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CONTENTS

SYMBOLIC MATHEMATICAL MANAGEMENT MODEL BASED ON THE ECONOMY OF COSTS AND THE PRICE OF HEALTH SERVICES IN VETERINARY MEDICINE

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Abstract

The article deals with matrix pre-indicator representations as premises for the applicative study of the economics and management of biochemical and biophysical control structures for ensuring the veterinary sanitary sustainability. For the first time, originally as a scientific contribution in the article, the general symbolic mathematical model of the studied process/phenomenon was elaborated, which confirms the conclusion that as the amplitude/scope of veterinary health services increases, in close connection with the increase of costs, the benefit marginal social health is declining.

Keywords: *cost, benefit, biochemical and biophysical control, mathematical model, veterinary health sustainability*

Introduction

It is found that the dimensions of the sustainable development framework refer to themes and sub-themes that should be matrixed together in an indicator system that, in the end, provides an aggregate, composite, evaluative indicator on the sustainability of development.

The environmental dimension has affecting multidimensional repercussions on all other dimensions of the general framework of sustainable development.

Such a symbolic formalized picture, with matrix pre-indicative representations, represents premises for the applicative study of the economics and management of biochemical and biophysical control structures for ensuring the veterinary sanitary sustainability.

Material and methods

In such a referential system it is found that between the prices and costs, the curve of marginal veterinary sanitary costs (C^s_{im}) evolves.

This has an increasing tendency, in general, maintaining the proportionality found in the fact that if the costs increase, as a consequence, it must / should or even it increases the prices (value) of veterinary health services (Fig. 1).

A managerial model based on the economy of costs and price of veterinary health services starts from their referential classification in the quadrant $\{(P_s) * O * (\Delta S)^n\}$ in which $(\Delta S)^n$ = marginal costs of providing veterinary health services (assimilated / equal to marginal social benefits); (P_s) = veterinary sanitary price.

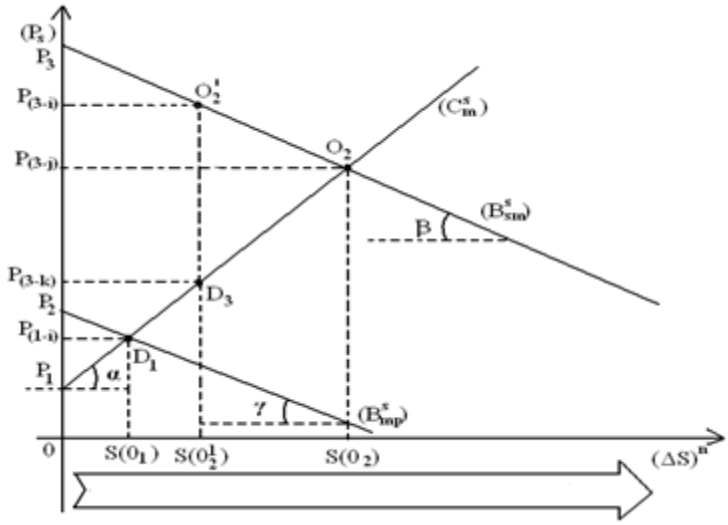

Fig. 1. *Scheme of the managerial model based on cost savings and the price of sustainable health services in the veterinary field*

On the other hand, in practice, it is found that at the prices obtained / determined, the value of the veterinary health managerial social benefit (B_{sm}^s) is maximized (high).

Results and discussions

As the amplitude / extent of veterinary health services increases, in close connection with the increase of costs, the marginal social health benefit registers a decrease.

As such, the curve of this indicator is sloping towards maximized / increased costs.

The same trend, the same meaning and the same decrease are registered in the case of the marginal private sanitary medicine (B_{sm}^s).

These intersections of the curves, associated with different slopes, occasion the symbolic formalization of the managerial model based on the economy of costs and the price of veterinary sanitary services.

For the first time, originally as a scientific contribution, the general symbolic mathematical model of the studied process/phenomenon was elaborated, as follows:

$$\begin{cases} \left(\Delta S^{t(n)}\right)^{+} \approx (P_s)^{+} \\ \left(\Delta S^{t(n)}\right) \cap (P_s) \rightarrow (\Delta\propto)^{+} \\ (P_s)_{max} \rightarrow (B^s_{sm})_{max} \rightarrow \left\{\left(\Delta S^{t(n)}\right)_{min} > 0\right\} \\ \left(\Delta S^{t(n)}\right)_{max} \rightarrow \max(\Delta\beta)^{-} \\ (C^s_m) \cap (B^s_{sm}) \rightarrow (\Delta\beta)^{-} \\ (P_s)_{med} \rightarrow \left(B^s_{mp}\right)_{med} \rightarrow \left\{\left(\Delta S^{t(n)}\right)_{med} > 0\right\} \\ \left(\Delta S^{t(n)}\right)_{med} \rightarrow med(\Delta\gamma)^{-} \\ (P_s)_{med} \cap \left(B^s_{mp}\right) \rightarrow (\Delta\gamma)^{-} \end{cases} \quad (1.1)$$

The above mathematical model, launched for the first time in the specialized literature in the veterinary field, is contributing in the incipient, primary phase of symbolic formalization of the studied/researched process/phenomenon.

Next, this original model undergoes equational mathematical iteration.

Each symbol holds finite sets of parameters, factors, variables and constants specific to the constitution of the process/phenomenon of sustainable veterinary health service.

The parameters in question, as equational elements, when they take values from the set of real numbers lead to the removal of indeterminacies, respectively to the measurement and dimensioning of the components of the researched subject.

The next step is the transformation of the equational mathematical model into a computerized model, which based on tele-informational programming and using calculation/computing operations values of an objective/purpose function are obtained, maximized or minimized, as conventional managerial expectations are established/assumed in the veterinary field. [11]

In this context, interpretative statements are made in connection with the original model developed in order to clarify the alignments that would serve its equational mathematization under the imperatives of optimal organization and management, maximized as efficiency / effectiveness.

The graph in fig. 1 shows that, in fact, the costs of providing the conventionally accepted veterinary sanitary service at the level of scheduled/imposed sustainability also include the opportunity costs of alternative use of the infrastructures in which the veterinary sanitary services are carried out, borne by the owner (state or private, or mixed, public-private).

The transaction costs of the veterinary service in question can be added to these.

The beneficiary / consumer of the veterinary sanitary service is found on the surplus area $\{P_{(3-j)}; O_2; P_3\}$.

In practice, it is found that the public or private market of quasi-sustainable veterinary health services frequently registers failures.

Between the marginal benefits of private veterinary health (B^g_{mp}) and beneficial social managerial veterinary health (B^g_{sm}) there are divergences just as often. [8]

As such, the predominant provision, with predilection, in the most usual, common way of the veterinary sanitary services characterized by a certain level of sustainability occurs at the incidence of costs $\{S(O_1)\}$.

The managerial projections in the field aim at a) adjusting the situations of failure, erosion, inadequacy of the market of sustainable veterinary health services and b) tangency/reaching the optimal social level of insurance/preferred provision of sustainable veterinary health services at the price level $\{P_{(3\text{-}j)}\}$.

So to reach the cost level $\{S(O_2)\}$, so in order to spend more (maximized) to get more positive results, it would be necessary to practice a price (insurance of resources, payments) of at least $\{P_{(3\text{-}j)}\}$.

The prices paid are almost always not enough to outline/obtain the resources related to the level $\{P_{(3\text{-}j)}\}$, to ensure spending at cost levels $\{S(O_2)\}$, with marginal benefits, obviously increased. [5]

It is estimated that this dysfunction, permanently encountered in almost all infrastructures owning/carrying veterinary health services, which are required to be sustainable, is caused by a so-called phenomenon of "generic parasitism" (functional peace, less self-sufficiency of consumers of veterinary health services or due to lack of funds/amounts to finance the achievement/satisfaction of the price $\{P_{(3\text{-}j)}\}$ requested/scheduled).

It is noted that however, at costs $S(O_2)$ deadline (B^g_{sm}) has higher values than the marginal costs of providing related veterinary health services.

Conclusions

1. The model thus conceived shows that, in fact, the largest surplus of good veterinary sanitary service for the beneficiary is registered for the area $\{O_3; O^1_2; P_3; P_{3\text{-}k}\}$.

2. In essence, the symbolic mathematical managerial model based on the economics of costs and prices of sustainable veterinary health services is found in graphic modelling expression, bearing formalizing equivalence, which by visualizing the evolutionary meanings and trends of marginal cost, prices and benefits helps to establish resolution and the accuracy of the equational mathematical elaborations in the field.

3. Veterinary health, including veterinary health services and the field of veterinary health sustainability, is among the topics related to the social dimension of general sustainable development.

4. The main dimensions of the sustainable development framework refer to the practical social value, to the environmental problems, to the economic evolutions, as well as to the institutional constructions in the field.

5. It is observed that the dimensions of the sustainable development framework cover topics that can be found in a matrix in an indicator system with the help of which to obtain an aggregate, composite indicator, referring to the sustainability of development.

6. Health, human and veterinary medicine, the general health system and sustainability / sustainable development ensure the feasible / reliable advancement of human communities today.

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CURRENT APPROACHES IN CHEMICAL HAZARD RELATED WITH FOOD SAFETY AND MEAT CONTROL

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Abstract

It is known that ingestion of chemicals such as veterinary drugs, hormones or pesticides in edible animal parts constitutes a potential health hazard for consumers because of possibility of developing multidrug resistance, carcinogenicity or other illnesses, etc. In the current EU legislation, chemical residues and contaminants in live animals and animal products intended for human consumption are addressed in Council Directive 96/23/EC. Identification and ranking of potential concerns within this document include all chemical compounds listed in this Council Directive, Annex I of Council Directive 96/23/EC, the group of substances that may be found in animal tissues into two categories. Following a risk based approach, EFSA has identified and ranked chemical health hazards in meat. As requested by the European Commission, EFSA has recommended improvements to meat inspection procedures to protect consumers from risks related to biological and chemical hazards.

Keywords: *chemical, consumers, public health hazards, meat*

General overview about the beginning of the awareness of risk related with chemical substance used in agro and livestock sectors

Residues and chemical food contaminants arise from a variety of sources, such are natural toxins, industrial contaminants, agrochemicals, veterinary drugs, food processing and packaging. Directive 96/22/EC prohibits the use of hormones in food producing animals except for well-defined therapeutic and zootechnical purposes and under strict veterinary control. Beta-agonists are used therapeutically in human and animal medicine. When are used at higher doses, they can also act as growth promoters by stimulating the increase of the muscular mass and reducing the adipose tissue. Directive 96/22/EC prohibits the use of beta-agonists in food producing animals except for well-defined therapeutic purposes and under strict veterinary control. Regarding prohibited substances (nitrofurans, Chloramphenicol etc.), they are not allowed to be administered to food-producing animals.

The COVID-19 pandemic has underlined the importance of a strong and resilient food system that functions in all circumstances and is capable of ensuring access to a sufficient supply of affordable food for citizens. The Commission will

take additional action to reduce the overall use and risk of chemical pesticides by 50% and the use of more hazardous pesticides by 50% by 2030 and also the Commission will revise the food contact materials legislation to improve food safety and public health regarding food packaging (a key role in the sustainability of food systems).

Stockholm Convention established that all parties must take measures to eliminate or reduce the release of POPs into the environment because residues of pesticides in food are a global problem. The Stockholm Convention on Persistent Organic Pollutants (POPs) was adopted by the Conference on 22 May, 2001 in Stockholm, Sweden. Initially, under Stockholm Convention only 12 POPs (3 categories) have been recognized as causing adverse effects on humans and the ecosystem: **pesticides** (aldrin, chlordane, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene, mirex, toxaphene), **industrial chemicals** (hexachlorobenzene, polychlorinated biphenyls (PCBs); by-products (hexachlorobenzene; polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF)), and **PCBs**.

POPs are carbon based organic chemical substances. Because of chemical properties, they can remain in the environment, intact, for a very long period of time (many years); they can accumulate in tissue (fatty, particularly) and are toxic to both humans and wildlife. In 2017, 16 additional POPs have been added. The main objectives of the Convention is to *prohibit and/or eliminate* the production and use of **POPs** that are listed in **Annex A** (e.g.: Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene, PCB); *restrict* the production and use of POPs that are listed in **Annex B** (e.g.: DDT); *reduce or eliminate* releases from unintentionally produced POPs that are listed in **Annex C** (Polychlorinated dibenzo-p-dioxins and dibenzofurans, Hexachlorobenzene).

According to EFSA "*the current procedures for sampling and testing are a mature system, well established, coordinated, and subject to regular evaluation that is in place across EU MSs, with residue testing that is based on common standards for method performance and interpretation of results (Commission Decision 2002/657/EC), laboratory accreditation (ISO/IEC 17025) and quality assurance schemes (QAS)*" (www.efsa.europa.eu, 2020).

General overview about food hygiene, meat inspection and chemical hazard

The European Union has a comprehensive legislative framework in place governing the use of pesticides. To ensure consumer protection, legal limits *known as maximum residue levels (MRLs)* are set on the amount of pesticide residues that can be permitted on food. So in the present MRLs have been set more than 500 pesticides in over 370 food products. The Commission's guiding principle primarily sets out in its **White Paper on Food Safety** is "*to apply an integrated approach from farm to fork covering all sectors of the food chain*".

According to EFSA: "*[...] is a need to develop new approaches to testing. Recent developments in chemical analytical techniques allow the simultaneous measurement of a broad range of substances. Analytical techniques covering multiple analyses and new biologically based testing approaches should be incorporated into feed quality control and NRCP testing. Application of such validated methods for multi-residue analyses, comprising veterinary drugs, pesticides and natural and environmental contaminants, should be encouraged. (soil; water, etc.)"* (https://www.efsa.europa.eu/, 2020).

Regarding meat inspection in the EU, there are precise specifications in Regulation (EC) No 854/2004. According to this Regulation, the main objective of meat inspection is to ensure that meat is safe and fit for human consumption. Rank undesirable or harmful chemical residues and contaminants in animals such chemical substances may occur as residues in edible tissues from the exposure of animals to contaminants in feed materials as well as following the possible application of non-authorized substances and the application of authorized veterinary medicinal products and feed additives. From these points of view, EU rules regarding food hygiene and meat inspection must cover all stages:

- production;
- processing;
- distribution;
- placing on the market.

In terms of *chemical risk in meat control,* there are still two approaches: traditionally and modern inspection techniques.

Traditional inspection techniques were not always suitable for detecting chemical contaminants (such as pesticides, hormones, veterinary drugs, etc.) and to ensure good public health standards. But for this moment, according to EFSA, modern meat inspection means:

- monitoring chemical (toxic) residues and contaminants based on risk of occurrence taking into account food chain information and prioritization by level of concern;
- more flexible control programs based on test results and open to new hazards;
- more integrated sampling, testing and intervention protocols for monitoring; chemicals in the food chain and environmental contaminants.

Modern met inspection related with *chemical hazards* should include:

- risk assessments on a wide range of chemicals that can be present in **food**;
- risk assessments on a wide range of chemicals that can be present in **feed**;
- risk assessments on a wide range of chemicals that can be present in **environment**.

The chemical risk is represented by:

- **mycotoxins** (aflatoxins, ochratoxin A, fusarium-toxins, patulin, etc.);
- **plants** (plants used as feed materials may contain a broad variety of toxic secondary metabolites);

- **metals** (cadmium, lead, mercury, inorganic, etc.) (from anthropogenic activities);
- **dioxins and PCBs**, polycyclic aromatic hydrocarbons (PAH), 3-MCPD and nitrates;
- **acrylamide**;
- **furan**.

The current legislation, such as Council Directive 96/23/EC, requires that the minimum number of bovine animals to be controlled each year for all kinds of residues and substances is 0.4% of the bovine animals slaughtered the previous year; minimum number of pigs that have to be controlled each year for all kinds of residues and substances is 0.05% of the pigs slaughtered the previous year; minimum number of sheep and goats that have to be controlled each year for all kinds of residues and substances is 0.05% of the sheep and goats; the minimum number of samples for each category of poultry must be one per 200 t of annual production, with a minimum of 100 samples for each group of substances where annual production in the category concerned is over 5,000 t and for horses, Council Directive 96/23/EC requires that the number of samples is to be determined by each Member State in relation to the identified problem (www.efsa.europa.eu/publications, 2020).

The latest EFSA regulations on chemical hazard related with meat inspection depending on the animal species and the category of chemicals (Table 1, Table 2):

Table 1

Chemical Hazard Related with Meat Inspection by EFSA (https://www.efsa.europa.eu/)

Species	Chemical hazards
Cattle	Dioxins, dioxin-like polychlorinated biphenyls (DL-PCBs)
Sheep and goats	Dioxins, Dioxin-like polychlorinated biphenyls (DL-PCBs)
Solipeds	Phenylbutazone*, Chemical elements (*cadmium)*
Farmed game (Deer)	None
Farmed game (Wild boar)	None
Farmed game (reindeer, ostriches, rabbits)	None

*EFSA recommended that phenylbutazone, which is not allowed in the food chain, be specifically included in the National Residue Control Plans (NRCPs) for solipeds.

Table 2

New Chemical Hazard Only for Two Categories of Animals (Farmed Game and Bovine) (EFSA Journal 2013; 11(6):3264; EFSA Panel on Contaminants in the Food Chain – CONTAM Panel; 2005-2010 period)

Category of meat/ Other observations:	Chemical hazards
Farmed game: a. Chemical hazards generally cannot be detected by current ante-/post-mortem meat inspection procedures. b. For farmed game and rabbits, the FCI should provide information on the specific environmental conditions of the farms where the animals are reared, including treatments. c. RECOMANDATION! Control programmes under the NRCPs should include "***new hazards***" and take into account information from environmental monitoring programs which identify chemical hazards to which animals may be exposed. d. European Commission Decision 97/747/EC requires that a minimum of 100 samples of farmed game (unspecified as to species) are to be taken annually for the NRCP testing, rather than the level of testing being proportional to the production of each species in each MS.	1. *Substance irrelevant* in farmed game or rabbit production (no known use at any stage of production). **2.** *Low potential concern* (VMPs/feed additives which have an application in farmed game or rabbit production, residues above MRLs are found in control plans, but substances are of low toxicological concern; E.g. **prohibited substances used at growth promotion such are stilbenes, thyreostats, steroids, resorcylic acid lactones, β-agonists) or organochlorine pesticides, chemical elements (lead and mercury) and natural toxins; veterinary medicinal products (VMPs) and feed additives above MRLs.** 3. *Medium potential concern* (Contaminants and prohibited substances to which farmed game or rabbits are known to be exposed and/or with a history of misuse, with a toxicological profile that does not entirely exclude specific hazards following accidental exposure of consumers; contaminants generally not found in concentrations above the MRLs/MLs in edible tissues of farmed game or rabbits; E.g.: **chloramphenicol, nitrofurans, nitroimidazoles, cadmium)** 4. *High potential concern* (Contaminants and prohibited substances to which farmed game or rabbits are known to be exposed and with a history of misuse, with a distinct toxicological profile comprising a potential concern to consumers; evidence for ongoing occurrence of residues of prohibited substances in farmed game or rabbits; evidence for ongoing occurrence and exposure of farmed game or rabbits to feed contaminants); E.g. **No substances were classified in the high potential concern category for farmed game or rabbits.** ☠ **NEW HAZARD** – anthropogenic chemicals in food-producing animals and derived products and in humans and for which occurrence data in farmed game and rabbits; E.g.: **olychlorinated dibenzo-p-dioxins, polychlorinated dibenzofurans (together often termed 'dioxins', dioxin-like PCBs (DL-PCBs), nondioxin-like PCBs (NDL-PCBs), brominated flame**

	retardants, such as polybrominated diphenylethers (PBDEs) and hexabromocyclododecanes (HBCDDs), or perfluorinated compounds, such as perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA). Radioactive caesium is another "new hazard" to be considered for farmed reindeer. ***!!! There is a need for an improved integration of sampling, testing and intervention protocols across the food chain, NRCPs, feed control and monitoring of environmental contaminants.***
Bovine: a. Samples should be taken on-farm and at slaughterhouse level with the aim of detecting illegal treatment or controlling compliance with the maximum residue limits (MRLs) for VMPs according to the Commission Regulation (EU) No 37/2010, with the maximum residue levels for pesticides as set out in Regulation (EC) No 396/2005, or with the maximum levels (MLs) for contaminants as laid down in Commission Regulation (EC) No 1881/2006 (Regulation (EC) No 396/2005 of the European Parliament and of the Council of 23 February 2005 on maximum residue level of pesticides in or on food and feed of plant and animal origin and amending Council Directive 91/414/EEC. OJ L 70, 16.3.2005, pp. 1–16. Commission Regulation (EC) No 1881/2006 of 19 December 2006 setting maximum levels for certain contaminants in foodstuffs. OJ L 364, 20.12.2006, pp. 5–24.). b. Self-monitoring residue testing. c. Dioxins and DL-PCBs which accumulate in food-	**Group A** – Substances having anabolic effect and unauthorized substances; E.g.: steroids; Beta-agonists; antithyroid agents. **Group B** – Veterinary drugs (antibacterial substances, including sulphonamides, quinolones); other veterinary drugs; other substances and contaminants (organochlorine; organophosphorus; chemical elements; mycotoxins, etc.). 1. *High potential concern*: dioxins and dioxin-like polychlorinated biphenyls (DL-PCBs). 2. *Substances classified in the medium potential* concern category (prohibited substances: stilbenes, thyreostats, gonadal (sex) steroids, resorcylic acid lactones, beta-agonists, chloramphenicol and nitrofurans); chemicals. 3. *Substances classified in low concern category*: prohibited substance; mycotoxin; natural toxins from plants; contaminants: organochlorine pesticides and organophosphorus compounds. 4. *Substances classified in the negligible potential concern category*. E.g.: prohibited substances, colchicine, dapsone, chloroform and *Aristolochia spp*. ☠ **NEW HAZARD:** 1. Polybrominated diphenyl ethers (PBDEs) in food. PBDEs are additive flame retardants which are applied in plastics, textiles, electronic castings and circuitry. PBDEs are ubiquitously present in the environment and likewise in biota and in food and feed. As these compounds bioaccumulate in the food chain, they deserve attention and should be considered for inclusion in the NRCPs. 2. Hexabromocyclododecanes (HBCDDs) in food (EFSA, 2011e). HBCDDs are additive flame retardants primarily used in expanded and extruded polystyrene applied as construction and packing materials, and in textiles.

producing animals have been ranked as being of high potential concern. d. Bovine farming in the EU is diverse, with substantial differences between intensively and extensively produced animals, and between veal calves and adult bovine animals, and consequently the types and likelihood of occurrence of chemical residues and contaminants will vary. e. With very few exceptions, presence of chemical hazards cannot be identified by current ante-/post-mortem meat inspection procedures at the slaughterhouse level, indicating the need for further harmonization of risk reduction strategies along the entire food chain.	3. Perfluorinated compounds (PFCs), such as PFOS, PFOA and others, have been widely used in industrial and consumer applications including stain- and water-resistant coatings for fabrics and carpets, oil-resistant coatings for paper products approved for food contact, fire-fighting foams, mining and oil well surfactants, floor polishes and insecticide formulation (perfluorinated compounds with different chain lengths into meat and various organs of the cows). 4. Chemical elements (cooper, selenium, zinc over used in bovine feeds). !!! *Considering the recent information available from the reassessment of undesirable substances in the food chain, covered by more recent EFSA opinions of the CONTAM Panel, additional compounds have been identified that require attention. Only a small number of compounds are considered to constitute a high potential concern for consumers.* *!!! Brominated flame retardants, including polybrominated diphenylethers (PBDEs), as well as hexabromocyclododecanes (HBCDDs) and perfluorinated compounds (PFCs), such as perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA), have a different toxicological profile. These compounds bioaccumulate* ***in the food chain and deserve attention,*** *as currently the* ***knowledge*** *about the prevalence and level of residues of these compounds in edible tissues of bovine animals* ***is limited****.* *!!! The development of analytical techniques covering multiple analysis and of new biologically based testing approaches should be encouraged and incorporated into feed quality control and chemical residues and contaminants testing in the NRCPs*

Table 3

Pesticide Residue Control and Consumer Exposure Degree in Pesticides in Food and on the Surface of Food of Animal Origin Pursuant to the Provisions of Application Regulation (EU) No. 2015/2015*

No.	Substance	Matrix and year implementation	Number of samples	Sampling unit	Analysis method
1.	Aldrin, Dieldrin, Bifentrin Clordan, Chlorpyrifos Chlorpyrifos-methyl, Cypermethrin, DDT Deltametrin, Diazinone Endosulfan, Famoxadone	2016 Raw cow's milk Pork fat	17 annual samples from each matrix in part	Animal farms Milk producers Meat processing units	Regulation (EC) no. 595/2002 Directive (EC) 63/2002 NSVFSA Order no. 147/2004 Regulation (EC) no. 882/2004 of the European Parliament and at Council regarding official controls made on imports of certain food products for animals and food of origin non - animal and modifying a Decision 2006/504 / EC
2.	Endosulfan, Famoxadone, Fenvalerate, Heptaclor, hexachlorobenzene, hexachlorocyclohexane, (HCH), beta isomer, Indoxacarb (only from milk in 2016 and at butter in 2018), hexachlorocyclohexane (HCH), beta isomer, Lindab, Methoxychlor, parathion Permethrin, Pyrimiphosmethyl, Spinosad (if only analyses the liver in 2017)	2017 Fat bird Liver (cattle and other ruminants, pig and poultry)		Processing unit Slaughterhouse or unit processing	
		2018 Butter Chicken eggs		Processing unit Egg collection centre, repacking centre	

*From The Multi-Annual and Coordinated Control Program of the Union for 2016, 2017 and 2018 by Insurance of the Maximum Limits of Pesticide Residue and Exposure Evaluation of Consumers to Pesticide Residue in Food and on Food Surface. The control of pesticide residues and the assessment of consumer exposure to pesticide residues in animal feed are done based on the specific program developed by NSVFSA.

In Romania, regarding the chemical hazards, it was noted that **chemical testing** is based on **common standards** for method performance and interpretation of results, laboratory accreditation and quality assurance schemes. Three competent authorities are involved in elaboration and implementation of National Control Program for pesticides residues: *National Sanitary Veterinary and Food Safety Authority (NSVFSA), Ministry of Agriculture and Rural Development (MARD) and Ministry of Health (MH)* (the national annual report is published and can be found at www.ansvsa.ro, www.madr.ro.). National Sanitary Veterinary and Food Safety Authority (NSVFSA) (the coordinator) has the responsibility for preparing the National Multiannual Control Program for pesticides residues in cooperation with the other two CAs. NSVFSA also has the responsibility for elaboration and implementation of its own National Program for Surveillance and Control for food of plant and animal origin, performed by Sanitary Veterinary and Food Safety County Divisions and BIPs. The Program sets the samples of food of plant origin from Member States and third countries, the point of sampling, the active substances to be analysed. In Romania, the Ministry of Agriculture and Rural Development (MADR) has the responsibility for national monitoring plan of pesticides residues in fruits, vegetables, cereals from domestic market. Implementation of monitoring program is performed by MADR through Laboratory for Pesticides Residues Control in Plants and Vegetable Products and Zonal Laboratory for Pesticides Residues determination in Plants and Vegetables Products – Mures, which analyses the samples taken by Counties and Bucharest Phytosanitary Units.

EFSA states monitoring program for chemical hazards should be more flexible and based on the risk of occurrence, taking into account FCI (food chain information), which should be expanded to reflect the specific environmental conditions of the farms where the animals are reared, and the ranking of chemical substances, which should be regularly updated and include new hazards. Control program across the food chain, national residue control program, feed control and monitoring of environmental contaminants should be better integrated.

On the other hand, the Romanian Rapid Alert System for Food and Feed (RASFF) is an instrument through which information is exchanged between the competent central authority for food and feed in Member States where an EU health risk is identified; its use has led to appropriate measures, such as the detention, withdrawal, confiscation or rejection of the products in question (Table 3, Table 4).

RASFF system includes four Central Authorities competent in matters of food safety:

- The National Sanitary Veterinary and Food Safety;
- Ministry of Health;
- Ministry of Agriculture and Rural Development;
- National Authority for Consumer Protection.

Table 4

Official by Rasff Notifications for Products Having the Country of Origin Romania (Report, 2018)

Notified by	Type of product	Year	Substance	Origin by Country	Confirmed
Germania	Food supplement	2013	Mercury	Processed in Romania and Switzerland, raw material from China via Germany and Belgium	x
Germania	Feed corn and total	2013	Aflatoxine B1	Romania via Belgium	x
Germania	Feed corn and total	2013	Aflatoxine B1	Serbia via Romania	x
Germania	Turkey breast	2013	MRL enrofloxacina	Romania	invalidated
Italia	Salami	2015	Dye E124 unauthorized	Romania	
Italia	Cheese	2015	LMA exceedance of dioxin-type polychlorinated biphenyls (PCBs)	Romania	x
Italia	Cheese	2013	LMA exceedance of dioxin-type polychlorinated biphenyls (PCBs)	Romania	x
Romania	Poultry meat and poultry meat products	2014	LMA exceeded for veterinary drug residues (tetracyclines)	Romania	x
Italia	Horse meat	2014	Heavy metal (LMA outdated Cadmium)	Romania	x
Romania	Horse meat	2014	Heavy metal (LMA outdated Cadmium)	Romania	x
Germania	Feed	2013	Aflatoxine	Romania	invalidated
Italia	Sausages with ham	2013	Undeclared dye E 124 - Ponceau 4R / cochineal red A (7.73 mg / kg - ppm) and of colour E 129 - So Red AC (2.21 mg / kg - ppm)	Romania	x

Table 5

Control of Contaminants in Food of Animal Origin, Carried Out on the Basis of the Specific Program Elaborated by National Sanitary Veterinary and Food Safety Authority (NSVFSA)*

No. crt.	Group of chemical substances	Chemical substance	Biological substrate	The sampling unit	Methodology	
					Screening	Confirmation
1.	**Heavy metals**	Lead	meat (without organs) bovine, sheep, pig, pig wild boar and bird	slaughterhouses; units of meat processing; units of cutting; meat units minced meat and prepared meat, units for sale with retail; units game manipulation	Regulation (EC) no. 333/2007	Regulation (EC) no. 333/2007
			liver of cattle, sheep, pig, wild boar, bird	slaughterhouses; units of meat processing		
			fish fillet muscles as is it in Regulation (EC) no. 1881/2006, with subsequent amendments	Units fresh produce from fishing; units fish processing; deposit refrigeration; fisheries; units marketing		

			crustaceans, muscle abdominal, muscle on appendices, and in the case crabs and crustaceans similar (*Brachyura and Anomura*) muscle on appendix	Units for sale with retail; deposits freezer		
			animal fats, including milk fats (butter, sour cream)	Processing units, cold storage, units retail sale		
	Heavy metals	Cadmium	meat (except organs) of cattle, sheep, pig and poultry yard, wild boar	Slaughterhouses, units meat processing; units of meat slicing; meat units minced meat and prepared meat, game handling units; units for sale with retail	Regulation (EC) no. 333/2007	Regulation (EC) no. 333/2007
			horse meat, with except for organs	Meat processing units; meat cutting units; minced meat and meat units prepared, slaughterhouses		

			liver from cattle, sheep, pigs, poultry yard, horses, pig wild boar	Slaughterhouses, units meat processing unit		
			kidneys from the cattle, sheep, horses, pigs, poultry	Slaughterhouses, units meat processing unit		
			fish fillets mentioned with except for species listed in the Regulation (EC) no. 1881/2006, with subsequent amendments	Fish processing units, cold storage, fishermen, grocery stores, units for sale with retail		
			golden fish, mackerel, Moroccan sardine, tuna, tuna black, anchovy, swordfish	Fish processing units, cold storage, fishermen, grocery stores, units for sale with retail		
			shellfish, eel, chef, sardines, mackerel	Fish collection centres, fish processing units, units for sale with retail		

		Mercury	crustaceans, muscle on appendix and abdomen, crabs and similar crustaceans (*Brachyura and Anomura*) the muscle on the appendix	Refrigerated warehouse, units retail sale	Regulation (EC) no. 333/2007	Regulation (EC) no. 333/2007
			fishery products and fish fillets	Refrigerated warehouse, retail units, Collection centres, units fish processing		
		Tin	canned foods (canned meat, canned fish)	Processing units, units retail sale		
2.	**Dioxin, furans and PCBs related dioxins**	The amount dioxins and PCBs of type	meat and meat products (without organs) from cattle, sheep, swine and poultry (extensive system)	Slaughterhouse, cutting units, processing units	Regulation (EU) no. 589/2014 a Commission of 2nd of June 2014 by the establishment methods sampling and methods analysis for control	Regulation (EU) no. 589/2014
			liver and derivatives coming from cattle, sheep, pigs and birds of the yard	Slaughterhouses, units processing, units for sale with retail		

		dioxins	fish meat, products of fish, except to those provided for in section 5 section 5.3. from annex to the Regulation (EC) no. 1881/2006, with subsequent amendments	Fish processing units, cold storage, units retail sale	levels of dioxins, PCBs dioxins and dioxins PCBs that do not are the type dioxins, in certain products food and drink. Repeal a Regulation (EU) no. 252/2012	
			fish fillets	Fish processing units, units for sale with retail		
			fat from cattle, sheep, pigs and birds	Slaughterhouses, processing units fats for consumption human		
			animal fats mixed	Slaughterhouses, processing units fats for consumption human		
3.	**Aromatic polycyclic hydrocarbs**	Benzopiren	smoked meat and products from smoked meat with traditional characteristics	Units for sale with retail (butchers; from fairs where it is sells products traditional)	Regulation (EC) no. 333/2007	Regulation (EC) no. 333/2007
			smoked meat and products from smoked meat	Processing units		

			smoked fish fillets and fishery products smoked,	Processing units, units retail sale		
			smoked fish fillets and fishery products smoked	Processing units, units retail sale		
			smoked sprinkles and canned smoked sprinkle	Deposits, units for sale with retail		
4.	**Melamine**	Melamine	meat products without membrane packs into plastic containers	Processing units, units retail sale	US FDA / 2009- method of determination melamine through GC/MS/MS	US FDA / 2009- method of determination melamine through GC/MS/MS

***** Section 9. A. Control of pollutants in food with animal origin, according to provisions of Regulation (EC) no. 1881/2006 of the commission from 19 December 2006 of establishing the maximum levels for certain contaminants in products food, with the following amendments and completions, as well as conform requirements for certification of products of animal origin intended export to third countries.

Food safety in Romania and meat inspection is under the current legislation from our country such is *Methodological Norms Program of the Surveillance, Prevention, Control and Eradication of Animal Diseases*, *those transmitted from animals to humans, animal protection and environmental protection, identification and registration of cattle, swine, sheep, goats and equine, and the rules for the application of surveillance and control program on food safety* (approved by the President of NSVFSA no. 35/2016). According to this regulations, control of contaminants in food of animal origin are made for four groups of chemical substances (Table 5, Table 6).

Table 6

Monitoring Other Substance Groups in Foods of Animal Origin Intended for Export to Third Countries*

No.	Food category	Criteria	Referential interpretation results	The unit from which are taken samples / Stage to which the criterion is applied food safety
1.	Meat for children under 3 years	Lead Mercury Hexaclorcyclohexane (ά-, β-, γ- isomers) DDT and metabolites	Annex no. 3 to the Technical Regulation of Customs Union TR CU - / 2011	Certified units export operations in Customs Union
2.	Meat for children over 3 years old	Lead Mercury Hexaclorcyclohexane (ά-, β-, γ- isomers) DDT and metabolites	Annex no. 3 to the Technical Regulation of Customs Union TR CU - / 2011	Certified units export operations in Customs Union
3.	Meat	Arsen Cadmium	Annex no. 3 to the Technical Regulation of Customs Union TR CU - / 2011	Certified units export operations in Customs Union
4.	Meat products at stored in container chrome	Chromium	Annex no. 3 to the Technical Regulation of Customs Union TR CU - / 2011	Certified units export operations in Customs Union
5.	Organs (liver, heart, tongue)	Lead Mercury Hexaclorcyclohexane (ά-, β-, γ- isomers) DDT and metabolites	Annex no. 3 to the Technical Regulation of Customs Union TR CU - / 2011	Certified units export operations in Customs Union
6.	Organ products (liver, heart, tongue) stored in container chrome	Chromium	Annex no. 3 to the Technical Regulation of Customs Union TR CU - / 2011	Certified units export operations in Customs Union

* In Accordance with the provisions of Annex No. 3 to the Technical Regulation of the Customs Union TR CU 021 / 2011 on Food Safety. Hygiene Conditions and Food Safety of Products for Children Using as Raw Materials Obtained After Slaughter.

Conclusions

In order to indicate incidence of chemical hazard related with meat inspection and food safety and strategy control monitoring data were analysed. Official reports (e.g., the European Food Safety Authority), Technical regulation (officials websites etc.), Scientific reports or papers from international institutions such as the European Commissions (EC), Reports of National Sanitary Veterinary and Food Safety Authority (NSVFSA) or Alerting and monitoring systems for chemical hazard (melamine, PCBs, heavy metals, pesticides etc.) were included in this research. Based on them, chemical hazard is a very present subject important both at European level and in Romania as well.

In Romania, sampling for meat security is done from slaughterhouses, units of meat processing, units of cutting, meat units minced meat and prepared meat, units for sale with retail, units game manipulation, slaughterhouses, units of meat processing, units fresh produce from fishing, deposit refrigeration, fisheries etc., based on Regulation (EC) no. 333/2007.

Polybrominated diphenylethers (PBDEs) as well as hexabromocyclododecanes (HBCDDs) and perfluorinated compounds (PFCs) bioaccumulate in the food chain and deserve attention. Farmed reindeer radioactive caesium is another "*new hazard*" to be considered.

28 European Union (EU) Member States reported in the framework of the residue in 2018 the frequency of non-compliant results was increased for **antithyroid** agents and **steroids**, while decreases were noted **for mycotoxins, antibacterials, anthelmintics, pesticides** such as organochlorine compounds.

Chemical hazards can be introduced into the chain via environmental sources such as soil, air, water and feed and can be prevented by a good quality control to prevent process contaminants. From this point of view, *modern* met inspection related with *chemical hazards* should include risk assessments on a wide range of chemicals that can be present in *food*, in *feed* and in *environment.*

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2. Directive 96/23/EC establishing residue monitoring plans, sampling frequency and range of substances to be tested.

3. Directive 2003/74/EC, concerning the prohibition on the use in stockfarming of certain substances having a hormonal or thyrostatic action and of beta-agonists.

4. Ordin nr. 147/2004 pentru aprobarea normelor sanitare veterinare şi pentru siguranța alimentelor privind reziduurile de pesticide din produsele de origine

animală şi nonanimală şi reziduurile de medicamente de uz veterinar în produsele de origine animală http://legislatie.just.ro/Public/DetaliiDocument/59321

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THE IMPORTANCE OF CLINICAL EXAMINATION AND INTRAORAL RADIOLOGY IN FELINE TOOTH RESORPTION

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Abstract

Between 30% and 70% of the cats suffer from feline odontoclastic resorptive lesions (FORL) or tooth resorption (TR), a noncarious odontogenic destruction of cat teeth, with or without replacement of the roots by bone. It affects all cats, young and adult, male and female, pure breed or mixed. Although the aetiology of this disease is yet unknown, the involvement of genetic predisposition cannot be ruled out, taking into consideration the many cases of tooth resorption in pure breed cats.

The diagnosis can only be made with an X-ray.

Keywords: *intraoral radiology, feline tooth resorption, cat*

Introduction

There are two types of tooth resorption: type 1 – without replacement of the tooth roots by bone and type 2 – with replacement of the tooth roots by bone. These lesions are covered by sore gum and pulpar tissue. They are generally located at the cemento-enamel junction cement or at the furcation of the multiradicular teeth.

Initial lesions may be asymptomatic, with the exception of halitosis, for a long time. In advanced stages, the animal has trouble chewing which results in weight loss and even anorexia.

Material and methods

The study was done in Romania in a clinic in Bucharest, which has as a profile veterinary dentistry.

All cats presented with dental conditions in the period 2017-2019 were monitored.

Results and discussions

Most commonly affected teeth are the third mandibular premolar (307/407), the fourth mandibular premolar (308/408) and the fourth maxillary premolar (108/208 – Fig. 4, 10 and 11).

When dealing with FORL patients, it is important to always take intraoral radiographs in order to decide therapeutic options. A series of full mouth radiographs is mandatory for analysing the distribution, extent and shape of the roots and lesions.

Fig. 1. *308 and 309 with type 1 TR*

Fig. 2. *Intraoral X-ray of a cat with type 1 TR in 204*

Fig.3. *Clinical examination of a cat with tooth resorption, right maxilla*

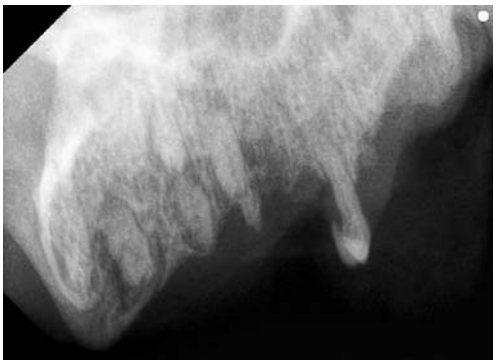

Fig. 4. *Intraoral X-ray of the right maxilla of the cat in fig. 3*

Fig. 5. *Early stage type 1 TR affecting the rostral mandible of a cat (down)*

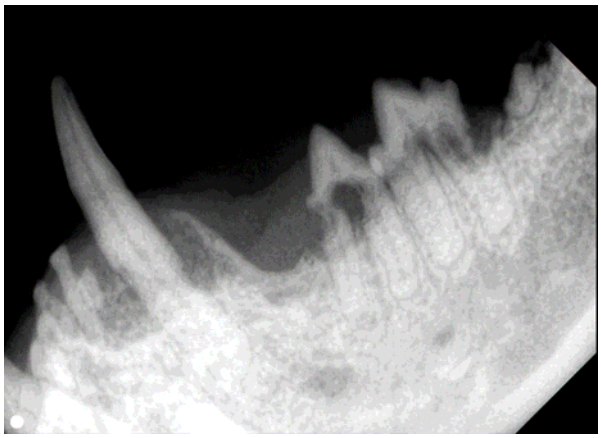

Fig. 6. *Early stage type 1 TR affecting the left mandible of a cat (up)*

The roots of teeth with type 1 TR have an intact and identifiable periodontal ligament and a similar radiopacity to the roots of the adjacent teeth. Radiographically, the roots of teeth affected by type 2 TR are less radiodense than the roots of adjacent teeth, the periodontal ligament disappears, and the root structure becomes hard to identify.

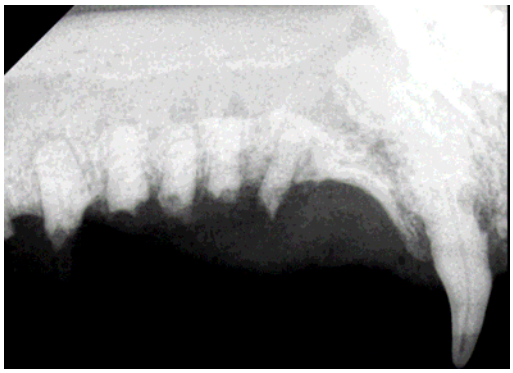

Fig. 7. *Retained roots of upper right premolars with type 1 TR and 104 with type 3 TR*

The only treatment option is extraction of the affected tooth. Extracting the root may be complicated because of the resorption and ankylosis. For type 1 TR (Fig. 1, 2, 5, 6, 7 and 10), the tooth must be completely removed.

Crown amputation of teeth with type 2 lesions (Fig. 8 and 9) results in fewer traumas to the patient and the healing will be faster and better than full extraction. Root atomization is not indicated. After extractions the patient must be regularly checked and full mouth radiographs should be taken.

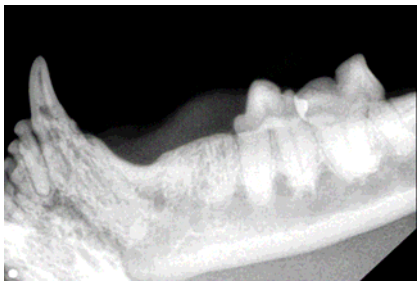

Fig. 8. *Intraoral X-ray of a cat with type 2 TR in 304 and 307, the crown of 307 is almost totally resorbed*

Fig. 9. *Intraoral X-ray of a cat with type 2 TR in 304 and 404*

Fig. 10. *Intraoral X-ray of a cat with type 1 TR in all upper left premolars*

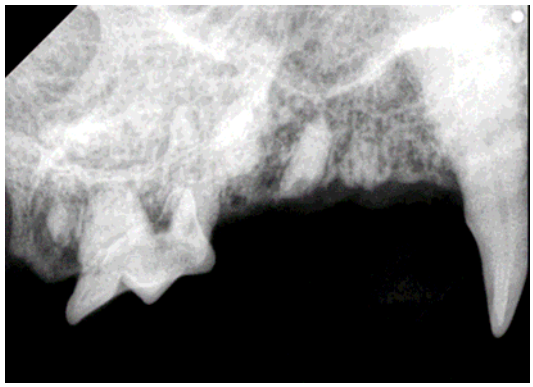

Fig. 11. *TR in the right maxilla of a cat retained roots of 106, 107*

Conclusions

1. It is important to diagnose and treat tooth resorption correctly, in order to prevent complications (iatrogenic jaw fracture) and pain in these patients.
2. The correct diagnosis can be made only after performing intraoral radiology.
3. Between 30% and 70% of the cats suffer from feline odontoclastic resorptive lesions (FORL) or tooth resorption (TR)

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USE OF CLOPROSTENOL IN BITCHES

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Abstract

The study aims using Cloprostenol in bitch, alone or in combination with Cabergoline, to induce therapeutic abortion. Over the years, the demand for therapeutic abortion has been a constant demand from pet owners, but because of the prohibitive prices of commercial preparations that are also widely used, abortion is often abandoned; this sometimes has special consequences, the resulting chicks being the result of unwanted mattings, having related parents or various diseases with vertical transmission.

However, the use of Cloprostenol to induce abortion is cheap, the only problem being that sometimes certain side effects occur. Between November 2019 and August 2020, 15 females were induced to have an abortion, using Cloprostenol alone or in combination with Cabergoline, in order to have an overview of the desired therapeutic effect and the undesirable consequences of the procedure.

Keywords: *bitch, abortion, Cloprostenol*

Introduction

The study was the consequence of requests for the induction of abortion in bitches over 10 kg in which the owners faced prohibitive prices for the usual commercial preparations. The disadvantage of using Cloprostenol is that it cannot be used in the first third of pregnancy, when the clinical signs of abortion are minimal.

Materials and methods

Induction of therapeutic abortion should be done only in females with ultrasound-confirmed pregnancy, approximately 3-4 weeks after unwanted conception. Also, medical products should only be administered under strict medical supervision for about 5 weeks. Induction of abortion took place in the second third of pregnancy with PGF2 alpha (Cloprostenol) which reduces blood circulation to the yellow bodies and causes their lysis. Progesterone synthesis falls below 2 mg/ml, at which point abortion is imminent. At the same time, PGF2 alpha acts on the myometrium by inducing its contractions and facilitating the elimination of uterine contents.

Cloprostenol contains synthetic analogues of PGF2 alpha and is administered to induce abortion from the 30th day of pregnancy.

The patients formed 3 groups of 5 females in which the following therapeutic schemes were used:

LOT 1

1) Administration of Cloprostenol 2.5 micrograms / kg every 48 hours from the 30th day of gestation.

LOT 2

2) Administration of Cloprostenol 1.5 micrograms / kg, daily for 5-7 days, starting with the 30th day of gestation.

LOT 3

3) Administration of Cloprostenol and prolactin inhibitors (Cabergoline), starting with the 25th day of gestation:

− Cloprostenol 1 microgram / kg / day S.C. 3 times at 48-hour intervals;

− Cabergoline 5 micrograms / day, daily for 7 days.

The puppies participating in the study were aged between 8 months and 6 years, weights between 4 kg and 56 kg, mixed or of different breeds: half-breed (7), Bichon (3), Shih-tzu (1), German Shepherd (2), Bucovina Shepherd (1), Husky (1).

Results and discussions

Lot number 1 consisted of the following patients: 2 Bichon females (aged between 9 months and 1.4 years, pregnant in 30 and 32 days); 1 shepherd from Bucovina (pregnant in 32 days); 1 husky; 1 mestizo (pregnant in 30 days). All were given Cloprostenol exclusively at a dose of 2.5 micrograms / kg at 48 hours, s.c. Bichon females aborted both after 3 administrations, the clinical signs following the abortion being relatively erased, dominated by apathy, moderate inappetence and vaginal discharge. The two large females (Bucovina shepherd and husky) aborted the first after three administrations, and the second after four administrations. The clinical signs that accompanied the treatment period were more pronounced in the Husky female that required (at the 4th administration) symptomatic anti-vomiting and supportive treatment, parenterally following a state of increased apathy and loss of appetite.

The female shepherd from Bucovina presented post-abortion hyperthermia (39.4 degrees Celsius) which resolved at 48 hours without antipyretic treatment.

The half-breed female had an abortion approximately 36 hours after the 3rd administration, the clinical signs that accompanied the abortion being similar to the others (single-dose vomiting, apathy, loss of appetite, prolonged lying down).

Lot number 2 consisted of 2 German Shepherd females and 3 medium-sized mixed-breed females (18-20-23 kg). The gestation age was 30/31 days according to the anamnesis. They were given 1.5 micrograms of Cloprostenol for 5-7 days.

− a half-breed female had an abortion after 5 days of treatment;

− two half-breed females and one German Shepherd female aborted after 7 days of treatment;

− a German Shepherd female did not have an abortion. On the 8th day she was given a dose of 2.5 micrograms of Cloprostenol / kg and the abortion occurred after 24 hours, accompanied by clinical signs of moderate intensity (vomiting, loss of appetite, temperature 39.2 degrees Celsius, apathy).

Lot number 3 consisted of 3 half-breed females, a bichon and a Shih-tzu.

The difference from the other groups was that the gestational age was younger: in half-breed females and Shi-tzu female – about 25 days, and in Bichon females – 28 days. All were given Cloprostenol 1 microgram / kg / day S.C. at 48 h (3 administrations per patient) and Cabergoline 5 micrograms / kg / day daily for 7 consecutive days.

Cabergoline administration should, in all cases, be started 24 hours before Cloprostenol.

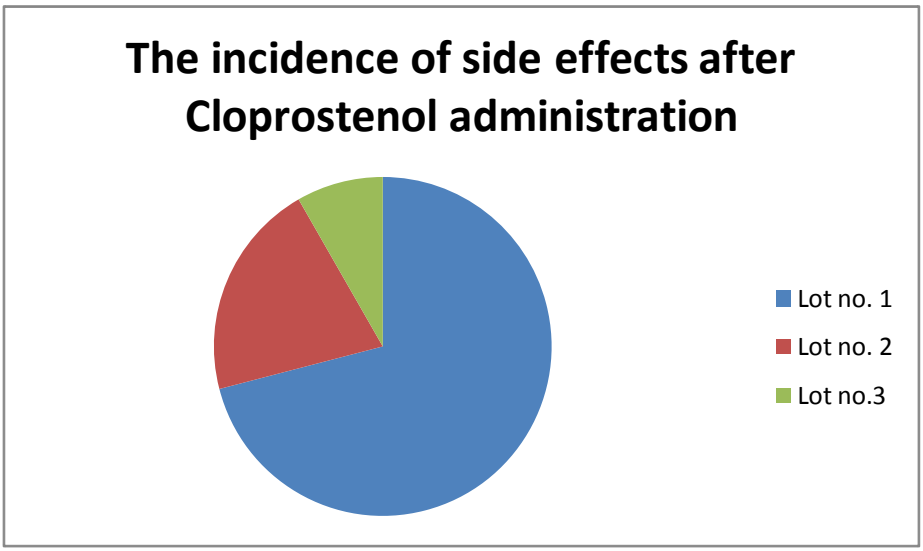

Fig. 1. *The incidence of side effects after Cloprostenol administration*

All females had an abortion at 24 h (respectively 36 h – Bichon female) after the last administration of Cloprostenol (Fig. 1).

The clinical signs were, in all cases, of very low intensity, the Shi-tzu female being the only one that showed a state of relative inappetence.

Conclusions

− The use of Cloprostenol can be useful, and for large breeds it can also present a pecuniary benefit.

− The main disadvantage of Cloprostenol is that it can only be used in the second third of pregnancy when abortion is accompanied in most cases by clinical signs, which nullifies the material advantage initially targeted.

− The association of Cloprostenol with Cabergoline is an obvious advantage due to the lack of side effects; these are due to the fact that the combination of medicinal substances can be carried out even from the 25th day of gestation; often the interruption of the pregnancy being associated with the resorption of the conception products and not with their elimination as in the cases of using Cloprostenol as the only preparation.

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