of Health and the Ministry of Education in 22 districts. From each school one teacher was nominated by the Ministry of

Education to carry out the assigned activities as a volunteer. All nominated teachers in a locality attended a one-day training held at the capital of the locality. Training covered all issues related to disease transmission, control, praziquantel dosage and possible side effects, what to do in case of adverse reaction, height measuring and dosage calculation and reporting. Staff from the schistosomiasis control programme at the Ministry of Health delivered the training sessions and provided the training materials. All costs (transport, meals and training material) were covered by the Ministry of Health. This ranged between \$10-12 USD given per teacher (per school). By the end of the training session, each teacher was provided with enough quantity of praziquantel tablets to cover all pupils in his/her school, forms for reporting to the MOH and written dosing guidelines. Agreement was reached with trained teachers to return directly to their schools and distribute, within 2-3 days, praziquantel to the target pupils and immediately send back reports. The Ministry of Education office at each locality collected the reports and sent them to the Ministry of Health. So by the end of the week all reports reached the Ministry of Health.

School-based schistosomiasis control programme is not a new approach and has been successfully implemented in many countries.¹¹⁻¹³ However, depending solely on trained school teachers for leading a school-based distribution of praziquantel and reporting back to health authorities under the supervision of Ministry of Education is an approach that this article is intended to highlight.

A very satisfactory achievement was reported in two successive rounds. In 2012 a total of 1306 teachers (one for each school) were trained and provided with praziquantel and they covered 316,539 pupils (representing 93% of the target). In 2013, the target of schools was revised and a total of 875 teachers were trained and provided with praziquantel. They covered 295,323 pupils (90%). The trained teacher in each assigned school has sent a verbal message to the parents through the pupils about the campaign and its timings. They moved from class to class, assisted by other teachers, thus covering all pupils. A team composed of health and education staff from state and locality visited a random sample of schools to acknowledge the teachers and to support their efforts. Reported side effects of the drug in both years were negligible and were mostly mild abdominal discomfort.

In Gezira State coverage with health facilities is adequate but health personnel are limited in type and number, so it is difficult for health workers to work outside their health facilities. In fact, the BNHP experience showed that the cost of involving health workers is very high. For that reason the Ministry of Health considered involving teachers in the distribution of praziquantel to school children. The other reason is that schools are widely distributed and teachers have strong links with the community and they are accepted by parents and children as proved in Ghana and Tanzania.¹⁴ This may explain the above mentioned high coverage rate. However, lack of teachers sup-

port (with other factors) lead to very low uptake in Uganda.¹⁵ So training and careful selection of teachers is needed. In this experience the health workers welcomed the involvement of teachers and agreed to provide support to them when they asked for help. In Nigeria, while the community accepted teachers as drug distributors, the health staff and officials at the Ministry of Health and the Ministry of Education were willing to involve teachers as organizer for the campaign not as drug distributors.¹⁶

LESSONS LEARNT

Sustainable control of neglected tropical diseases requires long-term political and institutional commitment and as well integration into primary health care system.¹⁷ Depending mostly on external support may be followed by a disastrous situation after completion of the funding period if the available local resources are not adequate as in the case after termination of the BNHP.^{7,8} As praziquantel will be available free of charge for several years from the Merck company, the Ministry of Health felt the need for an appropriate channel of distribution particularly for school and preschool children and hence this approach was initiated.

Teachers-centred distribution of praziquantel to school children will certainly contribute to the sustainability and success of the schistosomiasis control programme, as schools and teachers are public health resources that are widely spread and deeply rooted in the communities. The two rounds of experience demonstrated that the target can be reached and covered in a very short time with negligible cost. The Ministry of Health has therefore decided to expand the programme to cover all school children in the state. So, during 2014 plans are set to cover one million school children in about 2000 basic schools in only one week.

The experience of African Programme of Onchocerciasis Control (APOC) based on community-directed interventions, proved that success can be achieved and sustained provided that the suitable and appropriate mode of delivery was used.¹⁸ The community drugs distributors in APOC experience were volunteers and the activities more or less concentrated in rural areas.¹⁹ In the Sudan approach, teachers covered both rural and urban settings, in fact the majority of pupils are in urban schools.

The high uptake of praziquantel by pupils, the experience of two years implementation without reported severe side effect or bad experience combined with acceptance of parents, showed that this strategy can be extended to cover the preschool children also involving their teachers. Such an approach can open the door to include soil transmitted helminthes as preschool pupils are the primary target for de-worming,²⁰ especially since antihelminthics currently in use for preventive chemotherapy are also donated and have negligible side effects.

The key element in the success of this experience is the strong collaboration between the Ministry of Health and the Ministry of Education and this was considered essential for de-

worming programmes.²⁰ In fact the distribution of praziquantel described in this article is only a new area of collaboration between the two ministries. The two ministries have collaborated in a school health programme which conducts medical screening for all the newly admitted pupils (around 100,000 pupils) every year for the last 4 years.

CONCLUSIONS

Teachers-centred approach to provide praziquantel to school children as part of schistosomiasis control programme is a rapid, efficient and effective approach. The high uptake by pupils and the acceptance of parents to the idea paves the road to include preschool settings and use the same approach in addressing more health problems, particularly soil transmitted helminthes. However, the well established collaboration between education and health authorities is the key factor in the success. For the next 5 years we intend to make use of the Merck donation of praziquantel and head towards elimination of schistosomiasis.

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Case Report

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Prader-Willi Syndrome: A Case Report

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ABSTRACT

Prader-Willi Syndrome (PWS) is a rare multi-systemic genetic disorder, in which 7 or some subset of genes on chromosome 15 are unexpressed or deleted on the paternal chromosome, resulting from failed expression of paternally inherited genes on chromosome 15q11-13. The majority of individuals with PWS (70%) have a paternally derived deletion of 15q11-13, Twenty-five percent have maternal disomy of chromosome 15 (an absence of the normally active paternally inherited genes on the long arm of chromosome 15) and 2-5% have imprinting defects (certain genes or groups of genes are expressed differently depending on the gender of the parent from which they were inherited).

The main objective of this report is to further characterize the dental problems along with some of the general features of this syndrome and to emphasize the need of early involvement of dental practitioners for the overall management of these patients.

KEYWORDS: Prader-Willi syndrome; Multisystemic genetic disorder; Hyperphagia; Obesity.

INTRODUCTION

The clinical features of the Prader-Willi Syndrome (PWS) are complex, variable and characterized by severe neonatal hypotonia, feeding problems, childhood-onset hyperphagia, obesity, short stature, cranio facial disharmony, hypogonadism, learning and behavioral difficulties (because of hypothalamus dysfunction). Clinical features may alter with age. Scoliosis, hypopigmentation of skin and hair, juvenile diabetes, narrow forehead, sleep apnoea (because of obesity), delayed healing, small hands and feet and self inflicted injuries are some of the other characteristic features of this syndrome.^{1,2}

The worldwide incidence is between 1:15000 and 1:50000. It usually affects both males and females equally with a large preponderance for boys. Oro-facial manifestations reported in PWS include almond-shaped eyes with up-slanting palpebral fissures and a triangular mouth.³ Intraoral findings include the presence of hypoplastic enamel, rampant caries, low basal salivary secretion, delayed tooth eruption and excessive tooth wear.⁴⁻⁸

CASE REPORT

A 6-year-old boy reported to the Department of Paedodontics and Preventive Dentistry, Sudha Rustagi College of Dental Sciences, Faridabad, with the chief complaint of multiple decayed teeth since 2-3 years with no associated pain or swelling. The case was referred to us by the Fortis Hospital, Faridabad.

Natal history stated that the child was delivered by Caesarean section with the cord twisted around his neck and aspirated meconium. The patient did not cry at the time of birth and was kept in an incubator for a week. Prenatal history was not significant.

He had pneumonia and respiratory distress at 7 months of age and hospitalized for the same. Milestones were delayed. There were history of seizures since the age of 3 years

and the patient was under medications for the same. Speech impairment and intellectual disability were also seen. He had been diagnosed with right undescended testes for which he was surgically operated in July 2011 and March 2012 but the surgery was unsuccessful.

Family history: The boy was the youngest of three siblings with 2 elder sisters who were normal and no history of any disorder running in family.

Personal history: The child was very particular about personal hygiene and was having a routine of brushing once daily in the morning using toothbrush and toothpaste.

CLINICAL MANIFESTATIONS

On clinical examination, the child was short statured and obese (Figure 1). His height was 105 cms (whereas another child of same age is 119 cms) with a BMI (Body Mass Index) (weight [kg]/height [m²]) of 24.1.



Figure 1: Short statured obese child.

The boy had up-slanting palpebral fissures, almond shaped eyes, hypertelorism and mild strabismus. Line joining lateral canthus and superior point of pinna on left side was lower (Figure 2).



Figure 2: Up-slanting palpebral fissures, almond shaped eyes, hypertelorism and mild strabismus.

Thin upper lip and down turned corners of the mouth gave a 'fish mouth appearance' (Figure 3). His hands and feet were small (Figure 4) and self inflicted injuries were present on hands (Figure 5).



Figure 3: Fish mouth appearance.



Figure 4: Small hands and feet.



Figure 5: Self inflicted injury.

INTRAORAL FINDINGS

- Early mixed dentition stage.
- Dental caries were present in teeth 53, 63, 64, 65, 73, 75, 83 and 85.
- Root stumps were present with respect to 51, 52, 54, 61, 62, 72, 74, 82 and 84.
- Anterior cross bite between 11 and 41.
- No abnormality detected in frenal attachments, tongue,

buccal mucosa, palate, floor of the mouth.

- Panoramic radiograph showed presence of all permanent teeth (Figures 6-9).



Figure 6: Intraoral photograph showing carious teeth and root stumps.



Figure 7: Intraoral photograph showing anterior crossbite.



Figure 8: Intraoral photograph showing gingival hypertrophy.



Figure 9: Panoramic radiograph showing all permanent teeth.

MAJOR DIAGNOSTIC CRITERIA

In spite of history of rapid weight gain at the age of 3 ½ years, the child was cheerful and good natured but exhibited behavioral problems such as, short attention span, temper tantrums, obsessive compulsive disorder and stubbornness. Rage-type response of behavior was noticed during extraction of teeth, hyperphagia, narrow bifrontal diameter, almond-shaped eyes, down turned corners of the mouth, hypogonadism and thick viscous saliva. Delayed healing of wounds was reported after extraction of teeth.

CONFIRMATORY DIAGNOSIS

This syndrome has similarity to various conditions like Down's syndrome, Growth hormone deficiency, Obsessive compulsive disorder and Obstructive sleep apnea syndrome. Multiple consultations from doctors were taken and genomic imprinting suggested at the age of 3 years. Gene mapping was performed and the diagnosis was confirmed.

TREATMENT PLAN

- Restorations of carious teeth 53, 63, 65, 73, 75, 83 and 85.
- Extractions of root stumps 51, 52, 54, 61, 62, 72, 74, 82 and 84 followed by space maintainers.
- Pulpectomy 64.
- Anterior cross bite correction.

TREATMENT RENDERED

- Caries excavation done and GIC restorations.
- Pulpectomy.
- Extractions were performed.
- Patient is still under follow up.



Figure 10: Post treatment photograph of patient.

DISCUSSION

Management of PWS requires multidisciplinary care that includes combination of behavioural therapy, early diet managements, speech therapy, routine preventive health care with exercises and medications (such as growth hormone replacement therapy).¹

Different case studies also manifested classical features of the syndrome by assessing various parameters.

Salako et al⁸ reviewed the oral findings of children with PWS and found that oral mucosa in such cases is prone to self inflicted injuries because of having the habit of picking at the skin and biting the oral mucosa.

Olczak-Kowalczyk et al⁶ assessed the presence of self inflicted injuries in such children either as picking of the skin or biting of the oral mucosa.

Saeves R et al³ evaluated the orofacial dysfunction (present in 87%), resulting in chewing difficulties, increased prevalence of oral habits and drooling of foamy and viscous saliva. Severe respiratory problems and snoring was frequent.

CONCLUSION

Early diagnosis and thorough orofacial examination of such cases is important to optimize treatment planning and management and to minimize the risk of progression of developing symptoms. Once the diagnosis of syndrome is confirmed, dental consultations should be started, in which education of the parents on the possible dental problems and instructions on how to prevent them should be given. Early introduction of good dietary and oral hygiene practices and use of fluoride supplements, when appropriate, would help prevent the deleterious dental consequences, as experienced here in this case report. Early interventions also include physical and occupational speech therapy. Therapeutic interventions to manage growth, regular exercises, dietary and behavioral concerns can enhance the child's potential and can cause a significant impact on health.

ETHICAL APPROVAL

This case study protocol was approved by the Regional Medical Research Ethics Committee and also from the Ethical Committee of same institute where the case study was performed. Informed consent was obtained from parents of the child.

CONFLICTS OF INTEREST: None.

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Review

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An Integrated Approach to Management of Food Allergy – Recommendations for Consumers and Professionals

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ABSTRACT

The aim of the present paper is to review the existing knowledge on the current strategies in food allergy management and propose an integrated approach to management of food allergy and intolerance. Such approach should consist of Standard Operating Procedure (SOPs) addressed to health professionals, food industry and educators, and Dietary Behaviour Principles (DBPs) addressed to different groups of consumers, e.g. breastfeeding mothers, parents and carers of young children. The paper proposes a baseline for this formulation. However, more research is still needed on food allergies, particularly as regards food haptens (small molecular-weight components with sensitizing properties) as opposed to widely-known allergens.

KEYWORDS: Food allergy and intolerance; Haptens; Standard Operating Procedures (SOPs); Dietary Behaviour Principles (DBPs).

INTRODUCTION

Intolerance to foods has been known since ancient times, although it was regarded as minor health problem.¹ Concerns about food allergies emerged and escalated in the last few decades as a result of life-threatening anaphylactic reactions produced by food allergens. For instance, the prevalence of food allergy in US children has increased by 20% over the last decade, and similar trends have been reported in other countries.² According to statistics from the World Allergy Organization (WAO)³ and allergy associations, 8% of children and 3% of adults are affected by food allergies and intolerance. Allergists alert that this rate might be in fact much higher.⁴ According to Asthma and Allergy Foundation of America (AAFA),⁵ allergy is the 5th leading chronic disease in US among all ages, and the third most common chronic disease among children under 18 years old. As a chronic disease, it starts from infancy and often lasts for a lifetime.⁶ Although, many people outgrow their allergy, it drastically changes the quality of life of the patient and his/her family, and generates different costs, including social and psychological ones. Thus, since the 1990s, food allergy is considered a major public health issue.⁷

Almost all sources state that the most effective management food intolerance, including allergy, is elimination or avoidance of harmful ingredients.⁸ According to the American Food Allergy & Anaphylaxis Network (FAAN), no medication could prevent food allergies.⁹ Medications can be applied to merely control symptoms, which can range from mild (rashes, hives, itching, swelling, etc.) to severe (dyspnea, wheezing, loss of consciousness, etc.). Besides, despite numerous research projects devoted to food allergy, carried out in multinational consortia (e.g. INFORMALL, EUROPREVALL), knowledge on mechanisms of food allergy

and intolerance is still incomplete, especially with regard to haptens (small compounds typically of simple chemical structure) that are present in all foodstuffs either as natural components, contaminants, or additives given purposefully during food processing.

As it was pointed out by Nolan (2004) early diagnoses with timely and individualized management are key elements to fight the rapidly growing rate of allergy and may prevent complications and progression to a chronic disease.⁴

The goal of the present paper is to review existing knowledge on current food allergy management strategies and to suggest an outline for integrated management framework of food allergy and intolerance. It will consist of Standard Operating Procedure addressed to health professionals, food production sector and educators, and Dietary Behaviour Principles addressed to different groups of consumers, e.g. breastfeeding mothers. We would like to emphasize the importance to base the management strategies on evidence-based and up-to-date knowledge on food allergies, and we will indicate the areas which still need much more scientific evidence.

STATE-OF-THE-ART IN FOOD ALLERGY – KNOWLEDGE GAPS AND AREAS FOR FURTHER RESEARCH

At the beginning, it is necessary to distinguish between food intolerance and allergy. Food intolerance can be divided as allergy and pseudo-allergy (Figure 1). The term “food allergy” is used when an immunological mechanism has been defined or is suspected in case of food intolerance. Immune reactions to food are traditionally divided into IgE-mediated and non-IgE-mediated. IgE-mediated (type I or immediate) allergic reactions are to “classical” protein allergens (e.g. milk or egg proteins) while non-IgE-mediated may be due to the cell-mediated, de-

layed (type IV) allergic reactions to small molecular weight compounds (haptens) of synthetic or natural origin. Both allergy types are known causes of eczema, referred to as atopic eczema and allergic contact dermatitis, respectively. Another diseases caused by delayed type-allergy to haptens include allergic contact stomatitis,¹⁰ allergic contact conjunctivitis,¹¹ allergic vaginitis.¹² Relapses of allergic contact dermatitis caused by oral ingestion of haptens are referred to as systemic reactivation of allergic contact dermatitis – an entity that shares clinical characteristics with atopic eczema (chronic or recurrent course, flexural predilection of eczema, etc.) and is very difficult to tell apart from the latter.¹³ Furthermore, delayed type allergy was proposed as explanation for some cases of urticaria,¹⁴ asthma,¹⁵ and allergic rhinitis.¹⁶

“Classical” protein allergens, like eggs, milk, peanuts, legumes, etc. have been intensively studied with respect of food allergy and eczema. Nevertheless, only 10-50% of the cases could be explained by actual allergy to these compounds. Thus, focusing exclusively on these food allergens has proven insufficient in controlling the whole spectrum of food allergy and to be effective in management strategies. The role of delayed-type allergy to food haptens has not been yet systematically studied, however convincing scientific evidence supports assumption that they may explain cases that cannot be explained by the IgE-mediated allergy to food proteins. Therefore, next to paying due attention to “classical” food allergens (proteins), the research is needed on the food haptens, which have not yet been studied systematically in relation to food allergy. Recent clinical and experimental evidence seem to support the existence of relationship between food haptens and delayed type food allergy.¹⁷ This group of food chemicals typically causes symptoms that may appear from one to several days after the ingestion. Artificial food agents are present in a vast majority of contemporary food products. However, current risk management strategies offer no

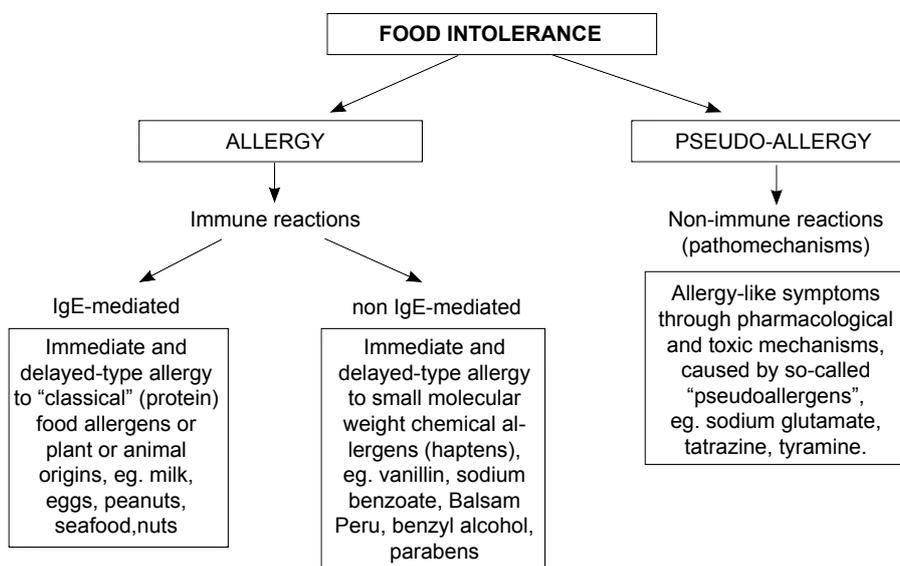


Figure 1: Food allergy within the spectrum of food intolerance. Source: Own research.

respective recommendations to food industry, health professionals and policy makers, who only know how to manage classical food allergens. Haptens may be present in food both as natural components (e.g. nickel, cobalt, vanillin) or contaminants (pesticides, animal drugs, industrial chemicals) and those purposefully added during food processing (preservatives, emulsifiers, colorants flavour enhancers, antioxidants). Finally most of oral drugs are also haptens,¹⁸ contrast to allergens, haptens are too small to be recognized by the immune system *via* antibodies or lymphocyte receptors, however; they form strong chemical bonds with endogenous proteins distorting their spatial conformation to such extent that these are no longer tolerated and induce immune reactions.

A number of recent reports (European Academy of Allergy and Clinical Immunology - EAACI and GA2LEN, several scientists confirmed that although patients suffering from food allergy and/or intolerance often associate relapses of their disease with ingestion of particular foods, only minority of these cases is caused by “classical” protein allergens (e.g. milk, eggs or peanuts).¹⁹⁻²² In majority of adolescents and adults allergies to “classical” food allergens, such as hen’s eggs and cow’s milk are considerably less common and play a marginal role. As a result, “elimination diets” aimed at curing food allergy or intolerance by excluding various “allergenic food” remain ineffective in most cases and too often cause unjustified dietary regimens.^{23,24} Better insight into the role of food haptens as a possible cause of dermatitis and food allergy was listed among relevant future research priorities by experts of the European Academy of Allergy and Clinical Immunology.²⁵

Large and medium-scale international research projects funded within the EU Framework Programs (eg. ALLERGEST, BIOAIR, EUROPREVAL, FAREDAT, GA2LEN, FORALLVENT, INFABIO, INFORMALL, PARSIFAL, PDCAAE, PROTAL) addressed various aspects of food allergies diagnostics, tests, cost, assessment, thresholds, prevention related to various elements of life (chronic respiratory conditions in children related to traffic air pollution, effect of gastrointestinal digestion on the allergenicity of foods, clinical course and biomarkers in severe chronic airway disease, effect of diet and lifestyle on risk of gastrointestinal infection and allergy in early life, determinants of childhood asthma and allergies across Europe etc.). Regardless the huge contribution and benefits from these studies to the present knowledge and management strategies, problems of high numbers of patients with food allergy still remain unsolved and current policies seem not capable of offering them sufficient support/help in the context of effective health policies.

CURRENT ISSUES IN ALLERGY MANAGEMENT STRATEGIES

There are four approaches to management of food allergy: avoidance, education, pharmacotherapy and immunotherapy. Total avoidance of an allergen, and being prepared with appropriate treatment of acute allergic reaction, are the main principles of successful food allergy management. Programs of dietary allergen avoidance have shown a positive effect in preventing or

delaying the atopic disease, yet their effect is mostly limited to infants at high risk of developing allergy. Dietary prevention of allergy in infants and small children was studied by i.a. Muraro et al and Sicherer et al.²⁶⁻²⁹ The results show i.e. that in case of high-risk children, breastfeeding combined with avoidance of solid food and cow’s milk for at least 4-6 months is the most effective preventive food regimen. On the other hand, in elder children elimination diets should be introduced with caution, due to the risk of malnutrition. Thus, patients, their families and healthcare workers need guidelines and suggestions for avoiding allergenic foods in meal planning, preparation and selection of nutritionally adequate replacement food.³⁰ Parents’ knowledge is also insufficient. It has been shown that only one eighth of the infants whose parents reported adverse food reactions were found to have an actual allergy or intolerance, which implies a need to raise awareness of the need for accurate diagnosis to prevent children being on unnecessarily restricted diets.³¹

Moreover, certain foods are difficult to avoid due to e.g. hidden ingredients, and there are social risks of dietary avoidance,³² and psychological distress,³³ which also should be addressed in management. Young et al³⁴ pointed out that numerous studies, examining food allergy and anaphylaxis care in schools and childcare settings, have identified two main deficiencies, such as inadequate food allergy management plans and deficiencies in recognizing reactions and treating reactions with epinephrine. There is also much to be done to improve current food allergy and intolerance management practices in healthcare sector. For example, most allergies are managed within primary care, yet it has been proven that very few GP’s and practice nurses get any formal training in allergy.³⁵ There are also concerns that diagnosis and management of food allergies vary from one clinical practice to another.³⁶ Besides, little or no emphasis has been given on the distinction between “food allergy” and “food intolerance” and consequently, there are no allergy/intolerance specific risk management strategies.

One of the latest book about food allergy comprised information about pharmacotherapy and educational programmes. Authors stated that currently it is no well-established-modifying treatment for food allergy and that the best method is avoidance of allergen(s). In case of acute food-induced allergic reactions exist recommendations for the pharmacological management.³⁷ Educational programmes in food allergy are not so often presented by scientists, perhaps because it is need of knowledge about foods as well as about nutrition. Technological processes during food products preparation often change allergenic properties. Educational programmes should comprised knowledge of disease, food properties, food technology, interactions between food and drugs used in allergy therapies, as well as psychology, how to change nutritional behaviour of patient.^{38,39}

The two position papers have been published on allergen immunotherapy in *Journal of Allergy and Clinical Immunology* in 2015 and 2016. They present actual international consensus on procedures inducing tolerance to specific allergens through repetitive administration of them, e.g. food allergens.

The key message is that "...For food allergy, EAACI (*European Academy of Allergy and Clinical Immunology*) systematic review of the literature highlighted a large heterogeneity in the protocols used by different research groups in terms of preparation of food allergens, up dosing, maintenance dose, and OFC (*Oral Food Challenge – a highly diagnostic provocation test used for the diagnosis of food allergy*) procedure; therefore there is no single established protocol that has been shown to be both effective and safe in large multicentre studies. Currently, there is agreement that although immunotherapy to foods is an important area of research, it is not yet ready for clinical practice...."^{40,41}

SUGGESTIONS FOR INTEGRATED MANAGEMENT OF FOOD ALLERGIES

There is a need to develop an innovative approach for evidence-based risk assessment and management in the field of food allergy, taking into account both "classical" (protein) allergens and small-molecular haptens occurring in food naturally, contaminants and food additives, from the farm through the food industry to the end consumer and further to the society ("from farm to fork"). This approach should take form of sets of documents addressing evidence-based solutions for the existing problems of food allergy management – available both in electronic and printed form as Standard Operating Procedures (SOPs) and Dietary Behaviour Principles (DBPs).

Standard Operating Procedures (SOPs)

Standard Operating Procedures with relevant recommendations should be developed and distributed among three main groups (sectors) of the relevant stakeholders: healthcare sector, food industry sector, and educational sector. The basic scope of each SOP should contain the following:

- Scope and applicability (purpose, limitations),
- Summary of methods and description of target groups,
- Definitions,
- Health and safety warnings,
- Cautions and mitigation plan,
- Interferences with final product,
- Personnel qualifications and responsibilities,
- Equipment and supplies,
- Procedures identifying all pertinent steps needed to accomplish the procedures, including checklists,
- Data and records management (i.e. calculations, forms to be used, reports to be written, data and record storage information, personal data protection),
- Specific recommendations, complementary to Procedures or referring to issues that are not covered by the Procedures,
- Guidelines for implementation – additional information on how to implement procedures and recommendations, taking into account regulatory issues,
- Quality assurance (control) – specifications for self-verification of the quality and consistency of work, with the inclu-

sion of specific criteria for each stakeholder group,

- References – other external documents and procedures that interfere with the SOP and recommendations (attached any document, including those which are not readily available).

The SOPs and relevant recommendations should be specific for each group of professionals, and include accordingly:

Health sector

Recommendations for medical doctors (allergists, general practitioners, gynecologists, pediatricians), including new methods of diagnosis of food allergy, updated list of allergens, and complementary practices in cooperation with other health professionals, in order to provide a complex care over allergic patients,

- SOPs for biochemical laboratories in hospitals, assuring Good Laboratory Practice (GLP) with biological samples from allergic patients, taking into account specific conditions of food allergy,
- SOPs and recommendations for dieticians and pharmacists regarding cooperation with medical doctors and providing advice in food and drug preparation and intake,
- SOPs and recommendations for nurses and midwives regarding cooperation with medical doctors and Good Communication Practice with allergic patients,
- SOPs for sanitary authorities regarding controls in hospitals, clinics, and other institutions.

Food industry

- SOPs and recommendations for agri-food producers, containing Good Agricultural Practices (GAP) to reduce risk of unintentional contamination of food with potentially allergenic agents,
- SOPs and recommendations for food technologists, including Good Manufacture Practices (GMP) i.e. to use allergy-friendly food ingredients, and to avoid cross-contamination which may occur during processing. It will contribute to make allergy declaration for new updated labelling and consumer information by providing an updated list of sensitizing food agents, which can be "classical" protein allergens and non-proteinaceous, small molecular weight sensitizers (haptens),
- SOPs for sanitary authorities regarding the control whether food production and processing practices at different stages of the food chain fulfil allergy-safety requirements, to provide an allergy-friendly food to the consumer.

Educational sector

- SOPs for kitchen staff at kindergartens, schools, etc., for allergy-safe meal preparation and distribution to children and adolescents,
- Recommendations for teachers regarding proper attitude

to allergic child, providing healthy lifestyle education and communication with children and their parents,

- Recommendations for school medical staff (doctors/nurse/hygienist) as regards preparation of school/childcare setting environment to be friendly for children with food allergies, as well as providing relevant care for such children during school hours, in cooperation with kitchen staff, teachers and parents.

Dietary Behaviour Principles (DBPs)

The objective of the evidence-based Dietary Behaviour Principles (DBPs) is to help allergic consumers and their families to understand their current dietary practices and how these practices influence the risk of food allergy, as well as to encourage them to develop eating habits that will prevent unnecessary exposure to food allergens/haptens and at the same time, to avoid malnutrition. It should be achieved by providing relatively simple decision making rules to be used in making aware food choices. DBPs should be formulated with respect to relevant consumer groups (with special version for children), each should consist of the following sections:

- Description of target group,
- Explanation of food allergies – short information about various types and effects of food allergy and intolerance, and where to seek for relevant information,
- Objectives of dietary changes – clearly defined and stated objectives of shaping specific dietary patterns which help avoiding unnecessary exposure to food allergens/haptens,
- Barriers to dietary behaviour change – a list of socio-cultural, economic, ethical and other barriers to dietary behaviour changes; each group of consumers will be provided with pertinent explanation of such obstacles, and will be encouraged and motivated to overcome these barriers,
- General information about commercially available allergenic food products most frequently consumed in Europe,
- Demonstrating proper dietary behaviours relevant for different types of food allergy and source of protein allergen/hapten, such as meal preparation at home, buying behaviours regarding the selection of low vs. highly processed foods, avoiding certain allergens, reading labels.

As in case of SOPs, DBPs should be addressed to different consumer groups, specifically:

- DBPs for pregnant and breastfeeding mothers to inform about the use of allergy-friendly food and culinary practices in home meal preparation to prevent from or to minimize the risk of food allergy, as well as best practices to be followed in breastfeeding,
- DBPs for parents and caregivers of infants who are not breastfed (weaning period) and of very young children not capable of self-managing their allergy/intolerance. It should provide advice on allergy-friendly infant formulas and how

to prepare meals for children with various types of food allergy, in order to prevent the risk of allergic reactions and at the same time, to avoid malnutrition,

- DBPs for children at the age of kindergartens and schools, who take first steps in self-management of allergy, to educate them to be responsible for their eating behaviours outside home,
- DBPs for adolescents with already shaped attitudes and dietary behaviour patterns, being exposed to strong peer pressures; it should inform them how to select allergy-friendly foods,
- DBPs for adults, to provide people with information about food nutritional value and allergen content in raw food products and processed foods; it should allow them making aware choices of food and learn proper meal preparation practices at home, in accordance with their preferences, age and health condition.

The integrated framework of allergy management – which SOPs and DBPs are part of – should take into account cross-country differences in the prevalence of food allergy and intolerance. For example, in case of peanut allergy it has been observed that societies in which peanuts are consumed fried or boiled (i.e. China) have lower peanut allergy prevalence compared with the societies where roasted peanuts are more popular (i.e. US).⁴² The above SOPs and DBPs should be prepared in cooperation with various professionals and representatives of the consumer and allergy associations, and distributed following approval of the relevant regulators.

CONCLUSIONS

The above considerations have been summarized in Figure 2. It shows that the integrated approach to management of food allergies should respond to three major problems identified: 1) low access to allergy diagnostics combined with the fact that there are no tests for all the allergens, 2) growing rate of food allergy, particularly in developed countries where the consumption of processed foods is very high and still increasing, 3) contemporary eating behaviours that seem to stimulate food allergies (column A).

We acknowledge the fact that more research is needed to gain the complete knowledge on food allergy (Column B). Particularly, it requires clinical assessment of the prevalence of allergy to haptens, on which present evidence is insufficient. Other research activities should be based on *in vitro* and animal models for testing known and so far unexplained, potentially allergenic interactions. More research is also needed to analyse the exposure to food allergens (and haptens) of individuals at different life stages. The integrated and systematic approach to management of allergy (Column C) consists of Standard Operating Procedures (SOPs) and recommendations addressed to three groups of professionals: 1) health sector, 2) food industry sector, 3) educational sector, and Dietary Behaviour Principles (DBPs) for different groups of consumers. They

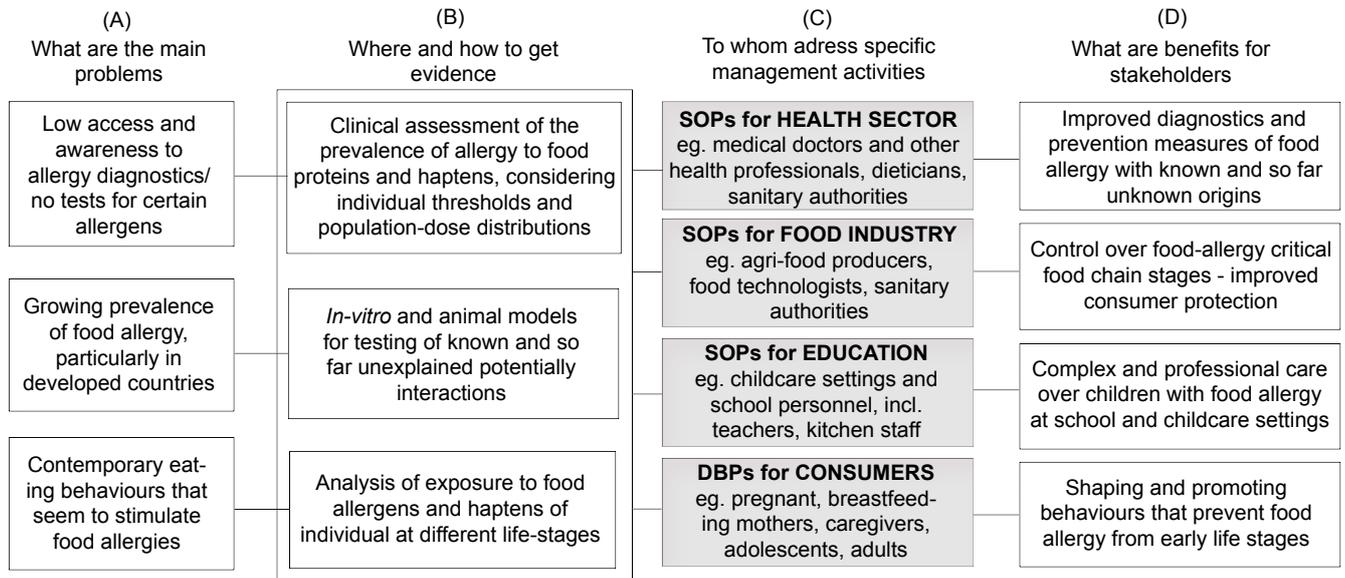


Figure 2: Integrated approach to management of food allergy – SOPs and DBPs.
Source: Own research.

reflect benefits for different groups of stakeholders (Column D). It is also important to involve relevant regulators and actors such as media and consumer/allergy associations, who would implement and communicate the SOPs and DBPs.

CONFLICTS OF INTEREST: None.

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