Current Oncology

Supplementary Materials

Cutaneous Malignancies in Tattoos, a Case Series of Six Patients

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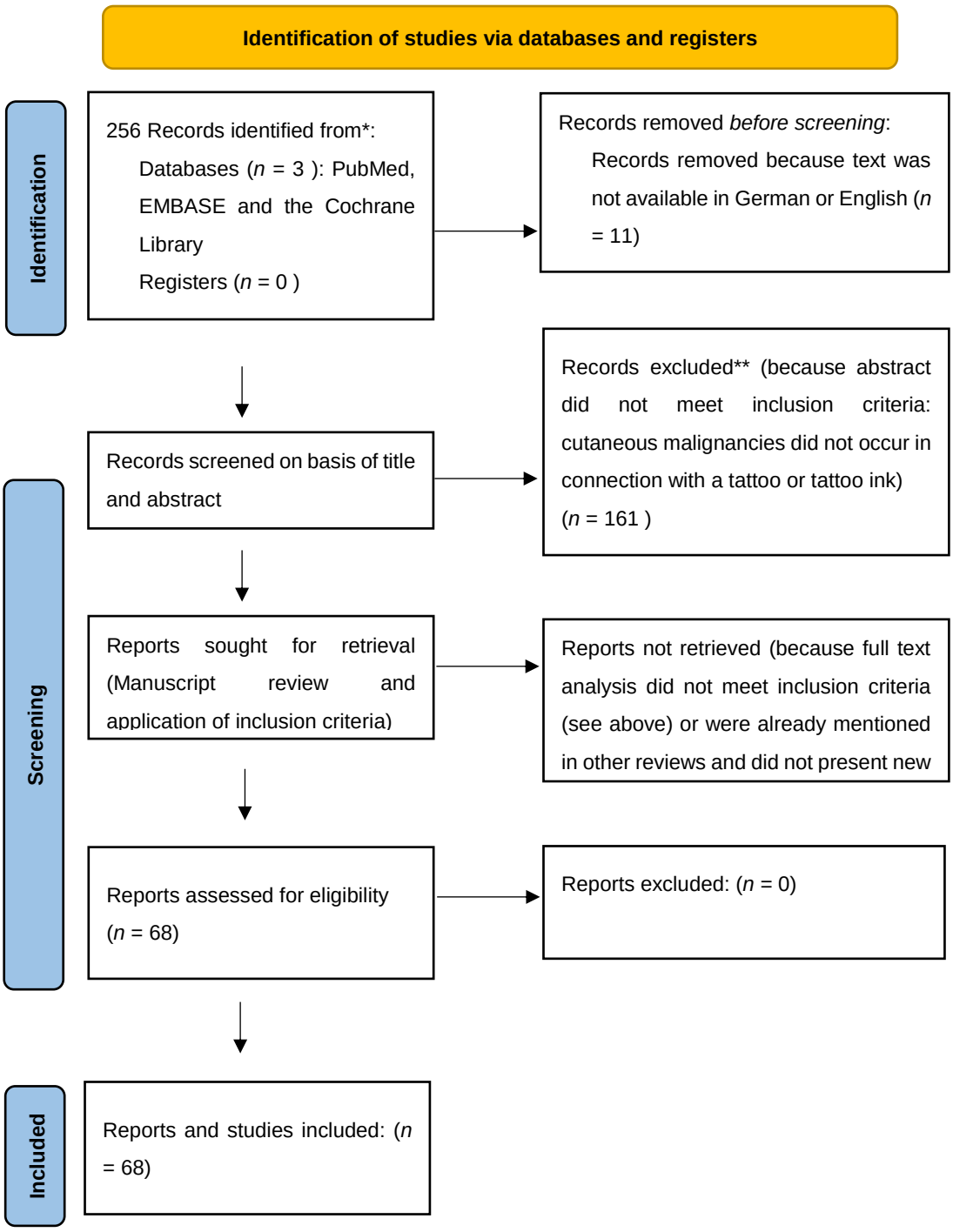
Figure S1. PRISMA 2020 flow diagram for literature research considering tumors in tattoos.



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers). **If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

The search of Medline (PubMed, EMBASE and the Cochrane Library) provided a total of 256 results. Search Terms were (in Title or Abstract): tattoo OR ink AND melanoma (*n*=140); tattoo OR ink AND basal cell carcinoma *n*=23); tattoo OR ink AND squamous cell carcinoma (*n*=51); tattoo OR ink AND keratoacantoma (*n*=26); tattoo OR ink AND dermatofibrosarcoma protuberans (*n*=7); tattoo OR ink AND cutaneous leiomyosarcoma (*n*=1); tattoo OR ink AND cutaneous lymphoid hyperplasia (*n*=8). After adjusting for language (English or German only) 245 remained. Out of these 245 references 161 were excluded due to the fact that after reading of the abstract, the paper did not meet the inclusion criteria. The remaining 84 were then read in full text mode and examined in more detail and 18 more references were excluded because they did not fit into the searching criteria or the presented cases were already mentioned in previous reviews and no new case was introduced in the study. In the end 68 references were included in the overview in table 1.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/, accessed on 1/9/2021

Table S1: Tattoo colorants and its cleavage products as well as possible adverse effects

Colorant	Cleavage Products (UV/Laser/Pyrolysis)	Reference
CI Pigment Yellow 74: IUPAC: (2-[(2-methoxy-4-nitrophenyl)diazenyl]-*N*-(2-methoxyphenyl)-3-oxobutanamide)	3-oxobutanamide, N,N0-bis(2-methoxyphenyl)urea, o-acetoacetanisidide, 2-methoxyacetanilide LASER: none Toxic: skin irritation, serious eye irritation	2004: [1], 2013: [2], 2020: [3]
CI Pigment Yellow 97: IUPAC: N-(4-Chlor-2,5-dimethoxyphenyl)-2-[[2,5-dimethoxy-4-[(phenylamino)sulfonyl]phenyl]azo]-3-oxobutyramid	UV: none LASER: aniline	2013: [2], 2020: [3]
CI Pigment Yellow 138: IUPAC: 4,5,6,7-tetrachloro-2-[2-(4,5,6,7-tetrachloro-1,3-dioxoinden-2-yl)quinolin-8-yl]isoindole-1,3-dione	Laser/Pyrolyse: hydrogen cyanide, benzene, Xylenes, 1,2,3,4-tetrachlorobenzene, pentachlorobenzene, 2,3,4,5,- tetrachlorobenzylaldehyde, hexachlorbenzene, 4,5,6,7- tetrachloro1,3-isobenzofuradione, 3,4,5,6- tetrachlorophthalimide Toxic:n.a.	2016: [4] [5], 2020: [3]
CI: Pigment Yellow 14 IUPAC: 2,2′-[(3,3′-Dichlor[1 ,1′-biphenyl]-4,4′-diyl)bis(azo)]bis[N-(2-methylphenyl)-3-oxobutyramid]	UV: 2-methylformanilide, 2-methyl-acetanilide, 3,3′-dichlorodiphenyl, 3,3′-dichlorobenzidine LASER: 3,3′-dichlorobenzidine	2015/2007: [6,7], 2020: [3]
CI: Pigment Yellow 83 IUPAC: 2,2′-((3,3′-Dichlor(1,1′-biphenyl)-4,4′-diyl)bis(azo))bis(N-(4-chlor-2,5-dimethoxyphenyl)-3-oxobutyramid)	UV: not studied LASER: 3,3′-dichlorobenzidine	2013: [2], 2020: [3]
CI: Pigment Red 22 IUPAC: 3-Hydroxy-4-[(2-methyl-5-nitrophenyl)azo]-N-phenylnaphthalin-2-carboxamid	UV: 2-amino-4-nitrotoluene, 4-nitrotoluene LASER: 2-amino-4-nitrotoluene, 4-nitrotoluene, naphthol AS	2004:[6], 2020:[3]
CI: Pigment Red 112 IUPAC: 3-Hydroxy-N-(o-tolyl)-4-[(2,4,5-trichlorphenyl)azo]naphthalin-2-carboxamid	UV: 2-toluidine, 2,4,5-trichloroaniline, 2-methylformanilide, 2-methylacetanilide LASER: 2-toluidine, 2,4,5-trichloroaniline Toxic: low (allergic skin reactions)	2013:[2], 2011:[8], 2020:[3]
CI: Pigment Red 9 IUPAC: 4-[(2,5-Dichlorphenyl)azo]-3-hydroxy-N-(2-methoxyphenyl)naphthalin-2-carboxamid	UV: not studied LASER: 2,5-dichloroaniline, 1,4-dichlorobenzene, methoxy-naphthol AS	2013:[2], 2011:[8], 2020:[3]
CI: Pigment Red 170 IUPAC: 4-[[4-(Aminocarbonyl)phenyl]azo]-N-(2-ethoxyphenyl)-3-hydroxynaphthalin-2-carboxamid	UV: 4-hydroxybenzamide, 4-aminobenzamide, benzamide LASER/pyrolysis: Aniline, benzene, 2-ethoxyaniline, 4-aminobenzonitrile, 2-naphtol, 2 additional unknows substances Toxic: : low (allergic skin reactions)	2013:[2], 2016 [4], 2020:[3]
CI: Pigment Red 254	UV: none identified	

IUPAC: 1,4-bis(4-chlorophenyl)-3-hydroxy-2H-pyrrolo[3,4-c]pyrrol-6-one	LASER/Pyrolysis: Benzene, Chlorobenzene, 4-chlorobenzonitrile	2013:[2], 2016 [4], 2020:[3]
CI: Pigment Red 202 IUPAC: 2,9-dichloro-5,12-dihydroquinolino[2,3-b]acridine-7,14-dione	UV: 4-chloroaniline LASER: none identified	2013:[2], 2020:[3]
CI: Pigment Red 122 IUPAC: 2,9-dimethyl-5,12-dihydroquinolino[2,3-b]acridine-7,14-dione	UV: none identified LASER: none identified Toxic: none classified	2013:[2], 2020:[3]
CI: Pigment Orange 13 IUPAC: 4,4′-[(3,3′-Dichlor[1,1′-biphenyl]-4,4′-diyl)bis(azo)]bis[2,4-dihydro-5-methyl-2-phenyl-3H-pyrazol-3-on]	UV: 3,3′-dichlorodiphenyl, 3,3′-dichlorobenzidine LASER/Pyrolysis: aniline, 3,3′-dichlorobenzidine, : 3,3′-dichloro-1,1`diphenyl, Benzene, 3,3′-dichlorobenzidine, Phenzlisocyanate, 3,3′-dichlorodiphenyl-4-amine, hydrogen cyanide, benzonitrile, 2-chloroaniline, 2-aminobenzonitrile	2011:[8], 2013:[2], 2016:[4], 2018: [5], 2020:[3]
CI: Pigment Orange 34 IUPAC: 4,4′-[(3,3′-Dichlor[1,1′-biphenyl]-4,4′-diyl)bis(azo)]bis[2,4-dihydro-5-methyl-2-(p-tolyl)-3H-pyrazol-3-on]	UV: 3,3′-dichlorobenzidine LASER: not studied	2013:[2], 2020:[3]
CI: Pigment Orange 16 IUPAC: 2,2′-[(3,3′-Dimethoxy[1,1′-biphenyl]-4,4′-diyl)bis(azo)]bis[3-oxo-N-phenylbutyramid]	UV: formanilide, acetanilide, 3,3′-dimethoxydiphenyl LASER: none identified	2013:[2] 2011:[8], 2020:[3]
CI: Pigment Violet 23 IUPAC: 2,20-Dichloro-13,31-diethyl-18,36-dioxa-4,13,22,31-tetrazanonacyclo (19.15.0.03,19.05,17.06,14.07,12.023,35.024,32.025,30) hexatriaconta-1,3,5(17),6(14),7,9,11,15,19,21,23(35),24(32),25,27,29,33-hexadecaene	UV: none identified , LASER: none identified, Pyrolysis: Benzene, 2-amino-9-oxo-dihydroacridine-3-carbaldehyde,	2013:[2], 2020:[3]
CI: Pigment Violet 19 IUPAC : 5,12-dihydroquinolino[2,3-b]acridine-7,14-dione	Pyrolysis: 1,2-Benzenedicarbonitrile, benzonitrile, phthalimide, UV: none identified, LASER: none identified, Component toxicity (Copper): acute oral toxicity, serious eye irritation, acute inhalation toxicity	2016: [4], 2020:[3]
CI: Pigment Green 7 IUPAC: Polychloro copper phthalocyanine	UV: none identified LASER/Pyrolysis: 1,2-benzene dicarbonitrile, 2-methylbenzonitrile, benzonitrile, benzene, and the poisonous gas hydrogen cyanide (HCN)	2013:[2]
CI: Pigment Blue 15 IUPAC: (29H,31H-phthalocyaninato(2-)-N29,N30,N31,N32)copper	UV:n.a., Laser:n.a. Toxic: may cause respiratory irritation (Specific target organ toxicity, single exposure), suspected of causing cancer (Carcinogenicity)	2016: [4], 2020:[3]
CI: Pigment Black 7 IUPAC: Carbon Black	Toxic: Chronic (Cumulative) Toxicity, Toxic to Reproduction (ECHA) suspected, Tumorigenic, Carcinogenic, irritative	2013:[2], 2016: [4], 2020:[3]
Contamination/additives		
CI/IUPAC: Antimony	Tumorigenic, Carcinogenic, irritative	2020:[3]
CI/IUPAC: Arsenic	Toxic: acute & chronic toxic, Carcinogenic, irritative	2020:[3]
CI/IUPAC: Cadmium	Toxic: Carcinogenic (inhalative), toxic, irritative	2020:[3]
CI/IUPAC: Chromium	Toxic: Irritative, anticipated to be human carcinogen, acute toxic, cumulative lung damage	2020:[3]
CI/IUPAC: Cobalt	Toxic: probable human carcinogen, nervous system disturbance, acute toxic, irritative	2020:[3]
CI/IUPAC: Lead	Toxic: anticipated to be human carcinogen, irritative, chronic (cumulative) toxic, mutagen	2020:[3]
CI/IUPAC: Nickel	Toxic: Skin sensitizer (Category 1), irritative (eyes, nose, throat, skin)	2020:[3]
CI: Methyl methacrylate IUPAC: methyl 2-methylprop-2-enoate	Toxic: Skin sensitizer (Category 1), irritative (eyes, nose, throat, skin)	2020:[3]
CI: Dodecyl methacrylate IUPAC: dodecyl 2-methylprop-2-enoate	Toxic: Skin sensitizer (Category 2), serious irritative (eyes, nose, throat, skin), may cause respiratory irritation	2020:[3]
CI: Tetradecyl methacrylate IUPAC: tetradecyl 2-methylprop-2-enoate	Toxic: Skin irritation, may cause allergic skin reaction, serious eye irritation, may cause respiratory irritation	2020:[3]
IUPAC: Styrene	Toxic: Skin sensitizer (Category 2), serious irritative (eyes, nose, throat, skin), acute inhalative toxicity, specific target organ toxicity; repeated exposure (Cat. 1), suspected of reproductive toxicity	2020:[3]
CI: α-Methylstyrene IUPAC: prop-1-en-2-ylbenzene	Toxic: Causes serious eye irritation, may cause respiratory irritation	2020:[3]

CI/IUPAC: Benzene	Toxic: Carcinogenicity (Cat 1a), Skin irritation, serious eye irritation, may cause genetic effects, specific organ toxicity (Repeated exposure)	2016:[4], 2020:[3]
CI/IUPAC: Toluene	Toxic: Skin irritation (Cat.2), Specific target organ toxicity, repeated exposure, Cat. 1, reproductive toxicity	2016:[4], 2020:[3]
CI/IUPAC: Naphthalene	Toxic: Carcinogenicity (Cat. 2), acute oral toxicity	2016:[4], 2020:[3]
CI/IUPAC: Biphenyl	Toxic: Skin irritation (Cat.2), serious eye irritation, may cause respiratory irritation	2016:[4], 2020:[3]
CI: Dimethylcyclosiloxanes (oligomers) IUPAC: 2,2-dimethyl-1,3,5,2,4,6-trioxatrisilinane	Toxic: Reproductive toxicity, Cat. 2	2016:[4], 2020:[3]
CI/IUPAC: Silicone	Toxic: Serious eye irritation (Cat. 2b)	2016:[4], 2020:[3]
CI: Ethylene glycol IUPAC: ethane-1,2-diol	Toxic: acute oral toxicity, Specific target organ toxicity, repeated exposure (kidney), Cat. 2	2016:[4], 2020:[3]
CI: 1-Methyl-2-pyrrolidinone IUPAC: 1-methylpyrrolidin-2-one	Toxic: Skin irritation (Cat. 2), serious eye irritation, Specific target organ toxicity, (single exposure; Respiratory tract irritation), Reproductive toxicity(teratogenic effects)	2016:[4], 2020:[3]
CI: N-Vinylpyrrolidone IUPAC: 1-ethenylpyrrolidin-2-one	Toxic: Carcinogenicity (Cat. 2), acute oral toxicity, acute dermal toxicity, serious eye irritation, acute inhalation toxicity, may cause respiratory irritation (Specific target organ toxicity, single exposure; Respiratory tract irritation)	2016:[4], 2020:[3]

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