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Safety and Viability of Raw Beef in Standard or Hospital Nutrition Regimens: A Single-Center Retrospective Study

Massimo Quarenghi*, Maria Mallone, Teodoro Chiaravalloti, Alessia Bergamaschi and Rosamaria Turri Quarenghi

Department of Internal Medicine, Ente Ospedaliero Cantonale, Bellinzona, Switzerland

Corresponding author: Massimo Quarenghi, Department of Internal Medicine, Ente Ospedaliero Cantonale, Bellinzona, Switzerland, E-mail: massimo.quarenghi@eoc.ch

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Abstract

Background: Malnutrition is highly prevalent in patients admitted to the hospital and thus represents a prognostic factor of worse outcomes. Malnutrition frequently occurs during hospitalization, but proactive management of these patients can improve their prognosis. Instead of resorting to artificial nutrition, one potential option is to enhance dietary offerings by introducing more appealing and modern dishes inspired by local culinary traditions. With improved hygiene standards and rigorous control measures, certain previously excluded preparations, such as raw beef dishes, could be considered for inclusion in hospital menus. In this study, we present our experience in this regard.

Methods: Over a period of four months during the summer, a raw meat-based dinner option, specifically hand-chopped Piemontese fassona beef tartare, was incorporated into both the standard and hospital nutrition regimens once every two weeks. This meat has an excellent protein and fat composition, a good amount of polyunsaturated fats and organoleptic characteristics.

Results: Following the four-month period, given the positive feedback received from patients, a retrospective analysis of medical records was conducted to investigate the occurrence of zoonotic diseases. The dish was selected 345 times out of 1,217 total servings (28.4%) across all wards, including the palliative care ward with patients in the pre-terminal stage. The selection rate was 39% among female patients. No infectious complications were detected.

Conclusion: In geographically low-contamination areas, the introduction of raw beef dishes is both feasible in both hospital and standard nutrition, provided that certified high hygienic standards are adhered to throughout the preparatory procedure.

Keywords: Raw beef; Standard nutrition; Hospital nutrition; Nutritional team; Foodborne infection

Introduction

Malnutrition remains a major challenge for hospitalized patients worldwide [1-4]. The prevalence of patients at risk for malnutrition can reach up to 50% in hospital settings. Identifying and treating these patients are crucial due to the increased morbidity and mortality associated with malnutrition, as well as the significant impact on patient prognosis [5-7]. While malnutrition may already be present upon admission, it often develops during the hospital stay in most cases [8]. Numerous strategies have been implemented to combat malnutrition and improve dietary inputs in terms of quality and quantity needs [9]. Before resorting to artificial nutrition, an alternative approach would be to enhance dietary offerings by introducing increasingly appealing, modern dishes inspired by local cuisine, as recommended by the recent European Society for Clinical Nutrition and Metabolism (ESPEN 2021) guidelines for both standard and hospital dietary regimens: Diet composition should consider local food habits and food patterns [10,11]. However, the introduction of new dishes with raw ingredients often leads to conflicts between traditional dietetic practices, which raise concerns about infectious risks and modern practices, which highlight the significant reduction in zoonotic diseases in our region (European Union), given the advanced preparation techniques and improved hygiene standards that greatly mitigate the associated risks [12-15]. Considering the limited research on this subject, the objective of our study was to determine whether certain types of preparations can be introduced in an acute hospital setting while implementing enhanced hygiene measures. At our hospital, a hand-chopped beef tartare (Piemontese fassona), which is a raw meat delicacy, has been introduced. Based on the positive patient feedback and the lack of subsequent complications, an evaluation was conducted to confirm that the practice did not cause any infectious issues.

Materials and Methods

This single-centre, retrospective, observational study was conducted at the Regional Hospital of Bellinzona, Switzerland, which provides services in oncology, radiotherapy, dermatology,

intensive care, internal medicine, surgery (general-visceral, trauma orthopaedic, thorax), gynecology, obstetrics and pediatrics. As recommended by the ESPEN guidelines, this hospital has a structured food facility consisting of a kitchen, a delivery system and an ordering system [11]. The entire facility is certified according to the Hazard Analysis Critical Control Point (HACCP) protocol [16,17].

Since mid-2017, the hospital has been equipped with a dedicated clinical nutrition and dietetic service (nutritional team) that supports physicians in the management of patients with nutritional issues, including malnourishment. The hospital has also assigned a dietitian dedicated solely to the kitchen to supervise dietetics and to work closely with chefs in dietetics for overseeing all hospital dietary needs [11]. Menus are typically changed and adjusted according to the ongoing season (winter, spring, summer and fall menu) and the last major re-evaluation and total revision were performed 4 years ago. Our hospital's food planning involves close collaboration between the dietetic chefs, who propose dishes and the nutritional team, which analyses and ensures the correct composition of macronutrients and total energy. This approach aligns with the Mayo Clinic Dietetics Manual, a widely used reference text in our region [18].

For summer, a raw meat dish, i.e., a Piemontese fassona beef tartare, was introduced for the first time as part of the evening meal and was served on Thursdays every 15 days for 4 months. The Piemontese fassona is a breed of cattle, a prominent modern member of the subfamily Bovinae, native to Piedmont (Italy), used nowadays mainly for meat purposes owing to its tenderness [19]. This particular beef cut has interesting characteristics, including lower fat content and a good proportion of Polyunsaturated Fatty Acids (PUFAs), even compared to meats that are typically low in fat, such as poultry [20].

Before introducing this dish into the hospital dietary regimen, the nutritional team mandated a random bacteriological analysis of the food by an accredited external laboratory (Helvetia Lab-St. Antonino-Switzerland) to assess the microbiological quality of the food **(Table 1)**. The whole supply chain starting from traceability, cold chain control, storage, proper handling and delivery to the patient using refrigerated carts, was reviewed, owing to its importance in preventing bacteriological contamination and evaluated according to HACCP protocols [16].

Table 1: Result of the microbiological analysis of the Piemontese fassona beef tartare test sample (delivery temperature to the laboratory 5°C). Laboratory: Helvetia Lab-Switzerland.

Microbiological analysis	Method	Result	Maximum value
Aerobic mesophilic germs	HL-AD001	850'000 UFC/gr	-
E. Coli	HL-AD002	<10 UFC/g	-
Salmonella app.	HL-AD014	Absent in 25 gr	0 in 25 gr
Listeria monocytogenes	HL-AD013	<100 UFC/gr	100 UFC/gr

The meat course was offered as a free choice, but as a second option and only to patients who had already been evaluated for their dietary requirements and for the type of regimen to be followed. Accordingly, the following patient groups were excluded from receiving this regimen: patients who had not yet undergone a medical evaluation; those undergoing general surgery and had not received the surgeon's express permission to receive this regimen; patients admitted to the medical oncology department; patients with known immunosuppression; patients undergoing autologous peripheral stem cell transplantation and those admitted to the obstetrics department. The course was made available as a second option to avoid any accidental enrolment of patients who met exclusion criteria but were yet to undergo a medical evaluation for some reason, such as patients who had been moved from the emergency room. Additionally, Piemontese fassona beef tartare was offered as part of the diabetic diet regimen.

The hospital's infectious diseases department and the respective medical teams were informed of the introduction to ensure awareness of the change.

Data source and analysis

Data regarding the total number of patients who consumed the Piemontese fassona beef tartare in relation with the total number of meals served was provided by hospital catering service. A physician from the nutritional team reviewed the medical records of each patient and explored the potential presence of a complication on the discharge letter or the occurrence of an epidemic in the facility related to consumption of the Piemontese fassona beef tartare (*e.g.,* acute gastrointestinal issues and positive stool cultures). For patients admitted twice during the experimental period, we assessed whether the admission diagnosis was linked to food, parasitic poisoning or infection. In addition, conditions that could lead to infections were considered, such as the use of therapeutic doses of corticosteroids (more than 5 mg daily), immunosuppressive drugs or immunosuppressive illnesses that had been prescribed a diet-restricted regimen. Furthermore, any complaints from both patients and the medical team were recorded.

Results

During the four-month study period, 345 servings of the Piemontese fassona beef tartare were served every 15 days for a total of seven dinners out of a total of 1,217 servings (28.3%, average 28.4%) **(Table 2)**. Based on the results of microbiologicalassessments, the processed product was contamination-free when delivered properly (in cooled carts) and maintained appropriately at the ideal temperature until consumption **(Table 1)**.

Table 2: Analysis of the quantities and where the Piemontese fassona beef tartar it is taken.

Weeks	1°C	2°C	3°C	4°C	5°C	6°C	7°C	Total
Portions served	46	45	61	48	50	47	48	345
Total meals provided	182	187	167	176	170	163	172	1217
% of the total	25.3	24.1	36.5	27.3	29.4	28.8	27.9	28.3% (average 28)
Number of portions served by ward/number of patients admitted								
Surgery	9/28	7/24	11/28	13/29	8/22	6/21	6/29	
Intensive care	1/4	0/2	0/2	0/3	0/3	0/0	0/2	
Palliative care	0/5	0/5	5/7	0/5	2/5	1/4	2/5	
Medicine 1	12/23	8/22	9/23	6/23	4/22	7/20	6/22	
Medicine 2	3/15	8/21	8/21	9/23	9/19	5/20	4/15	
Medicine 3	3/15	7/24	6/19	3/17	8/23	6/16	4/15	
Orthopedics	9/22	9/24	11/24	7/18	10/21	12/23	14/22	
Radiotherapy	0/8	1/12	4/9	5/10	1/8	2/10	3/9	
Urology	8/17	3/12	7/13	4/13	8/14	8/14	7/13	
Total	46/137	43/146	61/146	47/141	50/137	47/128	48/132	342
Others (careers-parents, other departments, *etc*.)	0/45	2/41	0/21	1/35	0/33	0/35	0/40	3

A total of 345 servings were served, excluding a few servings provided to caregivers or parents of hospitalized children; hence, 340 servings were consumed by patients **(Tables 2 and 3)**. The Piemontese fassona beef tartare was selected across all age groups, from the youngest patient (17 years old) to the oldest (96 years old), with an average age of 68 years, of which more than a third were females (39%) **(Table 3)**.

Table 3: Characteristics of the patients and results.

Characteristic	
Demographic	
Patients tot. No.	340
Age-Yr (CI)	68 (17-96)
Female sex-No./tot No. (%)	133/340

	(39%)
Medical history	
Diabetes no/tot. No. (%)	66 (19%)
Immunosuppressive Diseases (ID) Δ -No tot.	8
Solid organ transplant No./tot pz ID	3/8
Medication	
Cortison	14/340
No./tot. (%)	(4%)
Immunosuppressive therapy** No/tot. (%)	20/340 (5.9%)
Endpoints	
Readmission no/tot. Readmission for food-borne Infection No/tot. readmission	83/340 0/83
Acute food-born infection No./tot.	0/340
Coprocultures post ingestion of Piemontese fassona/total coprocultures (No/No. tot)	4/6
Positive coprocultures for germ linked to tartar	0
Diagnosis: Diarrhea in exit letters No./tot	0/340

The dish was selected in every ward, including the palliative care ward with patients in the pre-terminal stage **(Table 2)**. No nosocomial outbreak of gastrointestinal symptoms was reported or detected. Anonymized analysis of records did not reveal any major gastrointestinal infectious following the ingestion of the Piemontese fassona beef tartare, as determined by assessing discharge letters or based on the stool culture history (parasitology, general bacteriology by Polymerase Chain Reaction (PCR) for *Salmonella, Shigella*/EIEC, *Campylobacter*, *Escherichia coli* VTEC/EHEC or assessment for Clostridium difficile toxin and culture) **(Table 3)**. No patient who was readmitted in the following weeks or stayed at a rehabilitation service at another facility (but from the same hospital group) experienced any issue related to the consumption of Piemontese fassona beef tartare. Of the 340 patients evaluated, we detected six stool cultures without growth of pathogenic bacteria (general bacteriology and clostridium difficile), of which only four cultures were conducted after meal consumption and subsequently examined. Of the four cultures examined, the first was performed after the second administration, whereas the other three were performed after the third administration. Of these, one patient reported diarrhea 4 days after consuming the Piemontese fassona beef tartare; this patient was on antibiotic therapy for empyema and intestinal symptoms were attributed to this therapy. For the second patient, who was recovering from a colectomy, assessment was performed using a sample of stool that became more liquid 8 days after consumption. For the third patient, assessment was performed 9 days after the second administration and the cause was undetermined. Considering the fourth and last case, stool cultures were collected following diarrhea that developed 4 days after raw beef consumption and symptoms were attributed to ingestion of Pirfenidone (Esbriet®; diarrhea was reported in 25% of patients) [21]. All four analyses, PCR for bacteriology and toxin and culture for Clostridium difficile, yielded negative results. All symptoms were self-limiting and considered mild, given the absence of any mention of symptoms on discharge diagnoses.

We identified two patients with kidney transplants on assessing diagnoses in discharge records. In addition, we identified patients who were undergoing chemotherapy or immunosuppressed patients who consumed physician-approved regular hospital diets. A thorough investigation into their hospitalization revealed no infectious issues related to consumption of the served beef tartare.

Discussion

During hospitalization, food intake serves more than the basic essential function necessary for every individual to survive and perform various functions; in this setting, it can have therapeutic value [22,23]. Malnutrition remains a critical challenge within the hospital setting, warranting careful identification owing to related morbidity and specific treatments, given its well-established effects on patient prognosis in all care departments [7,24,25]. Dietary intervention forms the foundation for both preventing and treating malnutrition [26]. To combat malnutrition, while introducing oral nutritional supplements or artificial nutrition is frequently considered an appropriate solution, improving the basic diet by providing high-quality food ingredients that are also appetizing could be an alternate strategy [10]. The recent ESPEN 2021 guidelines regarding nutrition in hospitals, rehabilitation centers or nursing homes propose a minimum of two different regular diets (the standard and hospital nutrition regimens) and a minimum of two different additional diets adapted to the size and focus of the hospital [10]. Furthermore, according to the ESPEN guidelines, patient and personnel surveys regarding hospital food and diets should be conducted regularly, at least once a year and hospitals should be re-evaluated every three to five years based on novel data in nutritional sciences and medicine, as well as the hospital's focus and needs [10].

In our study, the product, *i.e.*, the Piemontese fassona beef tartare, has good organoleptic properties that encourage its consumption, with a biochemical structure that helps ingest the proper ratios of macro and micronutrients, especially protein [19,20]. This dish, which is high in protein and relatively low in fat, is suitable for therapeutic diets, as well as for use as a single course or as a component of other meals suggested for standard and hospital menus: Diabetic (in our trial, 19% of participants had diabetes) and depending on the size of the meat cut, for modified texture **(Table 3)** [10,19,20]. Our speech therapy and dysphagia service also found that the Piemontese fassona beef tartare could be feasibly introduced into both minced and soft diets.

Further, we observed that the introduction of certain dishes in this case, the dish was based on local traditions has been markedly successful. The newly introduced dish was selected by more than 25% of patients, regardless of age, including those with very debilitating conditions and those as young as 17 years of age. The Piemontese fassona beef tartare was also selected by pre-terminal patients admitted to the palliative care unit, where food comfort has a substantially greater value than that in other units **(Table 2)**.

In addition, the quality aspect needs to be carefully considered. Our hospital has an anonymous patient complaint reporting system to report any issue. No complaints were received regarding the newly introduced dish. In contrast, patients frequently posted favorable images of the meal on social media. This was true regardless of the subjective and non-scientific nature of the oral feedback.

The use of raw foods, except for fruits and vegetables, has been persistently avoided for food safety reasons, hygiene regulations or local health laws. Given the known and well-established infectious issues recorded in the literature or the possibility of their contamination with multi-resistant bacteria, certain foods of animal origin, particular organs (such as liver) or entire species (poultry, pork) do not lend themselves to raw consumption [27-29]. Nonetheless, it must be highlighted that the microbiological quality of food differs depending on the quality of the supply chain and the region of origin. Given the differences in the incidence of pollutants in products, particularly in products in the European Union compared with those in the rest of the world, individuals involved in the raw material selection process must remain aware of the local circumstances [30-36].

Diet composition also considers local eating habits and food patterns according to the ESPEN recommendations for standard and hospital nutrition regimens [10]. We believe that, with increased hygiene and dietary standards, it is possible to include long-standing locally used raw foods, such as that beef in our study. Products from a controlled supply chain that complies with all the strictest hygiene and health regulations (the highest certification being the HACCP) can achieve very high hygiene and health safety standards, as evidenced by our analyses **(Table 1)** [16]. Certification involves clear protocols for microbiological analysis. In the present study, the product was assessed before initiating the regimen and could be monitored at any time by health authorities, similar to that for all other food products. Based on data examined during the study period, no gastroenteritis outbreaks, infectious bacterial single issues or other infectious problems were reported **(Table 3)**.

A major limitation of the study is the sample size: The 340 servings were only partly compensated by the spread over seven days in four months. In addition, this was a single-center study (with only one kitchen team) involving a new course with a new preparation; hence, considerable attention was probably afforded to proper compliance with sanitation regulations. Limitations that do not allow result extrapolation to larger settings or daily preparations where the utmost attention to sanitation compliance would be substantially difficult to manage [16,37]. Nevertheless, hygiene protocols should be applied for other foods, such as vegetables, which are often served raw and can also present infectious issues [38-40]. Another limitation of this study is the potential parasite contamination associated with raw meat. However, this issue is also applicable to other foods, especially meat of certain other species (pork, game), vegetables and salad and it remains poorly detectable, given the frequent absence of acute symptoms. However, beef is less susceptible to parasite contamination than other sources, assuming it has been supplied by a certified supply chain; hence, the possible occurrence of future infection, except in a circumscribed outbreak, would be difficult to attribute to the ingestion of this single cut, prepared following precise methods and procedures [41,42]. Furthermore, although in-hospital infections have a higher mortality than do out-of-hospital infections, Clostridium difficile and virus contamination has been found to frequently occur person-to-person rather than from food items, as described by Meakins et al. [43].

Another aspect, only partially assessed in the present study, involves immunosuppressed patients, with persistent concerns regarding the consumption of raw foods among these patients; however, recommendations in this regard have become slightly flexible over time in light of studies demonstrating the weak scientific evidence and, ironically, the uneven application across hospitals within the same country, as well demonstrated in the Swiss case of low-bacterial regimens [44]. In the present study, the selected dish was not included in the menu provided to haemato-oncology wards to avoid unnecessary risks. However, during retrospective data analysis, we identified three patients who had undergone solid organ transplant, distant from the acute phase (>three months) and had consumed the Piemontese fassona beef tartare, as well as two patients with an acquired immunodeficiency on immunoglobulin therapy (Privigen®) and two haematologic patients transferred for severe acute respiratory syndrome coronavirus 2 infection to the COVID department; no infectious complications were documented in any of these patients. Accordingly, the findings of the present study illustrate the feasibility of the practice, although delivery should be re-evaluated at all times, as advocated and recommended by the various guidelines [10].

Conclusion

In geographic areas of low agro-food contamination, the introduction of raw beef dishes is possible in both hospital and standard diet regimens and hospital wards that do not treat severely immunosuppressed patients, provided that there is strict adherence to certified high hygienic standards during the entire preparatory procedure.

Statement of Ethics

The study was conducted in accordance with the Declaration of Helsinki. This study protocol was reviewed and the need for approval was waived by Ethics Committee Canton Ticino-Switzerland (Req-2023-01350, CE Ref TI4487).

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Author Contributions

M Quarenghi: Conceptualization, methodology, data writing original and draft preparation. Turri Quarenghi R: Supervision and reviewing. Mallone M, Chiaravalloti T, Bergamaschi A: Writing, reviewing and editing. All authors read and approved the final manuscript.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Data Availability Statement

All data generated or analyzed during this study are included in this article. Further enquiries can be directed to the corresponding author.

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