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# Mummies and 'impossible' drugs
## A new look to the Svetlana Balabanova's ethnobotanical revisionism

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ABSTRACT

*In the 1990s, the Bulgarian chemist Svetlana Balabanova undertook a series of chemical analyses aimed at searching for drugs in almost a thousand human remains from the archaeological sites of four continents. Most of these analyses resulted in findings that were 'impossible' from the point of view of the accepted history of drugs, such as the presence of cocaine in Egyptian mummies, derivatives of Cannabis in Peruvian mummies, and nicotine in Eurasian mummies and skeletons; results that contradicted the established knowledge regarding the post-Columbian diffusion of cocaine, hemp and tobacco between the Old and New Worlds. What caused a sensation and brought Balabanova to global prominence were her theses to justify these results, which conjured up transatlantic journeys by the ancient Egyptians to reach South America, with a commercial exchange of coca and hemp, and the presence of native species of tobacco in the Old World. This article presents a review of the* Balabanova affair *based on a comprehensive consultation of all the publications of this scholar concerning archaeological and ethnobotanical research. Careful observation of the numerous contradictions and inconsistencies present in these studies lead to new deductions, which reveal the strong possibility of falsification of the results of various chemical analyses, and the likelihood that other chemical analyses were never even performed. The publication of the results of these 'ghost' researches can be explained by analysing Balabanova's character, as evidenced by reading her writings on ethnobotanical revisionism which are generally not taken into consideration, and which show how much Balabanova can—and should be—considered a 'proto-conspiracy theorist', whose only interest was to* 'alter our cultural history', *at whatever cost.*

## Introduction

During the 1990s, the studies of the German team led by Svetlana Balabanova, a forensic chemist specialised in the detection of drugs in the human body, caused a sensation. For over a decade, this scholar undertook a series of analyses carried out on hair and other body parts of ancient Egyptian, European, Asian and South American mummies and skeletons. The search for psychoactive drugs culminated in surprising findings, such as the presence of cocaine and nicotine in Egyptian mummies, and THC—the main active ingredient of *Cannabis*—in Peruvian mummies. These mummies are dated long before the transoceanic adventure of Christopher Columbus, whose date (1492) is generally set as a *terminus post quem* for the presence of the genus *Cannabis* in the Americas, and for extra-American knowledge of the coca plant.

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What caused even more sensation were the hypotheses put forward by Balabanova to try to explain these results, involving transatlantic journeys by the ancient Egyptians, who would have reached South America and brought back the coca plant to their homeland, and her theory of the presence and knowledge of species of *Nicotiana* in the Old World in periods long before the adventure of the Genoese admiral.

What is surprising is the degree of certainty with which Balabanova presented her theories, coupled with the degree of incompetence in matters of ethnobotany that transpires from her writings, so much so that it is surprising that her articles were able to pass the critical judgment of the editorial scientific committees of the academic journals that hosted her publications, in spite of the numerous criticisms that were raised by experts from various scientific fields.

The hypothesis of transoceanic adventures of the ancient Egyptians was brought to the fore by the mass media of the whole world, in particular following a television program of the *Discovery* series dedicated to this topic, first broadcast by US national TV in January of 1997, and again in July 1999. This hypothesis was subsequently used, and still continues to be referred to, as firm data not only by a certain 'conspiracy theorist' literature, but also by uncritical and marginal scientific literature; literature that will not be reported here, as it is based on preconceived positions and on an excessively reduced knowledge of Balabanova's work.

This review is based on the consultation of all of Balabanova's publications in the fields of archeology and ethnobotany, including a couple of books that are never cited by those who have dealt with—for or against—the *Balabanova affair*. It is the writer's opinion that it is only through viewing all of her works that the thought and character of this researcher is revealed.

Svetlana Balabanova (1929–2015) was born in Sofia, Bulgaria. She carried out her university studies in Prague, in the then Czechoslovakia, where in 1969 she graduated in Chemistry. In 1982 she graduated in Human Biology at the University of Ulm, Germany, where she worked as a forensic toxicologist. In the second half of the 1980s she specialised in analytical techniques aimed at identifying psychoactive drugs in human tissues and fluids, particularly the hair. Her first publications date back to 1987 and concern the determination of cocaine in hair using the two analytical techniques considered among the most sophisticated at the time and which she used for all subsequent analyses, including those of archaeological finds: radioimmunologic technique (RIA) and combined gas chromatography/mass spectrometry (GC/MS) (Balabanova and Homoki 1987; Balabanova *et al*. 1987). Analytical studies for the determination of methadone (Balabanova and Wolf 1989), THC (Balabanova *et al*. 1989), caffeine (Balabanova and Schneider 1990) and nicotine (Balabanova *et al*. 1990) followed. Sometimes interpretations of her data were criticised by other toxicologists, as in the case of the determination of THC in hashish smokers, considered superficial and questionable (Käferstein *et al*. 1990).

In 1989, as reported by the same Balabanova (1997:7), she was contacted by Wolfgang Pirsig, otorhinolaryngologist and paleo-pathologist who also worked at the University of Ulm, who asked her if she was able to analyse the drugs in the hair of ancient mummies, and made the first stock of Egyptian mummy hair available to her. In the 13 years that followed, Balabanova apparently undertook the analysis of almost a thousand mummies and skeletons from archaeological sites of four continents.

## The Balabanova's research

In 1992, Balabanova's team communicated the results of an investigation carried out on nine Egyptian mummies, with the discovery of three psychoactive drugs: cocaine, THC and nicotine. The mummies dated from 1070 BCE to 395 CE. Analyses were performed on the hair, facial skin, muscles of the head and abdomen, and the bone of the head. Of the nine samples, seven consisted of only the head, another was incomplete in body and only one was a complete mummy. Regarding their provenance,

there is a reference to a *Munich Mummy Project*.[1] Apart from the absence of nicotine in one of the nine mummies, the three drugs were found in all the samples (Balabanova *et al*., 1992a).

The main critical observations that can be advanced regarding this meagre communication (only one page long), some of which were presented by different authors immediately after its publication (Hertting *et al*., 1993), are the following:

- The authors of the study did not adopt the methodology of accompanying the analysis of the tested samples with that of control samples, i.e. with organic tissues of which there is the certainty of the total absence of the substances being sought; an important technique for the validation of results, especially in cases, like this one, where positive results are obtained in all the samples analysed. This lack of use of control samples will accompany all the work of the Balabanova team, with the exception of some rare cases which, as we will see, are of dubious credibility.
- As 'excellent proof' ('in excellent agreement') of the use of these drugs among the ancient Egyptians, the authors cite a passage from the *Ebers Papyrus* (782/93, 3–5)—a hieratic writing from the period of the XVIII Pharaonic Dynasty that deals with materia medica—which they state refers to the use of poppy seeds to calm the crying of children. This is the first of a long series of inconsistent tests, misleading if not decidedly wrong, which will accompany all the work of the Balabanova team. In this case, the drugs found in the mummies have nothing to do with those present in the genus *Papaver*; moreover, the identification of the term *šꜣpn* present in that passage of the *Ebers Papyrus* as opium poppy is considered doubtful by many Egyptologists (Nunn 1986:156).
- As for *Cannabis*, in this and other writings by Balabanova's team, its psychoactive active principle THC is improperly identified with 'hashish', which is the name of the resin produced by the plant; an imprecision that denotes an unacceptable carelessness in the serious fields of analytical chemistry and ethnobotany. And a real mistake, very serious for a chemist, is the one reported in a paper published two years later (Parsche *et al*. 1994), where THC is considered an alkaloid, when it is well known that it does not belong to the chemical class of the alkaloids. That this is not a mere typo is evidenced by the fact that this error is reported throughout the article. The discovery of hemp and its derivatives in Egyptian archaeological contexts is admissible, since it is a plant of the Old World. And in fact some finds are known which would attest to a knowledge of the hemp plant among the ancient Egyptians, at least for its use as a fibre plant, while the knowledge of its psychoactive properties still remains uncertain.[2] The discovery of THC by the Balabanova team may therefore not surprise us too much; however, it is surprising that THC was found in all the mummies analysed, which span a period of 1,400 years.
- The discovery of nicotine is more problematic, since this alkaloid is present in the species of tobacco (*Nicotiana*), and we know that this American plant spread to other continents only after the adventures of Columbus. However, nicotine is also present in other plants of Eurasian origin, as highlighted by Balabanova herself in subsequent publications. What will become increasingly puzzling is the belief in the presence of *Nicotiana* species throughout the Old World, which was said

1 The establishment of the *Munich Mummy Project* was formally communicated during an Egyptology Congress held in Munich in 1985. This project was directed by Gerfried Ziegelmayer, director of the Institute of Anthropology and Human Genetics of the University of Munich, helped in organisation by Franz Parsche, anthropologist and paleo-pathologist of the same institute. Scientists from various disciplines participated in this project, aimed at studying the processes of mummification and the substances used in mummification in ancient Egypt, most of them from the Ludwig-Maximilian University of Munich, and in whose list the name of Balabanova does not appear. Various Munich institutions provided the material for this project, bringing together 15 mummified bodies, some complete, several incomplete, and in 6 cases consisting only of the mummy's head. The largest number of these mummies were provided by the München Staatliche Sammlung Ägyptischer Kunst. The article by Parsche and Ziegelmayer reported the results of the investigations carried out on the 15 mummies using X-rays, scans, endoscopy, histological observations, and chemical analyses of the substances used in the mummification. Some of these mummies were stripped of their bandages (Parsche and Ziegelmayer 1988). In this study the mummies were not analysed for their psychoactive drug content.

2 Hemp pollen has been identified inside the mummy of Ramesses II, a pharaoh who died at the beginning of 1,200 BCE (Leroi-Gourhan 1985), and hemp fabrics dated to the 2nd millennium BCE have recently been identified in the excavations of Dra Abou el-Naga, a hill near the necropolis of Thebes (Rodríguez Frade 2022).

to have been employed (smoked) by different populations, until these plants became extinct through 'forgetfulness'.

- The most surprising and enigmatic datum is the presence of cocaine in Egyptian mummies, since this alkaloid has so far been found only in the American species of the genus *Erythroxylum*, of which the plants with the greatest concentration are the two species *E. coca* and *E. novogranatense*— each with two varieties—uniquely found in South America (Plowman 1986).

The publication of Balabanova's team was followed by a series of criticisms, some baseless, others more plausible (Hertting *et al*. 1993). Among the most improbable ones, T. Schäfer, who called Balabanova's results 'grotesque', suggested the possibility of an exchange error with mummified material coming from modern drug addicts. As a more plausible hypothesis, Schäfer himself pointed out that in the modern period nicotine-based products were applied to mummies as powerful insecticides for their conservation, and complained of the lack of more sophisticated techniques in Balabanova's study, such as for example using hair-segmental analysis. This involves breaking the hair into segments about 1 cm long, corresponding to the average hair growth of one month, and analysing each segment. This provides a history of the individual's relationship to drugs over time.[3] In addition to offering data on the individual's relationship with drugs over time, this technique leads to a greater exclusion of the possibility of modern contamination. Balabanova's team did not adopt it for any of the hundreds of mummies analysed, except in rare cases, and even these are dubious. The possibility that the mummies had been treated with tobacco-based preservative products, as first proposed by Schäfer, is one of the most plausible explanations for the presence of nicotine, as will be seen later.

Schäfer himself seems to have been the first to consider the hypothesis of a transoceanic contact of the ancient Egyptians with America lasting at least 1,400 years, which in his opinion should be excluded *a priori*. While many agreed with his position and denied the possibility of these voyages, this option was later adopted by Balabanova.

Franz Parsche, a member of the Balabanova team, responded to the criticisms raised by the various scholars in an insufficient, almost arrogant manner, re-proposing the improper identification of THC with hashish—despite it having been pointed out to him—and excluding the possibility of contamination '*since our analytical methodologies exclude them*', without specifying how this exclusion would occur (Parsche, in Hertting *et al*. 1993). The impossibility of errors in the analytical methodologies adopted by Balabanova's team will be a laconic and rigid leitmotif of the rare cases of response to the criticisms raised by many sides.

In the same year, 1992, Balabanova's team published another 'impossible' result, concerning the analysis of the hair of two Peruvian mummies belonging to the 'Munich Peruvian Mummy Collection'. Dated around 1,500 CE and concerning an adult woman and a 2-month-old baby, with only the analytical technique of the radioimmunoassay, both mummies tested positive for cocaine and 'hashish' (Balabanova *et al*. 1992b). The improbable data concerns the discovery of THC ('hashish') in pre-Columbian Peruvian mummies, since, as already highlighted, it is believed that *Cannabis* could only have reached the American continent after the Columbus adventure. This article did not cause a sensation, since it probably went unnoticed having been published in a local German museum magazine.

However, an article published the following year did cause considerable sensation, where in the space of only half a page the results of the analysis of hair, skin, muscle, brain, teeth and bones of 72 Peruvian mummies dated from 200 to 1500 CE, of 11 Egyptian mummies dated from 1,070 BCE to 395 CE, of the skeletal tissue of two inhumations from Sudan and with datings, one of 5,000–4,000 BCE and the other

3 This technique has been successfully applied for example on the long hair of the 'chicha de Llulliaillaco', a 13–15 year old Inca girl who was sacrificed around 1,500 CE on a high altitude Andean volcano (6,700 m) and whose body has remained almost intact due to the low temperatures. Segmental analysis of the hair revealed a peak in cocaine intake six months before being immolated, while the presence of alcohol metabolites increased significantly in the last weeks of her life (Wilson et al. 2013).

from 400–1400 CE and, finally, of the bone tissues of 10 individuals belonging to the 'Bell Culture' (in reality it is the 'Bell-Beaker Culture') of Germany, dating back to around 2,500 BCE, were reported. In this study, nicotine was found in almost all the samples analysed, while cocaine and 'hashish' were identified in most of the Egyptian and Peruvian samples, but not in the German and Sudanese ones. The concentrations of these substances in the hair were similar to those of modern drug users (Parsche *et al*. 1993).

As already noted, the discovery of 'hashish' (THC) in Peruvian mummies is another of the 'impossible' finds in which Balabanova's team seems to have specialised, and this time the news caused quite a stir, as it was published in an international journal (*The Lancet*). The fact that the concentrations of the drugs in the hair of the mummies were comparable to those of modern users of these drugs is suspicious of a general modern contamination, since lower concentrations would be expected in millennia-old biological tissues due to their gradual degradation. As in the previous study, and in the subsequent ones carried out by this team, the investigation methodology lacks the use of control samples, and it is surprising that nothing is said about the origin of these mummies, not even in which museums they were kept. This total lack of information on the origin and biographical history of the mummies analysed will be a feature of almost all the work of the Balabanova team.

In the same year and in the same journal *The Lancet*, N. Moore published a critical note regarding the study by Parsche *et al*. (1993), citing arguments of an ethnobotanical nature and also with a certain sarcasm ('*Did the Egyptians introduce tobacco to the Americas?*') (Moore *et al*. 1993). To this criticism Parsche this time responded with some caution by stating that he had no explanation for the presence of THC in Peruvian mummies nor for cocaine in Egyptian ones, and that there was a need for further investigations. It should be noted that this caution of Balabonova's associates in interpreting their results will in time gradually transform into ever more daring certainties.

In 1994, in an archeology magazine of the Canary Islands (*Eres*), Balabanova's team published the analyses performed on the bones, teeth and hair of 62 mummified human remains of Peruvian origin, and this time they did their utmost to expose the biographical history of these finds: they were discovered during three excavation campaigns carried out from 1932 to 1954, they date from 115 to 1,500 CE, and are currently kept in the Peruvian Mummy Collection in Monaco. Thirty-four of 61 mummies tested positive for cocaine, 39 of 45 for nicotine, and 39 of 60 for THC. The researchers also reported that they had performed segmental hair analysis of seven individuals (Parsche *et al*. 1994).

Also in 1994, Balabanova and Schultz gave a very short communication on research conducted on the skeletal remains of 30 individuals from the site of Nevall Çori, in south-eastern Turkey (7,000–6,500 BCE), and of 34 individuals from the Basta site, in southern Jordan, both belonging to the late PPNB cultural horizon (7,000–6,500 BCE).[4] They reported the total absence of nicotine and its major metabolite, cotinine. The latter is generally considered a metabolic product following the intake of nicotine, and in the analysis of biological findings it is preferable to look for this metabolite, with the aim of excluding the possibility of external contamination by nicotine. However, one should note that cotinine is present as a secondary alkaloid in *Nicotiana* species, and can be formed by the auto-oxidation of nicotine outside the human body (Frankenburg and Vaitekunas 1957), thus including the possibility that positive results may be due to external contamination.

Also, again in 1994, members of Balabanova's team gave a brief communication on the investigations carried out on 11 Egyptian mummies and 55 Peruvian mummies, in this case without any indication of their origin and chronology. They searched for THC, cocaine, morphine and caffeine, but did not specify whether and in which mummies they found these substances, with the exception of the communication of the discovery of THC in Peruvian mummies and cocaine in Egyptian mummies,

4 PPNB = Pre-Pottery Neolithic B, is a Neolithic culture widespread in upper Mesopotamia and in the Mediterranean Levant, dating 8,800–6,500 BCE.

without giving more specific information on the number of mummies that tested positive to these drugs. This short communication has something of the surreal about it. Most of the few lines are taken up with nonsensical explanations of the results of these analyses. For example, one reason given was that '*it is historically known that Peruvian people chewed coca leaves and that Egyptians used frankincense and myrrh in ritual ceremonies and in medical prescriptions*' (Hobmeier and Parsche 1994). The authors did not look for frankincense and myrrh compounds in their analyses, and implicating these substances is part of their 'pull the wool over your eyes' method to conceal the inconsistency of their research.

In the same year, 1994, Balabanova communicated the results of the analyses performed on the bones of four artificially mummified bodies obtained from unspecified '*excavation sites located in Egypt*', and on the bones of 20 naturally mummified bodies of European origin, without specifying which ancient culture they belonged to, or by which museums or other institutes they were kept, simply with the vague indication of the dating for all these mummies as '*from 3,000 to 1,400 years*', probably meaning 'years ago', which she neglects to add. To these samples were added 15 bone samples from modern individuals who died in traffic accidents, both smokers and non-smokers. Nicotine and cotinine were found in all ancient samples, while nothing is said concerning the results on the control samples. The highest concentrations were found in the Egyptian samples—concentrations in some cases very high—and since cotinine was present in concentrations of no more than 3% compared to nicotine, the authors deduced that plants containing nicotine had been used during embalming, and that cotinine was formed later by oxidation from nicotine (Balabanova and Scherer 1994).

In the years 1994–1995 members of the Balabanova team presented the results of an investigation carried out on an Egyptian mummy of the XXI Dynasty, dated to 950 BCE, of which they finally reported the post-excavation biography in a fairly thorough way. The mummy, which was kept in the State Collection for Egyptology in Munich, was undressed during these studies. Once stripped it showed considerable destruction of the anterior chest wall. THC, nicotine and cocaine were again found, and the highest concentrations of nicotine and cocaine were found in the stomach of the mummy, while the highest concentrations of THC were located in the lung tissue (Nerlich *et al*. 1994, 1995; Parsche and Nerlich 1995). These data suggested an intake of cocaine and nicotine orally and of THC by inhalation, and the authors suggested that the purpose of the intake was medicinal, in particular to relieve the physical pain caused by the disease (Nerlich and Parsche 1994).

In 1994 and 1995, Balabanova and her team presented the results of a nicotine research investigation carried out on skeletons showing bone deformations in 33 individuals from the Austrian cemetery of Lenthia/Linz, dated to 300–400 CE, and in 97 individuals from the Austrian site of Gars/Thunau, dating to 800–1,000 CE. The reason for choosing individuals who manifested pathological deformations was to verify whether nicotine had been used as a medicinal agent. Nicotine was detected in 33 of the 97 samples from the Gars/Thunau site and in only one of the samples from the Lenthia/Linz site. No significant correlation was found between the presence of nicotine and bone pathologies. Furthermore, nicotine was found predominantly in infants, a fact which according to the authors suggested its use '*as a "domestical remedy" and not as a strong medicinal agent*' (Balabanova *et al*. 1995a), which in reality is an unsubstantiated claim.

Continuing the investigations in Egyptian territory, Balabanova's team analysed samples of 134 naturally mummified bodies from the site of Christian Sayala, in Egyptian Nubia, dated from 600 to 1,100 CE. The presence of nicotine was determined in 115 of the 134 analysed bone tissues, and in 27 of the 34 analysed hair samples. The concentrations of nicotine in the bones increased with the increase in the age of the individuals, reaching the maximum in the age group between 7 and 13 years, and then decreased in the remaining age groups; while the nicotine concentration in the hair was highest in the 1–6-year-old population, and decreased in the 7–14-year-old group. The presence of nicotine in the mummies of infants was explained by the placental transmission of the alkaloid from the mother to the fetus, or by means of mother's milk. In an attempt to explain the halving of the nicotine concentration

in the hair of young people aged 7–13 compared to those aged 1–6, the authors implicated the cessation of breastfeeding at 6 years of age (Balabanova *et al*., 1996a); babies are usually weaned very much earlier.

The same team carried out investigations on the natural mummies of Sayala, in search of cocaine. It is not specified whether these mummies were part of the stock already analysed for the search for nicotine or whether they concerned other mummies from the same archaeological site; it would have been important to know whether the same individuals were taking both nicotine and cocaine. The tested sample consisted of 71 individuals, all dating between 600 and 1,100 CE, and in 34 of these the hair was also analysed. Cocaine was identified in 56 individuals, and once again in this case the highest concentration was found in the age group between 1 and 6 years. The authors did not consider the slightest doubt that this presence of cocaine was caused by the use of the coca plant, and seem to be scrambling to try to reconcile their results, particularly the variations in cocaine concentration in the various age groups: to explain the maximum concentrations in infants, they came to hypothesise that coca-rich saliva was given to children as a tranquilizer, without giving any supporting ethnographic or pharmacological reference to the highly unlikely 'calming' effect of cocaine in children. The decline in cocaine concentration in individuals over 6 years of age was again explained by the cessation of breastfeeding at that age. Furthermore, the increase in cocaine in the age group of 23–39 years would have corresponded to the period of greater labor productivity, for which cocaine would have been used as a stimulating agent, and its decrease recorded in individuals older than 40 years would have indicated a reduction in working activity (Balabanova *et al*. 1997a).

In a further investigation, the Balabanova team analysed bone tissues from four artificial mummies and seven natural Egyptian mummies, dating between 1,070 BCE and 395 CE, and from six skeletons from the Austrian site of Franzhausen, dated to 2,000–1,500 BCE. The highest nicotine content was found in artificially mummified Egyptian bodies. The concentrations of cotinine turned out to be very low, and according to the authors this could be an indication of an assumption of nicotine shortly before the death of the individual, thus leaving no time for its metabolisation and transformation into cotinine; or, *Nicotiana* plants were used post mortem during the embalming process, and in this case the low amounts of cotinine recorded could have been formed later by oxidation (Balabanova *et al*. 1997b).

The same team searched for nicotine in ancient skeletal remains of Chinese origin, again without giving any information about their institutional provenance. An initial communication (Balabanova *et al*. 1995b) reported the analyses performed on eight remains from Neolithic sites in the Chongtan area, in Guangxi, dating around 3,700 BCE, in search of nicotine, morphine, cocaine and THC. Only nicotine was found, in 5 individuals.

In a second communication, the same team reported the results of the analyses performed on 81 bone samples of Chinese origin, with assumed dating from 10,000 to 100 years ago. The origin of these samples is not clearly specified, it would seem that at least a part came again from the Chongtang site—without any indication whether they were new samples or if those already analysed in the previous communication were included (Balabanova *et al*. 1995b)—and from the Leiguden site, both from southern China. Nicotine and cotinine were detected in 21 samples. The quantities of nicotine were mostly low, and its finding in the collarbones of some skeletons from the Guilin site dated between 10,000 and 7,000 years ago would, if true, represent the oldest documented human relationship with this alkaloid. Some of the samples dated to the last few centuries, at a time when American tobacco had already arrived in China. In this study a control method was employed, with the analysis of the bones of modern smokers and non-smokers who died in road accidents (Balabanova *et al*. 1996b).

In another investigation, Balabanova's team searched for nicotine in the bone tissues of 123 skeletons from the Im Rauner cemetery, in the Kirchheim unter Teck area, Land of Baden-Württemberg, Germany, belonging to the Merovingian cultural horizon, dating to 450–700 CE. Nicotine was identified in 18

individuals, while in another 49 trace concentrations were found (Balabanova *et al*. 2001).

A final chemical investigation seems to have been carried out on two naturally mummified bodies found in the suburban area of the Roman imperial-age legionary fortress of Carnutum (Austria), dating from the mid-2nd century to the mid-4th century CE. Tissues from autopsies of modern non-smoking traffic victims were used as control samples. The two mummies tested positive for nicotine (Balabanova 2004).

## The Balabanova's ethnobotanical revisionism

Balabanova's team found drugs everywhere, in ancient burials from four continents, in about half of almost a thousand mummies and skeletons analysed, and several results belong to the category of 'impossible' findings from an ethnobotanical point of view (see Table I). To justify the 'impossible' findings, Balabanova proposed ever more daring solutions, in an ever more certain and stubborn manner, paralleling the growing volume of criticisms raised by other scholars. Their framework of what can be called *ethnobotanical revisionism* was based on the following hypotheses/certainties:

1. The existence of nicotine-rich *Nicotiana* species in the Old World which were used in Europe, Asia and Egypt, and which were subsequently forgotten, until their total extinction. The most common method of intake of these species of tobacco was by inhalation through the practice of smoking with pipes, objects that would be commonly present among Eurasian archaeological finds.
2. Transatlantic voyages of the ancient Egyptians continued for over a millennium, with the exchange of psychoactive drugs (coca and *Cannabis*) with the ancient Peruvian populations.

It must be taken into account that Balabanova did not start from scratch in her work of ethnobotanical revisionism, but referred to old theses; which however had already been largely refuted. She herself stated in the introduction of her book on Old World tobaccos that '*these scholars, rejected by the scientific world at the time, have become for me the main guide of this work*' (Balabanova 1997: 8). The researcher was also strongly influenced and encouraged by a recent discovery, that of tobacco fragments in the mummy of Pharaoh Ramesses II (see a little further on), and the refusal by the scientific community to consider the validity of this discovery only served to strengthen the rigidity and 'conspiracy theorist' vision of the Bulgarian scholar.

## Tobaccos of the Old World

The thesis of the existence of ancient species of tobacco in the Old World was the one most developed by Balabanova, to whom she also dedicated a short monograph in German with the title *The history of the tobacco plant before Columbus outside America and smoke through the centuries* (Balabanova 1997). This book has been ignored by those who have discussed Balabanova's work; this is an important omission, since it is in this book that the author, without the restriction of mediation from her research team colleagues, indulged in arguments that highlight a more complete vision of her thought and character. In other words, it is this book—which would like to be a treatise on the ethnobotany of tobacco, and had been preceded by an article with similar arguments (Balabanova 1994)—that fundamentally shakes the scientific credibility of the Bulgarian scholar.

The thesis of ancient tobacco plants of the Old World, which Balabanova began to support immediately after criticisms were raised regarding her first research published in 1992—as can be seen in her book on the history of hair (Balabanova 1993: 149–150)—was articulated on various regional directives—Egyptian/African, Asian and European—for each of which she supplied evidence that was, in her opinion, decisive.

As far as Egypt is concerned, starting from 1993 the Bulgarian chemist ventured into what appears to be one of her most striking oversights which she continually proposed in her writings, awkwardly exposing arguments of an entomological nature: she brought as demonstration of the presence of tobacco

in ancient Egypt the discovery of carcasses of an insect popularly known as *tobacco beetle* (*Lasioderma serricorne* L.) in the tomb of Tutankhamen and in the mummy of Ramesses II, believing that this insect, due to its popular name, was exclusively associated with tobacco plants. What Balabanova has always been unaware of, not having taken the precaution of consulting a professional entomologist, is that this beetle is not specific to *Nicotiana* plants: it is present as a fossil in the Mediterranean, it has been identified in archaeological sites from the Bronze Age, is probably an endemic species of Egypt, and is found with a certain frequency as a pest in museum collections throughout the world (Buckland and Panagiotakopulu 2001). Based on this mistaken belief, Balabanova developed imaginative considerations. For example, in an attempt to justify the absence of *Nicotiana* plant remains among Tutankhamen's wreaths, she speculated that '*in the first days after burial, the insect devoured the tobacco leaves and then died*' (Balabanova *et al*. 1993), and in another publication she repeated this conjecture, that these beetles that infested the tobacco plants used for the embalming and burial of Tutankhamen's body '*devoured the tobacco plants, then starved to death*' (Balabanova 1997: 59).

Another proof in favour of the use of *Nicotiana* among the ancient Egyptians concerned the results of research carried out on the mummy of Ramesses II in the early 1980s by a French team, which found fragments of a species of *Nicotiana* in the cavity belly of this mummy, as well as determining the presence of nicotine in these plant fragments. The plant fragments were found at different depths of the abdominal cavity and were impregnated with the resin used during the embalming process; according to the French scholars this would be direct evidence of the fact that this plant had been placed on the corpse before or during the process of its embalming, and therefore it could not have been the result of an external contamination (Layer-Lescot 1985; Paris and Drapier- Laprade 1985). In this case, Balabanova did not force or misinterpret the data, but used them in her favour despite knowing that the scientific world had already rejected them, considering them the result of contamination generated before the discovery of the mummy at Deirel-Bahari in 1881, or perhaps later during its transport to Paris in 1975 (Balabanova 1997: 60). Buckland and Panagiotakopulu in 2001 convincingly solved this enigmatic find, showing how the modern contamination was caused by vigorous tobacco-based treatments on the whole body, which the pharaoh's mummy underwent for conservation purposes.

As further proof, Balabanova's team has repeatedly called into question the discovery of an African native species of *Nicotiana*, *N. africana* Merxm., and that it was therefore '*conceivable that this plant was already known in ancient Egypt*' (Balabanova 1997: 62). In reality, this species has been found in Namibia, in a region diametrically opposite to Egypt, and it is not known to be used traditionally (Merxmüller and Buttler 1975). But Balabanova didn't worry about these distances inside the huge African continent since, assuming that the ancient Egyptians undertook far more demanding, transoceanic journeys, 'going down' to Namibia to get a kind of tobacco would have been a journey that was not even worth mentioning in the pharaonic chronicles. The geographical knowledge of Balabanova appears somewhat distorted, since she hypothesised that this species of *Nicotiana* present in Namibia '*may have been imported into Egypt from the west coast'* and as proof of this she refers to the *'lively commercial relations through the Nile, navigable for its entire length*' (Balabanova, 1997: 62): the west coast of Africa has nothing to do with the Nile, nor has the Nile ever been navigable in its entire length due to its cataracts, nor is Namibia reachable sailing down the Nile.

A further gross evaluative error, indicative of the amateurish level with which Balabanova treated the field of ethnobotany investigation, concerns the fact of calling into question the ascertained knowledge by the ancient Egyptians of *Withania somnifera* (L.) Dunal—a Solanaceous species used as a medicinal plant—in support of the possibility of the pharaonic use of plants of the Solanaceae family, therefore also of *Nicotiana* species (Balabanova *et al*. 1994); this is reported without realising the improper extrapolation of modern taxonomic concepts, such as the grouping of the large Solanaceae family, to the plant knowledge of the ancient Egyptians.

In favour of her theses, Balabanova repeatedly called into question the times of diffusion of the plants; for example, she considered the 200-year period too short to allow the spread of *Nicotiana* plants from America in North Africa (Balabanova 1997: 53). The researcher did not know tobacco plants and was unaware of how invasive they are; an observation in the eyes of anyone who tries to cultivate *N. tabacum* and *N. rustica*.

When Balabanova communicated the discovery of nicotine in ancient Chinese human remains, she immediately hypothesised the presence and pre-Columbian knowledge of *Nicotiana* species in China (Balabanova *et al*. 1995b; 1996b). Referring to the inseparable obsolete texts, she proposed *Nicotiana fruticosa*, a species of tobacco which in the 18th and 19th centuries many authors, including Linnaeus, had considered to be an autochthonous Chinese species. In reality, for at least 40 years before Balabanova's writings, *N. fruticosa* was considered a synonym of *N. tabacum* and therefore of American origin (Goodspeed 1954: 372). The 'proofs' of the existence of native Asian tobacco became increasingly imaginative, to the point of involving characters such as Marco Polo and Mohammed; the former described *N. fruticosa* in his diaries, but due to a translation error this plant was interpreted as a dye, while the latter condemned to hell those Muslims who smoked a herb, which could not be anything else other than tobacco (Balabanova 1997: 69–70).

Continuing this revision of Balabanova's work would not be worthwhile, were it not that all this serves to arrive at a consideration that has much more serious consequences than an eccentric ethnobotanical revisionism, and for this reason I ask the reader to be patient a little longer.

Turning their gaze to Europe, to justify the discovery of nicotine in the skeletons of the Merovingian age in Germany, Balabanova's team reached a pinnacle of grasping at straws: They noted that the only known source that could account for the nicotine concentrations recorded in these human remains may have been a species of *Nicotiana*; that the supposed *Nicotiana* was used as food was excluded, since otherwise it would have been found in a greater number of the bodies analysed, and because the analysis of the German archaeological latrines never revealed the presence of *Nicotiana*; the use for medicinal purposes was also excluded, since in other analyses on the presence of nicotine in Austrian skeletons no correlation was observed between the presence of the alkaloid and the diseases identified in these remains; and, because Hildegard of Bingen—the well-known religious and naturalist German female who lived between the 11th and 12th centuries—did not mention any species of *Nicotiana* in her medical treatises. The only possibility which remained was of using the assumed species of *Nicotiana* for religious purposes or as an 'everyday luxury item' (Balabanova *et al*. 2001).

These arguments make no logical sense. Regarding the exclusion of the use of *Nicotiana* as a food source, no uses of this type are known, as the plant taken orally is highly toxic and therefore the argument reported by these authors is wholly unnecessary, including the involvement of the ancient German latrines. The exclusion of the use of the supposed European species of *Nicotiana* as a medicine due to the lack of correlation between nicotine and the pathologies found in the Austrian skeletons, does not take into account the fact that in human remains it is possible to identify only a few of the diseases to which individuals were subjected during their life. Highlighting the absence of the *Nicotiana* plant in Hildegard's writings as 'proof' is pure deductive delirium; if anything, this absence in the writings of Hildegard, but also in all the classical writings, would be a testimony in favour of the absence of this phantom species of *Nicotiana* in the Old Continent.

But the nucleus of the evidentiary system of the thesis of the existence of ancient European tobacco was based on an intricate Renaissance disquisition and confusion relating to the so-called 'farmer's tobacco' and 'yellow henbane'. It should be noted that in the 16th century tobacco plants arriving from the New World were often included in the category of henbanes (*Hyoscyamus spp.*), hallucinogenic plants of the Solanaceae family (Toro and Samorini 2019).

Dioscorides, writing in the 1st century CE, reported the existence of three species of henbane, two of which are easily identifiable with the two best-known Euro-Mediterranean species, the black henbane (*H. niger* L.) and the white henbane (*H. albus* L.). The third species has had a lot of ink spilled on the problem of its identification. It is usually referred to as *Hyoscyamus luteus* (yellow henbane), although it should be noted that it was not Dioscorides who gave it this name—an attribution error made by many authors who have not consulted Dioscorides' original text. Of this species, the Greek physician and botanist wrote that it has yellowish flowers, more tender leaves and fruits (than black henbane) and a reddish seed (Dioscorides, *De Mat.Med*., IV, 71).

The *taxon Hyoscyamus luteus* was coined in 1553 by the Flemish botanist Rembert Dodoens in his *Trium priorum de stirpium historia commentariorum imagines*, accompanying the brief description with a drawing of the plant (p. 437). Most of the modern scholars have recognised *Nicotiana rustica* L. in this *taxon* of Dodoens (as an Italian study see Comes 1897), due to a strong correspondence in the details of the drawing with the morphological characteristics of this species of tobacco, and a more extensive description given by Dodoens in his *Cruydeboeck* of 1554 (Part 3, Ch. 89, p. 481). In later writings (e.g. *In Purgantium aliarumque eo facientum* ..., 1574, p. 347) Dodoens specified that he had seen this plant in Belgian gardens and that it was a rare species. He believed that it was the yellow-flowered henbane of Dioscorides, and this identification of a plant drawn as a species of tobacco with a plant described in the 1st century CE helped to strengthen the thesis of the existence of a native European tobacco species, supported on several occasions by various authors starting from the Renaissance up to the late 19th century.

Among these authors we should mention Lothar Becker, who in 1875 published a text in which he recognised *Nicotiana rustica* as a native plant, which was known for centuries with the popular name of 'farmer's tobacco' (*Bauerntabak*). It is very probable that Balabanova was strongly influenced by this book by Becker which she repeatedly quoted in her writings, and several parts of her book on tobacco (Balabanova 1997) copy the thesis proposed in Becker's book word for word. Lothar Becker (1825–1901?) was a German naturalist who throughout his life was literally obsessed with the history of tobacco; a story that he believed was distorted by erroneous interpretations of ancient sources. He was convinced of the existence of tobacco plants in the Old World, and wrote numerous articles and three books on the subject. His theses were so imaginative that he did not always manage to get his writings published, and he had to self-publish his books on tobacco (Darragh 2019). To give just one example, Becker went so far as to state that the intoxicating source with which the biblical Noah got drunk was not wine but tobacco, on the basis of improbable derivations of Hebrew terms from Chinese ones (Becker 1881).

To increase the confusion generated around the *taxon Hyoscyamus luteus* in the 16th century were added, on the one hand, the news reported by some authors that this plant came from Syria, and on the other the lack of recognition that it came from the New World by Dodoens and other editors of Renaissance herbariums. The tendency of modern scholars is to believe that we are dealing with a confusion between two distinct plants: a species of *Nicotiana* from the New World—*N. rustica*—and another Old World plant from the Eastern Mediterranean, possibly *Hyoscyamus aureus* L., characterised by showy yellow flowers. This species of henbane could be the enigmatic third species mentioned by Dioscorides (Ockenden 1939; Dauney *et al*. 2007).

*Nicotiana rustica* is the tobacco plant with the highest nicotine content, and together with *N. tabacum* it is the most widespread and traditionally tobacco used in the Americas, as well as being the basis, alone or mixed with *N. tabacum*, of the manufacture of modern Western cigarettes. It arrived in Europe together with *N. tabacum*, or perhaps some years earlier, and was the first species to be drawn, by Fuchs and Dodoens (Dauney *et al*. 2007). That it is of strictly American origin has been recognised for over a century (Comes 1900: 61–77), and has recently been confirmed by specific genetic studies (Mehmood *et al*. 2020).

In using the Renaissance herbariums, Balabanova made a conspicuous false step: with the aim of demonstrating that the yellow henbane mentioned by Dioscorides in the 1st century CE was the same plant drawn by Dodoens and other 16th century authors, she brought back the relative images for a comparison, and as the first image she proposed the drawing from a German herbarium of 1610 entitled *Dioskurides Kräuterbuch*, passing it off as a drawing from the 1st century: '*Consider the illustrations of the 'Hyoscyamus luteus' of Dioscorides of the first century. (figure 60) ...*'. Dioscorides has not handed down any drawing of the plants that he treated in his text *De Materia Medica*, and it is only the annotated editions of his text, starting from the 6th century one known as *Dioscorides of Vienna* or *Codex Aniciae Julianae* up to the Renaissance ones, that are accompanied by drawings of the plants mentioned (Stannard 1966). It is not possible to consider this error as an oversight by the Bulgarian scholar, but as a real act of deception. This is an important point to corroborate the thesis that I will explain a little later: if Balabanova used deception in manipulating other people's data, it is legitimate to suspect that she was not averse to using deception in presenting her own personal chemical research and the results of her research.

The thesis of the ancient use of *Nicotiana* species in the Old World is continuously accompanied by the belief that the mode of ingestion was through the aspiration of tobacco smoke, mainly through pipes that were found almost everywhere in archaeological excavations; at least, they were according to the obsolete writings that Balabanova used uncritically without consulting the modern archaeological literature that has refuted the antiquity of these pipes (see e.g. Shaw 1960). For example, the Bulgarian researcher reported a passage from Jean Chardin's work of 1711, *Voyages de Monsieur le Chevalier Chardin, en Perse, et autres lieux de l'Orient*, incorrectly quoting among other things the location,[5] in which the French traveller, describing the use of tobacco in Persia, reported the discovery of a terracotta urn containing pipes and tobacco during the reconstruction of the ancient city of Sultania, and that the practice of smoking tobacco '*was already known in 1200 CE*' (Balabanova 2000: 118). In addition to the fact that the chronology of this find is not reported elsewhere and that in any case it would be unreliable for those times, what Chardin reported is a little different. He wondered if tobacco originated in Asia, without being able to obtain useful information, and went on to say that a man from Isfahan informed him that he had read in a *Géographie de la Partide* of the discovery of the urn containing the pipes and the tobacco, and that this made this man think that tobacco had been imported from Egypt, and that it could only have been native to Persia for 400 years: speculations by 18th century personages which cannot be taken as proof of anything. Not even the news of certain clay pipes '*similar to those of today*' found in the surroundings of the Pyramids of Giza can be taken into serious consideration, information for which Balabanova did not offer any chronological reference, merely citing a generic book on the pipes.

As regards the practice of smoking, it is appropriate to distinguish the aspiration of smoke present in the surrounding air (passive aspiration) from that of directly aspiring the smoke using specific instruments and preparations such as pipes or cigars to introduce it into the lungs (active aspiration). In reality, the aspiration techniques are more diversified (direct and indirect aspiration, aspiration with retention of the smoke in the mouth without introduction into the lungs, as in the case of cigars, etc.), but the distinction presented here is sufficient to state that in the Old World passive aspiration practices were known, for medicinal, intoxicating or magical purposes, while those of active aspiration were practically unknown, apart from rare medical purposes, as in the case of Indian Ayurvedic medicine and, perhaps, isolated cases in Greco-Roman medicine. Generally speaking, the common Eurasian man was unfamiliar with the practice of active smoke aspiration, and only became acquainted with it upon the arrival of tobacco and its associated practices from the New World (Gilman and Xun 2009).

Alongside the hypothesis/certainty of the existence of *Nicotiana* plants in the Old World which would have been known and used by the ancient Egyptians, Chinese and Europeans, Balabanova's team highlighted the fact that nicotine is present not only in the genus *Nicotiana* but in other plant species, citing from

5 It's not vol. III, p. 301–307, but vol. II, p. 13 of the 1811 edition.

time to time plants of the genera *Prunus*, *Withania*, *Zinnia*, *Sempervivum*, etc., and also some common vegetables such as cauliflower, aubergine and tomato,[6] as possible sources responsible for the presence of nicotine in the biological tissues of Egyptian and European archaeological finds. However, the inclusion of the tomato is disconcerting (Parsche and Nerlich 1995), since it is a plant native to the Americas that notoriously spread to the rest of the world following the adventure of Columbus; the authors either did not know that the tomato too is of American origin—just as at the beginning of their research they probably did not know that coca was of American origin (see a little further on)—or perhaps they assumed that the ancient Egyptians brought the tomato from the Americas in addition to the coca plant.

## The Asian origin of corn

The culmination of Balabanov's ethnobotanical revisionism concerned neither tobacco nor other psychoactive plants, but a food plant, also native to the Americas: corn. The recognised history of the spread of this grass in the Old World sees its first introduction to Spain by Columbus returning from his second Antillean voyage in 1494 (or perhaps, from his first voyage). After an initial period during which corn was considered a mere botanical curiosity to be cultivated in vegetable gardens, especially in Andalusia, in the 16th century this grass spread to Portugal, France and Italy. The Portuguese were mainly responsible for its diffusion in Africa and Asia, while the Venetians spread it in the Balkan peninsula, Turkey, and Egypt. Maize from regions of the Ottoman Empire reached Central Europe and its popular names included *Turkish grain* (*granoturco* in Italian) and *Indian grain*. These names spawned a dispute over whether corn had Asian or American origins, which continued well into the early 20*th* century. In this, maize followed the fate of several other new plants and foodstuffs that spread rapidly throughout the Ottoman Empire—which at the time included Egypt and parts of northern Africa, parts of the Arabian Peninsula, the Near East, Turkey and the Balkan regions—so that when these new species reached Europe from those regions, they were considered to be of Oriental origin. Moreover, it must be taken into account that in the 16th century the adjective 'Turkish' often simply meant something exotic or foreign, without a specific reference to the geographical area of Turkey (Casanova and Bellingeri 1988: 117).

In her reinterpretation, and taking inspiration from 16th and 17th century texts, Balabanova proposed the Asian origin of maize, referring to a hypothetical chronological anachronism, based on the sum of five years of cultivation of the plant in Spain and Portugal at the beginning of the 16th century, plus another five years to reach Turkey, plus another five years to spread to other regions of the Ottoman Empire, etc.; ultimately it would have taken a few decades for maize to reach Germany from the East, and the accounts obtained by summing up these five-year periods taken as a random unit of measurement of timing of diffusion, would not add up. Reading some German texts from the mid-16th century, including the herbarium of Leonhart Fuchs, the imaginative creativity of Balabanova declares '*the detailed description of the plant and its effects speaks of basic knowledge that is generally available only on native plants*' (Balabanova 1997:94).

It is important to observe how this digression on the origins of corn did not start from the need to explain results of personal chemical research, as in the case of the discovery of nicotine and other drugs in mummies, but rather seems to have been dictated by the desire to contradict ethnobotanical knowledge historically acquired, as '*the time has come to alter our cultural history*' (Balabanova *et al*. 1993:93); a statement that lays the groundwork for legitimacy in mistrusting the integrity of her research and the results of her research.

## Transoceanic voyages

The hypothesis of a transcontinental transport of the coca plant by the ancient Egyptians is an idea that is full of holes. Nowadays archaeological research has somewhat conflicting theses regarding the peopling of the Americas: from those that are based on one, two or three migratory flows through

6 However, it must be pointed out that due to the found presence of nicotine in vegetables, there is the suspicion that it may be contamination caused by the use of nicotine pesticides.

the strip of land that united Alaska with Siberia (Beringia), in a period around 13,000–11,000 BCE (Marangoni *et al*. 2014), to those which postulate a first population of South America in earlier times, around 50,000–20,000 BCE (Lahaye *et al*. 2013). Without excluding the possibility of revising the 'orthodox' chronologies of transoceanic contacts, these strong divergences have nothing to do with the idea that the ancient Egyptians would have crossed the Atlantic Ocean in much later times. Several authors, including Balabanova (2000:120), have reported as 'proof' the experience of Thor Heyerdahl, the Norwegian adventurer who in 1970 crossed the Atlantic by means of a papyrus boat, named *Ra II*. It is worth noting that paleontological investigations of recent decades have highlighted how hominids—specifically *Homo erectus*—had acquired the ability to navigate the seas as early as 800,000 years ago, colonising the Indonesian and Austral-Oceanic islands (Bednarik 1997), and later Sardinia (Martini 2009). However, it must be taken into account that cocaine was apparently found in Egyptian mummies dating back over 2,000 years, so in the event of the plant being transported from South America to Egypt, two possibilities would arise: either the Egyptians undertook a millennial trade with continuous transatlantic journeys, or the seeds of the coca plant were imported into Egypt and sown there, giving rise to local cultivation. Both possibilities are highly unlikely. Regarding the first, there is no evidence of it in ancient Egyptian archeology and literature, an omission which is no small matter. Herodotus, in a passage from the fourth book of his *Histories*, reported the Phoenician adventure of the circumnavigation of Africa, promoted by the pharaoh Necao II (610–595 BCE), upon which two whole years were spent. Regardless of the historical reality of this circumnavigation—still the subject of discussion (Garcia Moreno 1993; *contra* Bresciani 2004)—if the ancient Egyptians had made repeated trips to South America over a period of centuries, it would certainly have been mentioned in ancient literature. As regards the second possibility, one must take into account the impossibility of growing the coca plant—both the Andean and Amazonian species—in Egyptian territory. If the coca plant could grow outside its South American range, it would have spread to Mesoamerica, Europe, and Asia, even before the improbable Egypt.

## Criticisms and new chemical analyses

2001 was the turning point of the *Balabanova affair*, when two English scholars, Buckland and Panagiotakopulu, the first an archaeologist and the second a naturalist, presented an in-depth critique of the results—and above all of the deductions—of Balabanova's team's research. They included in their examination the findings of fragments of *Nicotiana* and nicotine in the mummy of Ramesses II, and the famous *tobacco beetle*, which Balabanova had continuously used to support her thesis of the presence of *Nicotiana* during Pharaonic Egypt.

Starting from the mummy of Ramesses II, the two English scholars have highlighted how this was subject to a painful history of displacement of the mummy both during the pharaonic periods and after its discovery in 1871, at the hands of a tomb robber. For ten years the grave robber stripped the tomb of its objects to resell them in the antique markets, and only later was the mummy of Ramesses II transported along the Nile towards Cairo, where it underwent further displacements and alterations, including a partial unbandage. In 1975 it was taken to Paris, where it was studied, and it was on this occasion that the tobacco fragments were found.

English scholars have additionally observed how in the 19$^{th}$ century, among the conservation practices of mummies, it was customary to sprinkle them with tobacco dust, as well as pyrethrum, the latter a compound obtained from species of *Tanacetum* and also identified in the mummy of Ramesses II. Both substances acted as insecticides. This practice was not limited to Egyptian mummies but to numerous other European and Asian mummies, and it is plausibly this conservation technique that gave rise to the discovery of fragments of tobacco and nicotine in the mummy of Ramesses II and of nicotine in the 'drugged mummies' of the Balabanova team.

Regarding the presence of cocaine, Buckland and Panagiotakopulu believe it to be the result of

modern contaminations, having verified its wide diffusion as a legal drug towards the end of the 19th century, which likely included amongst its devotees (in addition to Sherlock Holmes), many scholars of that era. The contamination of archaeological finds represents a major problem for today's analyses, which employ techniques and instruments capable of capturing substances in evermore infinitesimal concentrations, and this problem is exacerbated in the case of finds that came to light before these last decades, i.e., before the adoption of aseptic techniques of handling and conservation of the finds. An eloquent example is the case of the discovery of caffeine in the dust of museum shelves where North American prehistoric ceramics were stored (Washburn *et al*. 2014). As for the presence of THC in various Egyptian and Peruvian mummies, the two English scholars have highlighted how *Cannabis* extracts had been used as pesticides in the past, providing the relevant bibliographic documentation.

Ultimately, Buckland and Panagiotakopulu have focused attention on the importance of associating the studies of finds with their 'biography', that is, with the history following their discoveries: '*scientific techniques without context do not produce valid answers ... lack of information produces unacceptable stories, which often enter the literature as fact. Artefacts and their history have to be viewed as an entity*' (Buckland and Panagiotakopulu 2001: 554).

To date, a few other teams have developed investigations of pre-Columbian mummies and skeletons, all yielding negative results with respect to the presence of THC in American finds and cocaine in those from the Old World.

A noteworthy investigation, more methodologically correct than all those developed by Balabanova, was performed by Baéz's Chilean team on the hair of 19 mummies dated to the Formative Period (10 BCE–140 CE), together with two control samples consisting of hair of modern individuals living in the same region of northern Chile. The search for THC, cocaine and opiates returned negative results for all samples. The authors also had the foresight to have French colleagues at the Institute of Forensic Medicine in Strasbourg carry out the investigations on the same samples, who obtained the same negative results (Baéz *et al*. 2000).

Negative results for cocaine were also reported by Cartmell and Weems (2001) for 18 mummies from the Kellis site of the Egyptian oasis of Dakhleh. The analyses were performed on the hair of the mummies. Nicotine was identified in 14 of the 18 individuals analysed, although in concentrations corresponding to an intake more attributable to some food source containing nicotine than to a source with a high content of this alkaloid.

Anaesthetist David Counsell (2008), who specialises in ancient Egyptian drugs, reported that in 1994, '*as a result of the television documentary "Cocaine Mummies"*' [in fact this documentary appears to have first aired in 1997], seven samples taken from Manchester Museum mummies were analysed in a London laboratory. Three samples tested positive for nicotine, and none for cocaine. The presence of nicotine was interpreted as external contamination, the mummy samples having a museum history justifying it (two belonged to Elliot Smith's private collection). More recently Counsell analysed eight mummies in the collections of the Manchester and Leicester Museums, and none of these tested positive for cocaine.

Also recently, a German team investigated the hair of eight pre-Columbian mummies from Egypt, South America and Asia, looking for cannabinoids, opiates and cocaine. The results were negative, with the exception of the detection of nicotine in three samples of South American origin. Furthermore, the presence of cotinine was not detected in these three cases, and the authors expressed doubts that the presence of nicotine detected was not due to external contamination (Musshoff *et al*. 2009).

## Inconsistencies and suspected data falsifications

Careful observation of Balabanova's work in the field of archaeological finds reveals numerous inconsistencies, which I expose below together with attempts at explanation.

From reading the first two articles of 1992 concerning firstly the discovery of nicotine and cocaine in Egyptian mummies, and secondly the discovery of 'hashish' in Peruvian mummies, it is notable that they were accompanied by a total lack of surprise on the part of the authors for these incongruous finds from the point of view of the history of drugs. L. O. Björn (in Hertting *et al*. 1993) immediately noticed this discrepancy, although he had not arrived at the deduction that I propose here: namely, that Balabanova and her group had not originally noticed this inconsistency for the simple reason that they were unaware that tobacco, cocaine and hashish only spread between the New and Old Worlds after Columbus; in other words, they did not know the history of these drugs, and only after the critical comments of other scholars did they learn about them. This glaring omission of the historical and geographical inconsistencies of these first research results, and above all the fact that, in order to avoid making a fool of herself in front of the scientific world, she had to hide that she had not noticed these errors of historical knowledge, represents the 'original sin' of the *Balabanova affair*. Moreover, if she had known the origins of drugs, she probably would not have decided to look for cocaine and nicotine in Egyptian mummies and THC in Peruvian mummies in the first place. Such an interpretation of the original events has never been taken into consideration by those who have criticised Balabanova's work, and although it may be surprising, it could appear to be the most plausible. During the years in which I worked as a trainer in the Italian health institutions dedicated to the treatment of pathological addictions, I was able to verify there were numerous doctors, psychologists, psychiatrists who deal every day with drug addicts and their drugs, who do not know anything about the history of drugs. Therefore, I am not surprised to see there are forensic chemists who don't know the historical origins of the drugs they search for every day in the biological tissues of modern human bodies, dead or alive.

In an interview with Balabanova—an interview that has been reproduced in numerous documentaries, starting with the one aired on US TV in 1997—the researcher stated that she was amazed by the results obtained on the first Egyptian mummies: *'they were a kind of shock, I did not expect to find nicotine and cocaine, I was absolutely certain it was a mistake*', and she added that to be sure she had the samples analysed by three other laboratories, who confirmed her results (from the documentary *The Unsolved Mystery of the Cocaine Found Inside Ancient Mummies* produced by Timeline in 2017). If Balabanova's team had actually been amazed by the results, i.e. if they had understood the ethnobotanical inconsistency, they would surely have mentioned it in their communications, and if they really had availed themselves of the confirmation of the results from three other laboratories, they would certainly have communicated it in their publication. But in neither the original publication (Balabanova *et al*. 1992a) nor in any other subsequent writing, was this information reported.

Several communications from Balabanova's team have been published in articles extremely short, to the point of not being able to consider them real communications but simple preliminary information, even though they have not been followed by more detailed publications of the same research. The first communication, the one that aroused astonishment and criticism among scholars, and which concerned the first Egyptian mummies analysed (Balabanova *et al*. 1992a), occupied the space of a single page, and although it was noted in the text that it was a preliminary communication, a more extensive communication never followed.

The communication of a research carried out on 30 Turkish skeletons and 34 Jordanian skeletons was given in a mere twenty lines (Balabanova and Schultz 1994); that performed on 11 Egyptian and 55 Peruvian remains was given in 13 lines (Hobmeier and Parsche 1994); that performed on 90 skeletal remains found in three Austrian archaeological sites was given in 15 lines (Balabanova and Teschler-Nicola 1994); though at least this last one was followed by a subsequent more detailed communication.

With regard to the latter research, highly suspicious contradictions appear: the report communicates analyses carried out on skeletons from three archaeological sites: 33 from the site of Lenthia/Linz, 26 from that of Gars/Thunau and 31 from that of Franzhausen. In the more extensive communication of

the same research published the following year, the study carried out on the 31 skeletons of Franzhausen disappears. Furthermore, the skeletons examined from the Gars/Thunau site are no longer 26 but 97 (Balabanova *et al*., 1995a). It is reasonable to suspect that these numerical contradictions and omissions are the result of falsifications, and that the addition in the space of a single line of the results of analyses carried out on the 31 skeletons of Franzhausen, rigorously devoid of information on their origin, and in which nicotine was reported as found in 44% of the samples (Balabanova and Teschler-Nicola 1994), is the result of a total invention, i.e. that this study was never performed. In her book on Old World tobacco, Balabanova added two other sites, Matsee and Neuburg, to the list of Austrian archaeological sites of provenance of the analysed skeletons (Balabanova 1997: 71), but of these studies there is not the slightest track in her scientific publications.

Also, in the research carried out on the remains of Nubia (site of Christian Sayala), the accounts do not add up: in a preliminary communication (Balabanova *et al*. 1994) 39 hair samples are reported with the discovery of nicotine in 12 of these, while in a subsequent more extensive communication (Balabanova *et al*. 1996a) 34 hair samples were analysed and nicotine was reported as found in 27 of these. Furthermore, only in the first communication is it mentioned that hairs of modern non-smokers were used as control samples, while in the more extensive communication no mention is made of the use of control techniques.

Something is also not right in the report relating to the analysis of 62 mummified human remains of Peruvian origin (Parsche *et al*. 1994). Notice is given that '*for practical purpose we will use the names of the respective alkaloid in the following pages alone, but this always means that their metabolites are included*' (p. 110). It is not understood why the identified metabolites are not specified. The suspicion arises of a dishonest operation, where hypothetical metabolites are arbitrarily called into question without having been determined with analytical techniques, with the aim expressed by the same authors that if for an alkaloid '*its metabolites can be demonstrated in the samples, there is evidence of ante mortem consumption of these substances*', and that this would therefore exclude the possibility of modern contamination. Even data on segmental analysis of the hair of some of these mummies seems to have been added specifically to confirm that '*these alkaloids were deposited in hair during life*' (p. 114). Furthermore, in communicating previous analyses carried out on Peruvian mummified human remains, in which caffeine was found in addition to the usual 'hashish', nicotine and their metabolites, a bibliographic reference is reported as '*Balabanova et al., Tenerife, 1992a*'. This is not a useful indication, it does not explain what it is about, whether it is a communication that took place in some congress venue or an informal dialogue held under the umbrellas of a Tenerife beach perhaps with a cocktail in hand, and it has all the signs of a totally invented reference. The presence of caffeine in Peruvian mummies—which ought to be a matter of further discussion—is mentioned only in this passage, and the suspicion arises that it is another fictitious piece with merely decorative purposes.

Another issue that raises suspicions concerns the methodical lack of information on the provenance of the archaeological finds analysed by Balabanova's team. Observing their publications, it is natural to wonder how it is possible that the museums, university institutes or other institutions that have made the mummies and skeletons available for chemical analysis are not mentioned, and above all how it was possible that these institutions did not ask to be cited and thanked in the related publications. This is a very normal formal practice, an obligation from which no scholar can exempt himself. How is it possible that the museums that made available to Balabanova 97 Austrian skeletons, 71 Nubian mummies, 123 German skeletons, 30 Turkish skeletons, 34 Jordanian skeletons, etc., have not been cited and have not asked to be cited in the related publications? There's a simple answer, even if it may seem incredible: it's impossible. There is no way that this happened. And this impossibility justifies the suspicion that at least some of these searches have never been carried out.

These suspicions, which seem incredible, are proposed here for the first time as a solution to

something else equally incredible but which really happened: the publication in scientific journals of the analyses carried out on almost a thousand archaeological finds, of which the majority are not verifiable. They are 'ghost' finds, just as the results of these analyses are unverifiable.

Ultimately, as regards the findings of cocaine in Egyptian mummies, they can be explained as the result of modern contamination (grave robbers, archaeologists, museum staff accustomed to taking cocaine), or errors in analytical procedures, or falsified results. The findings of THC in Peruvian mummies can be explained by the custom in the recent past of applying *Cannabis* extracts as a pesticide, or by other types of modern contaminations, or as errors in analytical procedures, or falsified results. The discovery of nicotine in mummies and skeletons of three continents (Europe, Africa, Asia) can be explained variously by the consumption of food or medicinal plants containing nicotine not belonging to the genus *Nicotiana*, or as the result of the custom of applying tobacco extracts to the mummies for conservation purposes, or due to errors in analytical procedures, or as the result of falsified results, except when they are total invention.

## A proto-conspiracy theorist

One last question I try to answer in this review: who was Balabanova really? What was behind the appearance of a 'normal' researcher? She is undoubtedly a researcher who has done considerable damage; for example she humiliated Egyptologists and their scientific discipline in front of the whole world.

We have seen how the key text for understanding Balabanova's thought and character is her 1997 book on tobacco, which no one has ever previously taken into consideration, largely due to the fact that it was published by an obscure publishing house and was written in German, a difficult language for most international scholars.

In this book, referring to the opposition from the scientific world in accepting theses such as the existence of tobacco and corn originating in the Old World, Balabanova repeatedly quoted the phrase '*what cannot be must not be' (daß nicht sein kann, was nicht sein darf*), thus alluding to a hypothetical intentional will on the part of official science to hide 'inconvenient truths'. Behind this sentence seems to hide the key to interpreting the work of the Bulgarian researcher: a 'conspiracy theorist' character seems to be at the core, starting from her 'original sin' needing to be hidden (her ignorance of the history of drugs), gradually strengthened with the need to react against the raising of the criticisms addressed to her by many parts of the scientific world ('*science is a conservative world*', from the 1997 documentary), coupled with the acquisition of the obsolete 19th century documentation which confirmed the historicity of the alternative interpretations, and alongside the increase in her notoriety, which in the years 1996–1999 reached worldwide media levels. A certain degree of mythomania should not be excluded in this character analysis. Balabanova could be considered a 'proto-conspiracy theorist'.

The main purpose of the 'conspiracy theorist', understood as a contemporary character figure, is to contradict the officially recognised interpretative models, whether in history, science, political events, etc., on the basis of the firm belief in the existence of plots or conspiracies that act in defence of the interpretative *status quo*.

To believe that the lack of tobacco in Hildegard's medical writings is a confirmation of its presence and use as a non-medicinal source, closely resembles the mechanisms of the circular logic of conspiracy theorists: '*contrary evidence and lack of evidence are interpreted as supporting their theories*' (Keeley 1999: 120). Other characteristics of conspiracy logic are the beliefs that clearly false data are valid, and the association of events that are not related to each other; deductive procedures of which Balabanova has made extensive use: believing that a Renaissance drawing of the yellow henbane had been designed by a 1st century CE author; to believe that by going up the Nile for its entire length, Namibia can be reached; citing the ancient Egyptians' use of opium to demonstrate their use of cocaine and nicotine; justifying

the presence of cocaine in mummies of newborns with the administration of this drug by the mother to 'calm' the infant; explaining the reduction of nicotine concentration after the age of 6 of the analysed skeletons with the preposterous end of breastfeeding at 6 years, etc.

Balabanova was not a credible scholar, which she demonstrated in many ways. She never referenced serious studies, not even one, on any subject, for example on the history of tobacco (such as Laufer 1924 and Goodspeed 1954), she was never interested in them when, from the perspective of a correct methodology, she should have started from a careful study of these texts to make credible counter-proposals. Just as in the case of the *tobacco beetles*, for which this forensic chemist would have been better off if she had consulted professional entomologists, in dealing with ethnobotany it would have been better if she had consulted professional ethnobotanists. But that did not interest her, since her aim simply was to '*alter our cultural history*' (Balabanova *et al*. 1993: 93), at any cost.

## Tables

*Table 1 - Chemical analysis performed by the Balabanova's team on archeological mummies and skeletons.*

| Samples analysed | dating | use of control | proceeding | drugs reported | reference |
|---|---|---|---|---|---|
| 9 mm Egypt | 1,070 a.C.-395 CE | no | MMP* | "hashish", nicotine, cocaine | Balabanova et al. 1992a |
| 2 mm Peru | 500 BCE | no | MPMC* | "hashish", cocaine | Balabanova et al. 1992a |
| mm Peru | not reported | ? | not reported | caffeine | 1992, not specified |
| 72 mm Peru | 200–1,500 CE | no | not reported | "hashish", nicotine, cocaine | Parsche et al. 1993 |
| 11 mm Egypt | 1,070 a.C.–395 CE | no | not reported | "hashish", nicotine, cocaine | Parsche et al. 1993 |
| 2 sk Sudan | 5-4,000 BCE, 400-1,400 CE | no | not reported | nicotine | Parsche et al. 1993 |
| 10 sk Germany | 2,500 BCE | no | not reported | nicotine | Parsche et al. 1993 |
| 62 mm Peru | 115–1,500 CE | no | MPMC* | THC, nicotine, cocaine | Parsche et al. 1993 |
| 4 sk Egypt | 1,000 BCE–600 CE | no | not reported | nicotine | Balabanova & Scherer 1994 |
| 20 sk Europe | 1,000 BCE–600 CE | no | not reported | nicotine | Balabanova & Scherer 1994 |
| 11 mm Egypt | not reported | no | not reported | cocaine | Hobmeier & Parsche 1994 |
| 55 mm Peru | not reported | no | not reported | THC | Hobmeier & Parsche 1994 |
| 30 sk Türkiye | 7,000–6,500 BCE | no | not reported | no-nicotine | Balabanova & Schultz 1994 |
| 34 sk Jordan | 7,000–6,500 BCE | no | not reported | no-nicotine | Balabanova & Schultz 1994 |
| 31 sk Austria | Bronze Age | no | not reported | nicotine | Balabanova & Teschler-Nicola 1994 |
| 134 mm Nubia | 600–1,100 CE | yes(?) | not reported | nicotine, cocaine | Balabanova et al. 1994 |
| 1 mm Egypt | 950 BCE | no | SECM* | THC, nicotine, cocaine | Nerlich et al. 1994, 1995 |
| 33 sk Austria | 300–400 CE | no | not reported | nicotine | Balabanova et al. 1995a |
| 8 sk China | 3,700 BCE | no | not reported | nicotine | Balabanova et al. 1995a |
| 97 sk Austria | 800–1,000 CE | no | not reported | nicotine | Balabanova et al. 1995a |
| 81 sk China | 10,000–100 years ago | yes | not reported | nicotine | Balabanova et al. 1996b |
| 71 mm Nubia | 600–1,100 CE | no | not reported | cocaine | Balabanova et al. 1997a |
| 7 mm Egypt | 1,070 BCE–395 CE | no | not reported | nicotine | Balabanova et al. 1997b |
| 6 sk Austria | 2,000–1,500 BCE | no | not reported | nicotine | Balabanova et al. 1997b |
| 123 sk Germany | 450–700 CE | no | not reported | nicotine | Balabanova et al. 2001 |
| 2 mm Austria | II-IV century CE | yes | not reported | nicotine | Balabanova 2004 |
| **total: 916 mummies & skeletons** | | | | | |

**mm = mummy; sk = skeleton; MMP, Munich Mummy Project (Parsche and Ziegelmayer 1988); MPMC, Munich Peruvian Mummy Collection; SECM, State Collection for Egyptology of Munich*

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