Bovine spongiform encephalopathy crisis in Europe and its impact on beef consumption in Slovenia

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Summary
The bovine spongiform encephalopathy (BSE) crisis in Member States of the European Union adversely affected beef consumption in Slovenia in 1996. Although the disease has not been reported in Slovenia to date, the controversy about the link between BSE and Creutzfeldt-Jakob disease and scandals related to the illegal trade in beef in some countries have triggered doubts among consumers. Beef consumption in Slovenia was estimated using a beef supply model, consisting of the following variables: purchase and slaughter of cattle and import and export of beef. The model estimated that beef consumption fell by 16% in 1996 compared with consumption in 1995. Approximately half of the reduction was compensated by an increase in consumption of pork and poultry meat.

Keywords
Beef consumption – Bovine spongiform encephalopathy – Cattle – Europe – Slovenia.

Introduction
The occurrence of bovine spongiform encephalopathy (BSE) in cattle, and of the new variant Creutzfeldt-Jakob disease (nvCJD) in man has clearly provoked significant changes in cattle and beef markets, not only in the United Kingdom (UK), but also in other European countries (1, 3). The economic consequences of BSE in the UK have been represented on the market (home and foreign demand for cattle) and in the production sector (additional costs for breeders and for the meat industry) (2). Vast expenses have been incurred within the state budget and within the budget of the European Union (EU) (compensation for the compulsory slaughter of animals and for interventions on the market to restore consumer confidence) in addition to other long-term and hidden costs (6).

The status of the BSE threat in Slovenia has been monitored since 1991. In 1992, the histopathological diagnosis was introduced and since 1996, stricter controls have been applied: the brains of all cattle that have shown progressive clinical neurological signs must be examined histologically. In addition, histological examinations of brains from a randomly chosen sample of cattle over four years of age and slaughtered for human consumption have been performed. Monitoring of cattle at slaughter is still taking place (as at July 1999).

In Slovenia, regulations governing the import, transit and export of cattle, cattle products and raw materials have been harmonised with regulations in the EU. Since 1993, the import of meat and meat products from countries with a low incidence of BSE has been subject to the same conditions as those imposed in the EU. Meat must originate from cattle under two and a half years of age and must not come from farms on which BSE has been discovered in the past six years. Bones and all internal organs have to be removed. Meat-and-bone meal (MBM) must be heat-treated for 30 min at 140°C at 3 bars. In 1996, further preventive measures were introduced. At the end of March 1996, the Minister of Agriculture, Forestry and Food of Slovenia prohibited the import of cattle, cattle products and raw materials from the UK, Ireland, France, Switzerland and Portugal (countries in which cases of BSE had been recorded in native-born cattle), irrespective of their intended use. Since May 1996, the use of cattle brains, spinal cord, spleen, thymus, intestines and the visible lymphatic tissue for human consumption and the use of MBM in the nutrition of ruminants have been prohibited (9, 10).
The average annual beef consumption in Slovenia is estimated at 26 kg per resident for the period 1992-1995 (11). Beef production in Slovenia is insufficient to satisfy domestic demand: the degree of self-sufficiency in the same period amounted to 85%. Although Slovenia is a net importer of beef, the export of beef is an important activity. Meat and meat products of the highest quality are exported. According to the Statistical Office of the Republic of Slovenia, 2,726 tonnes of beef were exported and 13,827 tonnes of cattle and meat were imported in 1995.

The events connected with BSE in the UK and elsewhere in the EU in 1996 were strongly echoed in Slovenia. Although no cases of BSE or nvCJD have ever been detected in Slovenia and risk analysis shows a very low probability of the introduction of the disease (4), beef consumers are anxious. Sales of beef in Slovenia have fallen significantly according to publicly stated estimations.

The objective of this study was to estimate the impact of the BSE crisis in Europe on beef consumption in Slovenia. Since the demand for beef in Slovenia is growing, any study of the impact of animal disease on the beef market of Slovenia is of practical importance.

Materials and methods

Data for the analysis were taken from the regular research results of the Statistical Office of the Republic of Slovenia. The reaction of beef consumers in Slovenia to the BSE crisis in the EU can be estimated from sales of beef on the market in Slovenia. Unfortunately, the Statistical Office abandoned the collection of data on sales in 1995; however, other data on variables that have a direct relation with beef consumption are still recorded. These are as follows:

- purchase of cattle
- quantity of cattle slaughtered for human consumption
- export and import of cattle and beef.

Using this data from the Statistical Office, beef consumption in Slovenia can be estimated indirectly. The analysis was therefore based on a model of the beef supply chain. In terms of supply, purchase and import of cattle are at one end of the supply chain while sale on the domestic or foreign market is at the other end. Purchased cattle are either sent to a slaughterhouse or exported; meat is either used for direct consumption, manufactured or exported. Since beef production in Slovenia lags behind demand, the shortage of beef on the domestic market is balanced by foreign supply.

It is presumed in the analysis that all parties in the chain behave rationally. According to the principle of rationality, purchasers adapt the number and the price of purchased cattle for slaughter to the demand on the domestic beef market and to the conditions on foreign markets (7). However, the purchasers do not have full power, since purchase is bound to contracts to a certain degree. There is, therefore, a conviction that foreign trade, which is also influenced by the economic policy of the government, is more elastic to the demand on the domestic market than is the purchase of cattle. In regard to foreign trade, it is true that it is easier to adapt to the needs of the domestic market by altering levels of imports rather than exports.

On the basis of the beef supply model presented above, an equation of beef consumption in Slovenia has been developed, as follows:

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\text{beef consumption} = \text{slaughter of cattle} + \text{import of beef} - \text{export of beef}.
\]

The variable 'slaughter of cattle' is comprised not only of the slaughter of cattle raised in Slovenia but also of imported cattle. In addition, not all the cattle reared in Slovenia are slaughtered in slaughterhouses; many small farms in Slovenia are geared to the sale and home consumption of beef, outside the main supply chain. It is estimated that 30% of the annual production of beef is consumed in this way (11). In 1996, the increase in sales of beef outside the main supply chain would be expected because of consumer distrust related to the BSE crisis elsewhere in Europe. However, the latest calculations of the Statistical Office do not show such a movement (8); sales outside the main supply chain were estimated to be 32.7% in 1995 and 33.9% in 1996 (an insignificant rise).

The equation of beef consumption does not include foreign trade in live cattle. However, imported cattle are sooner or later reflected in the variable 'slaughter of cattle'. Including the import of cattle in the equation would therefore mean doubling the amounts and overestimating beef consumption.

The quantity of stored beef has been deliberately excluded from the equation. From the economic perspective it is logical to expect that little residual stored beef exists. It should be stressed here that the equation of consumption has to be seen dynamically and not statically. Possible changes in quantities are of interest, not the absolute values of variables. Consequently, stored beef would be important only if the quantity stored changed. For the reasons stated, it is considered that the reliability of the analysis would not be affected by ignoring stored beef.

As an introduction to the analysis, the consistency of statistical data on the slaughter of cattle was tested. Since most purchased cattle are slaughtered in slaughterhouses, it is expected that the number of purchased cattle will closely correspond to that of cattle slaughtered in slaughterhouses. Comparing the two variables confirms the assumption. The calculated coefficient of correlation is 0.87 (P<0.001).
Results and discussion

Figure 1 shows the quantity of purchased and slaughtered cattle in tonnes (live weight for purchased cattle and carcass weight for slaughtered cattle) for the period between 1993 and 1997. The figure also represents deflated purchase prices of the 'young fed cattle' category (the right-hand scale, Slovenian Tolars [SIT]). Young fed cattle represent approximately 80% of all purchased cattle.

If the quantities of purchased and slaughtered cattle over the entire period are considered, a slight rising trend can be seen (despite a fall in 1993 and 1994). The increase in quantity of purchased cattle in 1995 and partly in 1996 follows a significant rise of purchase prices in 1994. A one-year delay in response to the price rise is a logical consequence of the length of the production cycle.

In 1996, no reduction in quantities of purchased or slaughtered cattle was noticed. The downward trend of the curve in the first half of the year is part of the seasonal oscillations which are characteristic of the purchase and the slaughter of cattle. The analysis of seasonal oscillations in slaughter shows a systematic increase in the summer followed by a reduction in the winter. Thus, from a statistical point of view, the reduction at the beginning of 1996 does not exceed the range of regular monthly oscillations in slaughter (P>0.6). The quantity of cattle slaughtered in July 1996 was the highest recorded between 1992 and 1996.

Slaughter of cattle is only one of the variables in the written equation of beef consumption. Foreign trade must also be taken into consideration. By using the equation to calculate beef consumption in Slovenia, consumption in 1996 is shown in a different light (Table I). Unfortunately the Statistical Office does not collect data on foreign trade on a monthly basis, therefore consumption can only be calculated on the basis of annual figures.

Beef consumption has fallen by 16% in 1996 as compared to 1995, despite the increase in slaughter. Consumers have partly replaced beef with pork (2% increase) and poultry (4% increase). However, this replaces only 49% of the total reduction in beef consumption.

The calculated reduction in beef consumption can neither be attributed simply to the impact of BSE on consumer demand, as other factors can affect the demand for beef. Nor should the factors on the supply side be neglected. Agricultural policy can have a particularly significant impact on both supply and demand. The main reason for this reduction of beef consumption may be found by examining the variables in the equation of consumption. The graphic representation of the dynamics of the variables may simplify the answer (Fig. 2).

In Figure 2, export and import refer to live cattle and beef, although the equation of consumption includes only international trade in fresh and frozen beef. The variable 'slaughter of cattle' already includes imported cattle, as does the variable 'export of beef'. In order to discuss the developments on the market in Slovenia, it is important to

![Figure 1](image_url)

**Fig. 1**
Monthly dynamics of cattle purchased and slaughtered in Slovenia, 1993-1997
understand international trade in live cattle and beef. Figure 2 shows that Slovenia was a net importer of cattle and beef. In the period under observation, beef consumption increased until 1994, while slaughter decreased. The suppliers adapted to the demands of the beef market by increasing imports and by reducing exports. However, business decisions of this kind are always influenced by many other factors such as currency exchange rates and prices on foreign markets.

Purchase price rises for cattle in 1994 were followed by increased purchase in 1995, which continued in 1996. Consumption in 1995 remained at the same level as the previous year while the import curve turned down. The movement of foreign trade in cattle and beef seems to be predominantly directed by the situation on the domestic market. The excess of beef due to the reduction of beef consumption in 1996 and to the increase of cattle purchase intensified the need to increase exports and decrease imports. Imports were reduced by half, while the structure of beef imports changed significantly. In 1995, approximately 70% of imported beef was fresh and 30% frozen. These proportions were inverted in 1996, which was a consequence of the 400% reduction in the import of fresh meat in comparison with the previous year, while the quantity of imported frozen meat remained static. Such a significant reduction in the import of fresh meat can be regarded as a logical consequence of the reduced final demand for beef on the market in Slovenia. On the other hand, the export of beef in 1996 more than doubled. Practically all (97%) of the exports of cattle and beef from Slovenia represent the export of fresh meat to Italy. The export of cattle and beef increased in 1996 despite the adverse conditions on European markets, where the negative attitude of consumers in connection with BSE was reflected indirectly in a reduction in price, from as early as 1994 (2, 5). Thus, the increased export of beef from Slovenia in 1996 was not stimulated by the export price rise.

The dynamics of the variables can therefore be explained by the calculated beef consumption on the Slovenian market in 1996. Conclusions drawn from the dynamics also support the hypothesis that the main reason for the reduction of beef consumption lies in the demand of the market. An obvious surplus exists on the supply side which can be seen in Figure 2. It is unlikely that retail beef prices would increase in conditions of over-supply. Hence elevated retail beef prices could not curb the demand.

Taking into account all the aspects discussed above, the most plausible explanation for the reduction of beef consumption in Slovenia seems to be the consumer reaction to the perceived risk of eating beef.

Conclusions

The analysis of quantities of cattle purchased and slaughtered, and of the imports and exports of beef, supports the hypothesis that the BSE issue in the EU has also adversely affected beef consumption in Slovenia. Despite the reduction in beef consumption, the purchase of live cattle has not decreased, which is assumed to be a result of contractual relations between producers and purchasers. Since Slovenia is a net importer of beef, the supply has adjusted to the reduction of beef consumption by decreasing imports and increasing exports of beef.

The representatives of the Veterinary Services of Slovenia have stressed many times, in public statements, that the risk of BSE appearing in Slovenia is negligible. However, these public statements were overshadowed by the controversy concerning the connection between BSE and nvCJD, and by scandals related to the illegal trade in beef in some countries.
La crise de l’encéphalopathie spongiforme bovine en Europe et son incidence sur la consommation de viande bovine en Slovénie

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Résumé
La crise de l’encéphalopathie spongiforme bovine (bovine spongiform encephalopathy: BSE) dans les États membres de l’Union européenne a eu des effets négatifs sur la consommation de viande bovine en Slovénie en 1996. Même si la maladie n’a pas été signalée en Slovénie à ce jour, la polémique sur le lien possible entre la BSE et la maladie de Creutzfeldt-Jakob ainsi que les scandales liés au commerce illégal de viande bovine dans certains pays ont suscité des doutes chez les consommateurs. La consommation de viande bovine en Slovénie a été estimée à l’aide d’un modèle relatif à l’offre de cette viande, reposant sur les variables suivantes: achat et abattage de bovins, et importations et exportations de viande de bœuf. D’après les estimations du modèle, la consommation de viande bovine a baissé de 16% entre 1995 et 1996. Cette diminution a été compensée pour près de la moitié par une augmentation de la consommation de viande de porc et de volaille.

Mots-clés

La crisis de la encefalopatía espongiforme bovina en Europa y su influencia sobre el consumo de carne vacuna en Eslovenia

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Resumen
La crisis de la encefalopatía espongiforme bovina (EEB) en los Estados Miembros de la Unión Europea tuvo efectos adversos sobre el consumo de carne vacuna en Eslovenia durante 1996. Aunque hasta la fecha no se haya comunicado la presencia de la enfermedad en Eslovenia, la polémica sobre la relación entre la EEB y la enfermedad de Creutzfeldt-Jakob, aunada a los escándalos de tráfico ilegal de carne vacuna en algunos países, han bastado para despertar el recelo de los consumidores. Para estimar el consumo de carne bovina en Eslovenia se utilizó un modelo basado en el abastecimiento de carne, que incorporaba las variables de adquisición y sacrificio de ganado y de importación y exportación de carne vacuna. Según estimaciones realizadas con dicho modelo, el consumo de carne vacuna en 1996 cayó en un 16% con respecto al de 1995. Cerca de la mitad de esa reducción se compensó con un aumento del consumo de carne porcina y aviar.

Palabras clave
References


