



## The ancient Greek roots of the term *Toxic*

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### ABSTRACT

In ancient Greek literature the adjective toxic (Greek: *τοξικόν*) derives from the noun *τόξο*, that is the arc. This noun according to the *Liddell – Scott – Jones* lexicon had several meanings. Apart from the meaning that someone is able to use a bow or the military department of the archers, the medical context of the term is that a substance has the characteristic of a poison. This concept of the term survived until today with little differentiation.

In ancient Greek literature the adjective toxic (Greek: *τοξικόν*) derives from the noun *τόξο*, that is the arc. This noun according to the *Liddell – Scott – Jones* lexicon had several meanings [1]. Apart from the meaning that someone is able to use a bow or the military department of the archers (*τόξον*, τό, bow, Il.4.124, etc.: freq. in pl. *τόξα* for sg., *τόξ' ὤμοισιν ἔχων ἀμφηρεφέα τε φαρέτρην* 1.45, al., cf. Pi.P.3.101, S.Ph.654; sts. in Prose, Heraclit. 51, Hdt.2.106, PEleph.5.8 (iii B. C.); *ἐπιταίνετο*. . *τόξα* drew the bow, Il.5.97; also *τόξον τιταίνει* B.9.43; *τόξον ἔλκετ'* (v.l. *εἰλκεν*) Il.11.582; *τόξου πῆχυν ἀνέλκειν* 13.583; *τόξον τείνειν*, *ἐντείνειν*, A. Ag.364 (anap.), Fr.83; τ. . . *ἐντανύσαι* Od.21.245, cf. Hdt.2.173; *κυκλοτερές μέγα τ. ἔτεινε* Il.4.124, cf. E.Ba.1066; *τόξου ῥύμα* (i.e. the Persians, the bow being an oriental weapon), opp. *λόγῃς ἰσχύς* (i.e. the Greeks), A.Pers.147 (anap.). 2. *τόξω* by guess, Id.Ch.1033. 3. bowmanship, archery, *τόξων* *εὔειδώς* Il.2.718, al.; *τόξοισιν* *πίσυνος* 5.205, cf. 13.716; *ἢ τέχνη τῶν τ.* Hdt.1.73; *πρὸς τόξου κρίσιν* S.Tr.266; *τόξω* (sc. *νικῶν*) SIG1061.10 (Samos, ii B. C.). II. in pl. also, bow and arrows, *τόξα πεπετώτ' ἄλλουδῖς ἄλλα* Il.21.502, cf. Hdt.3.78, S.Ph.68, al.; sts. in pl. for the arrows only, *ib.652*, Pl.Lg.815a.), the medical context of the term is that a substance has the characteristic of a poison causing death or serious debilitation or exhibiting symptoms of infection [2]. The ancient Greek and Byzantine medical literature give the answer about how this term received this medical meaning. The physicians and pharmacologists of those times pointed out that it was a custom to dip in the pike of

the arrow in a poison, before it was fired against an enemy [3]. The main scope was to injure the enemy in order to be killed not due to the wound that was provoked but a cause to the symptoms of the poisoning that were presented after the hit [4] (Fig. 1).

Pseudo-Dioscorides (1st c. AD) described this concept in a very elaborate way:

*Περὶ τοξικοῦ. Τὸ δὲ τοξικὸν δοκεῖ μὲν ὠνομάσθαι ἐκ τοῦ τὰ τόξα τῶν βαρβάρων ὑπ' αὐτοῦ χρίεσθαι. παρακολουθεῖ δὲ τοῖς πεπωκόσι χειρῶν καὶ γλώττης φλεγμονῇ· μανία τε ἀκατάσχετος ποικίλαις ἐπιβάλλουσα φανταστικῶς· ὡς καὶ διὰ τοῦτο δυσιάτους εἶναι ἐν ταῖς θεραπέαις· σπανίως δὲ καὶ σώζεσθαι τινὰς τῶν πεπωκότων. Δεῖ μὲντοι συνέχειν αὐτοὺς δεσμοῖς ἀναγκάζοντας, καὶ βιαζομένους γλυκῶν οἴνων σὺν ροδίνῳ πίνειν καὶ ἐξεμεῖν· τό, τε τῆς γογγυλίδος σπέρμα πινόμενον σὺν οἴνῳ· ἰδίως δ' ἐπ' αὐτῶν ἀρμόζει καὶ ἡ τῆς πενταφύλλου ῥίζα, αἰμά τε τράγον ἢ αἰγός, ὁμοίως λαμβανόμενα· δρῶς τε φλοιός ἢ φηγοῦ ἢ πρίνου, γάλακτι συνεκλεανθείς· καὶ μῆλα κυδῶνια ἐσθιόμενα λεῖα· ἢ σὺν λήγωνι καὶ ὕδατι πινόμενα, ἄμομόν τε καὶ βαλσάμον καρπὸς σὺν οἴνῳ· καὶ εἴ τινες αὐτοῦ φύγοιεν τὸν κίνδυνον, πολὺν χρόνον κλινοπετεῖς διαμένουσι, καὶ ἀνασταύτες ἐπισημένιοι τὸν λοιπὸν χρόνον διάγουσι [5].*

(Pseudo-Dioscorides Med. *De venenis eorumque praecautione et medicatione* 20.1–16)

In this text the writer apart from the description of the terms of the

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**Fig. 1.** Odysseus slays the suitors of his wife Penelope (around 440 BC). Attic red figure skyphos from Tarquinia (Italy), Altes Museum Berlin. Licensed under the Creative Commons Attribution-Share Alike 2.0 Generic license.

root toxic, he would also describe the symptoms presented in the patient, the corporal and the mental ones as also the potential therapy. He underlined that the patient could present inflammation in the lips and the tongue. Also the patient loses his mind and has the symptoms of madness, having a lot of peculiar fantasies, therefore the writer has the impression that the patient falls in the state of mania, fact which makes the cure very difficult, reminding that only few managed to survive. Due to this uncontrollable condition, it is emphasized that the sick should be committed and under pressure to receive treatment. Regarding the treatment this consisted either of sweet wine mixed with juice of roses, in order to vomit, or wine mixed with blood of male or female goat, or wine mixed with turnip. The patient could also eat apples and quince. Finally, if the patient escape the death, he should remain in bed for a very long time and the rest of his life is full of various medical problems and malaise [6].

The same survived in a text of the Byzantine physician Oribasius of Pergamon (c. 320–403 AD):

*Περὶ τοξικοῦ φαρμάκου διάγνωσις καὶ θεραπεία. Τὸ τοξικὸν φάρμακον καλούμενον δοκεῖ μὲν ὀνομάζεσθαι ἐκ τοῦ τὰ τοξεύματα ὑπὸ τῶν βαρβάρων αὐτῷ χρίεσθαι, παρακολουθεῖ δὲ τοῖς πεπωκόσι γλώσσης καὶ χειρῶν φλεγμονῇ μανία τε ἀκατάσχετος ποικίλαις ἐπιβάλλουσα φαντασίαις, ὡς καὶ διὰ τοῦτο δισιάντως αὐτοὺς ἔχειν, σπανίως δὲ σώζεσθαι τινα τῶν πεπωκότων. δεῖ τοίνυν δεσμοῖς μὲν συνέχειν αὐτοὺς ἀναγκάζειν τε γλυκύν μετὰ ρόδινον πίνειν καὶ ἐμεῖν. βοηθεῖ δ' αὐτοῖς τὸ τῆς γογγυλίδος σπέρμα πινόμενον, ἰδιαίτερον δ' ἡ τῆς πενταφύλλου ρίζα καὶ τράγον αἶμα ἢ αἰγός, δρυός τε φλοιός, ἢ φήγου ἢ πρίου γάλακτι συλλεαυθείς, καὶ κυδώνια μῆλα ἐσθιόμενα, ἢ λεία μετὰ γλήχωνος ἐν ὕδατι πινόμενα, ἄμομόν τε καὶ βαλσάμου καρπός σὺν οἴνῳ. ἐὰν δὲ τις διαφύγη τὸν κίνδυνον, κλινοπετιῆς πολλῶν διαμένει χρόνῳ, ἐπισημένους τε τὸ λοιπὸν τοῦ χρόνου διατελεῖ [7].*

(Oribasius Med. *Eclogae medicamentorum* 129.1.1–129.3.7)

A very interesting medical approach to the theme is this of Nicander of Colophon (2<sup>nd</sup> c. BC) [8], which survived to us through the text of the sophist Euteknios (3<sup>rd</sup> to 5<sup>th</sup> c. AD) [9]. In this text except the information as we have seen them in the above texts about the therapeutic means, the writer gives us a more detailed description about the characteristics of the madness that could be presented in the patient and the corporal symptoms. Therefore is underlined that the patient cries out in surprise, is occupied by cowardice, his voice resembles that of a goat, his speech is like that of misanthrope, obviously meaning that his words are offensive and aggressive towards others, the patient resembles an angry bull, saliva in the form of foam comes out of the mouth bringing in mind a patient of lyssa and grits his teeth. On the other hand, his language is held in the mouth and phlegm is spited out. He also has swollen lips and tongue. His gingiva are blinding. In addition in many parts of the body,

even if they were not wounded by the arrow, the present necrosis in various places of their body. The writer also informs us about this military use by the Arab nomads.

*τοξικόν. Παραχρήμα δ' ἂν ἐπαμύνειν ἔχοις τῷ πεπωκότι τὸ τοξικόν, ἦν θεασάμενος τὸν ἄνθρωπον εὐροῖς πρῶτον μὲν βαρυνόμενον καὶ πεφορτισμένον ὡσπερ αὐτόν, ἔπειτα κάτωθεν μὲν παχέαια τὴν γλῶτταν ἔχοντα, ξηρὰ δὲ τὰ χεῖλη, καὶ τὰ στόμια οἰδαίνεται, ἢ τε δὴ φάρυγξ τὰ αὐτὰ ὑπομείνασα τοῖς χεῖλεσιν, φλέγμα λεπτὸν καὶ ξηρὸν ἀναπέμπει σφόδρα, ἔπειτα ἐκ βάρων αὐτοῦ τὰ μὲν οὐλα ῥήξιν ὑπομένει, ἢ δὲ διάνοια ταράττεται, βοᾶτε ὡς ὑπ' ἐκπλήξεως γεγυῶς κάτοχος δειλίᾳ, φωνῆ τε αἰγός εἰκνία χρήται, καὶ ὡσπερ οἱ μισανθρωποῦντες μοχθηρὸν φθέγγεται, καὶ ἀπλῶς οἶον αἰ τῶν ἀποκοπτομένων τὰς κεφαλὰς κεφαλῇ παρασύρει τὴν γλῶτταν· οἶα δὲ τῆς κερνοφορῶν ῥέας ἢ υποζάκορος, ἀνά τε δὴ τὰς ὁδοὺς καὶ τὰ χωρία στρεφόμενη, ἐμμανῆς τε οὔσα καὶ ἐνθεος, ἀθρόα κέχρηται καὶ μακρὰ τῆ φωνῆ, οἱ δὲ ἀκούσαντες εὐλαβοῦνται τῆς Ἰδαίας ῥέας τὸ φοβερῶτατον ὕλαγμα, οἶον καὶ μανίας πλήρες· τοιαῦτα καὶ οὗτος ἐσφαλμένα καὶ λύσεως γέμουτα φθέγγεται, καὶ ὡσπερ οἱ παῖδες, τὰ πολλὰ κλαυμυριζόμενος καὶ ὠρνώμενος διατελεῖ, ταυρηδόν τε ὑποβλέπεται καὶ ὑπαφρίζει τῷ στόματι, καὶ τοὺς ὀδόντας παρατρίβον ἦχον ἀπο<τε>λεῖ, ὡστε χρῆ τούτου μὲν φυλάττειν τὸ πρῶτον δῆσαντα, ἔπειτα οἶον ἐγγεῖν τούτῳ πολὺν καὶ μὴ βουλομένῳ· κᾶν ἢ συνηγμένους τοὺς ὀδόντας ἔχων, ἐνίει τὸν οἶον διεπαίρων αὐτοῦς, ὅπως ἂν ἐξεμῆ, ἢ ἔξεμοῦτος μετὰ βίας αὐτοῦ τῆς ἐκ τῶν δακτύλων, συνεξέληθ τὸ δεινὸν ἐκεῖνο φάρμακον καὶ θανατηφόρον. Ἄλλὰ τοι καὶ καθεψηθέντος νεογνοῦ που χηρός καὶ διατακέντος τὸ ὕδωρ πρὸς ἴασιν ἄγει πινόμενον σφόδρα, τῆς τε μηλέας τῆς ἐν ὄρει ὁμοίως ὁ καρπός, καὶ ὁ φλοιός τῆς αὐτῆς μηλέας δεῦρο κοπέεις ἄριστα ἴσται, καὶ τῆς ἐν κήποις δὲ τραφεῖσης μηλέας ὁ καρπὸς πρόσφορος· ἔστω δὲ τὰ μῆλα εἰαρινά· εἰ δὲ μὴ παρήη ταῦτα, τοῖς λεγομένοις ἐνταῦθα κέρηρισστρουθίοις, ἢ οἷς ἐκόμισεν ἡ Κρήτη στύφουσι τὰ κυδώνια μῆλα· πάντα τοῖνον σφύρη ταῦτα συγκόμας εἰς ὕδωρ ἔμβαλλε, τὸ δὲ ὕδωρ ἐχέτω καὶ γλήχωνος· διανοιγομένον δὲ τὸ στόμα ἐνσταζέτω τις τοῦ ἀνθρώπου τούτου ρόδιον μύρον, ἢ ἴρινον, ποιῶν τε τοῦτο συνεχῶς καὶ ἐν ἡμέραις πάννυ πολλὰς ῥύσασθαι τῆς τε μανίας καὶ πλάνης καὶ κακοπαθείας τῆς ἐκ τοῦ τοξικοῦ τούτου δυνήσεται τὸν ἄνθρωπον. Ἐπαλείφουσι δὲ τούτῳ μὲν τὰς αἰχμὰς τῷ φαρμάκῳ Ἀράβων Νομάδες, καταχρίουσι δὲ τὰς ἀκίδας τῶν βελῶν οἱ τὴν παρὰ τὸν ποταμὸν κειμένην τὸν Εὐφράτην γεωργοῦντες χῶραν· ἔστι δὲ ὡς ἐπίπαν τοῖς τιτρωσκομένοις τοῦτο τοξικὸν πολέμιον· ἐμπεσὸν μὲν γὰρ τῷ σώματι καὶ γενεσάμενον καθάπαξ ἀνθρωπίνου χροός, μέλανον πρῶτον μὲν τὸ σῶμα κατεργάζεται τοῦ τρωθέντος, ἔπειτα τρέπει αὐτό, καὶ νεκρῶδες ποιεῖ, καὶ διαδέχεται αὐτὸ ἐκ τούτου ὕδωρος, ὁ δὲ ἴός, τοῦ ἀνθρώπου κατασηπομένου καὶ ῥήξεις ὑπομένουτος τούτου, κατὰ παντός μέρους ἕξω χωρεῖν βιάζεται σὺν ὕδατι πάννυ πολλῶν καὶ ἀκαθαρίσιν [10].*

(Euteknios Soph. *Paraphrasis in Nicandri alexipharmaca* 7.21–39)

In the rest ancient Greek medical literature we do not find any other information or references about the term toxic [11], which was linked to something poisoning provoking corporal and mental disturbance [12]. This concept of the term survived until today with little differentiation, but always under the context of its lethal action [13].

## Literature Table

WRITER	CHRONOLOGY	WORK
Pseudo-Dioscorides	1 <sup>st</sup> c. AD	<i>De venenis eorumque praecautione et medicacione</i> 20.1–16
Oribasius of Pergamon	c. 320–403 AD	<i>Eclogae medicamentorum</i> 129.1.1–129.3.7
Euteknios	3 <sup>rd</sup> to 5 <sup>th</sup> c. AD	<i>Paraphrasis in Nicandri alexipharmaca</i> 7.21–39

## Authorship contributions

Please indicate the specific contributions made by each author (list

the authors' initials followed by their surnames, e.g., Y.L. Cheung). The name of each author must appear at least once in each of the three categories below.

#### Category 1

Conception and design of study Konstantinos Laios, acquisition of data: Konstantinos Laios, analysis and/or interpretation of data Spyros N. Michaleas, Gregory Tsoucalas

#### Category 2

Drafting the manuscript: Konstantinos Laios, revising the manuscript critically for important intellectual content Alexandros Papalampros George Androustos

#### Category 3

Approval of the version of the manuscript to be published (the names of all authors must be listed):: Konstantinos Laios, Spyros N. Michaleas, Gregory Tsoucalas, Alexandros Papalampros, George Androustos

### Declaration of Competing Interest

The authors report no declarations of interest.

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contributions from non-authors.

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