The ancient Greek roots of the term Toxic

Konstantinos Laios a,*, Spyros N. Michaleas a, Gregory Tsoucalas b, Alexandros Papalampros c, George Androutos d

a Department of History of Medicine and Medical Ethics, Medical School, National and Kapodistrian University of Athens, Athens, Greece
b Department of Anatomy, Medical School, Democritus University of Thrace, Greece
c Department of Surgery, Medical School, National and Kapodistrian University of Athens, Athens, Greece
d Biomedical Research Foundation, Academy of Athens, Greece

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ABSTRACT

In ancient Greek literature the adjective toxic (Greek: τοξικός) derives from the noun τοξόν, 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 (τοξόν, τό, bow, I.I.4.124, etc.: freq. in pl. τόξα for sg., τόξον μυστίν ἔχων ἄμφιρρους τε φαράγησιν 1.45, al., cf. P.L.P.3.101, S.Ph.654; sts. in Pros. Hesych. 51. Hdt.2.106, P.Perseph.5.8 (iii B. C.); ἐπιτάνετο... τόξον drew the bow, II.I.97; also τόξον φθινέω B.9.43; τόξον ἔλεκτρι (v.l. ἔλεκτρι) II.I.582; τόξον γέρων ἄμφιρρους 13.583; τόξον τεδίτε, έπτεθείς, Λ. Ag.364 (anap.), Fr.83; τ... ἐπιτάνεια Od.2.125, cf. Hdt.2.173; κυκλοφόρεις μέγα τ. έπεσε II.4.124, cf. E.Ba.1066; τόξον ἄμφι, (i.e. the Persians, the bow being an oriental weapon), opp. λόγις ἱγείς (i.e. the Greeks), A.Pers.147 (anap.). 2. τόξον by guess, ld.Ch.1033. 3. bowmanship, archery, τόξον ἐξ ἵδας Ι.2.718, al.; τόξον βίωμας 5.205, cf. 13.716; ἡ τέχνη τού τ. Hdt.1.73; πρός τόξον κρήσει S.T.tr.666; τόξον (sc. νικών) SIG1061.10 (Samos, ii B. C.); II. in pl. also, bow and arrows, τόξα πεπεταύεται ἀλλούς ἀλλί II.21.502, cf. Hdt.3.78, S.Ph.68, al.; st. in pl. for the arrows only, ib.652, P.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 τοξίκου. Τὸ δὲ τοξίκου ἡκεὶ μὲν ἑκομήσθη ἐκ τοῦ τά τοξεῖ τῶν μαχαῖρων ὡς ἄυστοι κρήσθησαν, παρακαθαριζομένου τὸ γεγυργόμενο γεγυργόμενο, καὶ γλάστρας φλεγμονής μακαὶ τὰ ἀκολούθησαν ποτάμια ἐξέφερον εὐτυχίας φαινόμενας ὡς καὶ δὴ τὰ ὄψιν διώξεως ἐκατέρχοντας ἐν τῷ ἑπεξεργασίας θεραπευτικῶς δὲ καὶ σώζονται τοὺς τῶν πειράκων. Δεῖ μέντοι συνεχεῖν αὐτοὺς ἀνοίγεις ἀνακρατεῖαις καὶ μαζώμοις γιγάντων ὕδων σὺν ῥοδώρ πλεῖων καὶ ἐξεμφόρες, τὸ τῇ γεγυργήσας σημεῖα πισωμένοι σὺν ὕδως ἑκάτου ὅπως ἐκ αὐτῶν ἀμήξει καὶ ἡ τῇ πενταγυμνόντω ῥέω, ἀμήξει τὸ τράχον ἢ ἀγαθός, ὁμοίως λαμμάδω ρίζης τῆς φλεγμονῆς ἢ περίκου ἢ περίκου, γάλακτος συμπελατικῆς καὶ μαζώμοι κεφαλῆς ἐνθύμεται λέει καὶ σῶν λήξεως καὶ ἦττοι πισωμένοι, ἠμισόμενα τε καὶ βεληνόμοι κτάσεις τῷ ὕδω καὶ ἐν τοῖς αὐτῶν φύορες τῷ κάθοις, πολύ χρόνου καθάρισεν διοικήσεις, καὶ ἔσπευδες ἐποθήμεροι τοὺς λείπεις ῥύπης διάσεϊς [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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K. Laios et al. underlined that the patient could present inflammation in the lips and 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.

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 quinces. 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 Orisbassius of Pergamon (c. 320–403 AD):

> Περὶ ταξικοῦ φαρμάκου διάφωσις καὶ θεραπεία. Τὸ ταξικὸ φαρμάκου καλολύμων δοκεῖ μὲν ἀκραζίατόν ἐκ τῶν ταξικῶν ύπο τῶν μορφῶν αὐτοῦ χρῆσθαι, παρακολουθήσας δὲ τῆς πεπονίας γλώσσας καὶ γεύσεως φλεγμόνας μακά τε ἀκατάστατος πουκαίας ἐπιβάλλουσα φασίπασες, ὡς καὶ διὰ τούτο διάφωσις αὐτοῦ ἔχειν, σπειρὼς δὲ σωστίζεται ταῦτα τῶν πεπονιτῶν, δεῖ τόν δεῖ νὰ μὴν συνέχεε ταῦτα ἀναγιγνύει τὸ γλύκον μετὰ βρωδοῦ πίειν καὶ ἔμελλε, ῥαιρίζει δ’ αὐτοῦ τὸ τῆς γούραλεμα σφιχήν πυρόν, διάπερνεν δ’ αὐτὸ τὸ πεύμα τοῦ βρωδοῦ βία, καὶ γράφει αὐτὸ σε ἐμπιστευτὴ, ἤ λεῖ σε γελώντος ἐν ὕπατι πυρόν, ἄφωνον καὶ βιατείρου καρπὸς κοίνων, ἐκ ἄχως ἦ ἐπὶ της διαφωτί τοῦ κίδουν, κλουστὴς πολλὴ διαμένει γρώς, ἐπεισοδίας τοῦ λοιποῦ τοῦ χρόου διατελεῖ [7].

(Orisbassius Med. Eclogae medicamentorum 129.1.1–129.3.7)

A very interesting medical approach to the theme is this of Nicander of Colophon (2nd c. BC) [8], which survived to us through the text of the sophist Euteneiros (3rd to 5th 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 spewed out. He also has swollen lips and tongue. His gigginga are blinding. In addition in many parts of the body,
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
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Declaration of Competing Interest
The authors report no declarations of interest.

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References
[1] H.G. Liddell, R. Scott, H.S. Jones, A Greek-English Lexicon, Clarendon Press, Oxford, 1940.
[2] A.M. Tsatsakis, L. Vassilopoulou, L. Kovatsi, C. Tsitsimpikou, M. Karamanou, G. Leon, J. Liesivuori, A.W. Hayes, D.A. Spandidos, The dose response principle from philosophy to modern toxicology: the impact of ancient philosophy and medicine in modern toxicology science, Toxicol. Rep. 6 (October (5)) (2018) 1107–1113.
[3] M. Grmek, D. Gourevitch, Les Maladies Dans l’art Antique, Fayard, Paris, 1998.
[4] M. Grmek, D. Gourevitch, Les Maladies à l’aube De La Civilisation Occidentale: Recherches Sur La réalité Pathologique Dans Le Monde Grec préhistorique, archaïque Et Classique, Payot & Rivages, Paris, 1994.
[5] Pedanii dioscoridis anazarbei. Vol. 2, in: K. Sprengel (Ed.), Medicorum Graecorum Opera Quae Exstant, Vol. 26.2, Knobloch, Leipzig, 1830.
[6] J. Scarborough, Pharmacy and Drug Lore in Antiquity: Greece, Rome, Byzantium, Ashgate, Burlington, VT, 2010.
[7] J. Raeder (Ed.), Eclogae Medicamentorum. Oribasii Collectionum Medicarum Reliquae. Vol. 4. Corpus Medicorum Graecorum, Vol. 6.2.2, Teubner, Leipzig, 1933.
[8] E.A. Barber, Nicander, in: N.G.L. Hammond, H.H. Scullard (Eds.), The Oxford Classical Dictionary, 2nd edn., Oxford University Press, Oxford, 1970, 732.
[9] A.S.F. Gow, A.F. Schofield, Nicander, the Poems and Poetical Fragments, CUP, Cambridge, 1953.
[10] M. Geymonat, Eutecnii Paraphrasis in Nicandri Alexipharmaca, Istituto Editoriale Cisalpino, Milan, 1976.
[11] L. Longrigg, Greek Rational Medicine: Philosophy and Medicine from Alcmaeon to the Alexandrians, Routledge, London /New York, 1993.
[12] B. Simon, Mind and madness in ancient Greece. The Classical Roots of Modern Psychiatry, BCornell University Press, Ithaca, NY, 1978.
[13] H. Kinoshita, H. Türkan, S. Vucinic, S. Naqvi, R. Bedair, R. Rezaee, A. Tsatsakis, Carbon monoxide poisoning, Toxicol. Rep. 20 (January (7)) (2020) 169-173.