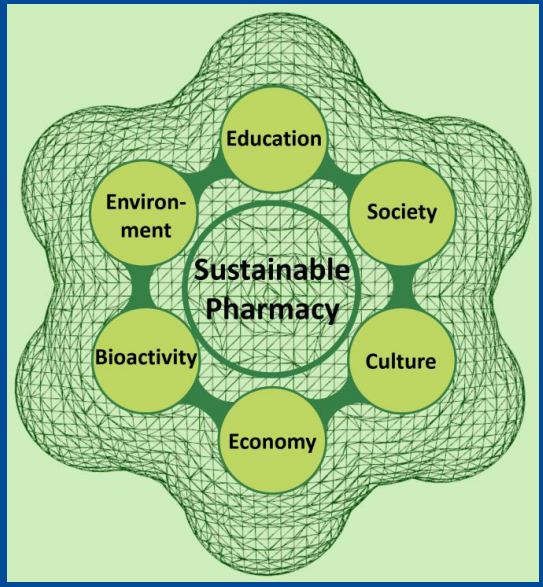
Sustainable Pharmacy and Pharmaceutical Care: two sides of the same coin



Prof. Michael Müller

Albert-Ludwigs-Universität Freiburg

11.02.2023

Hillerod, Denmark

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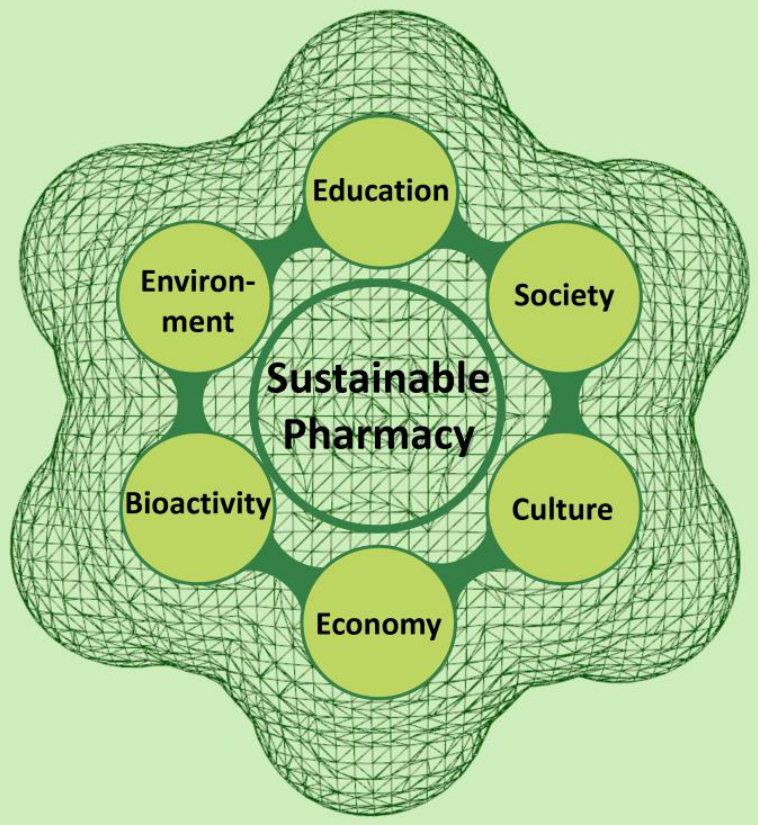
Sustainable Pharmacy



Sustainable Pharmacy
(Witte, Müller):

Sustainable pharmacy is the **simultaneous, equal and dynamic incorporation of pharmacological, environmental, economic and social aspects** with the aim of providing effective treatment of diseases for current and future generations.

Bundesamt für
Verbraucherschutz und
Lebensmittelsicherheit

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Tab. 1: Vergleich der Antibiotika-Abgabemengen bezogen auf die Wirkstoffklassen 2011 bis 2021

Wirkstoffklasse	Abgabemenge [t]											Differenz [t] 2011-2021
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Aminoglykoside	47	40	39	38	25	26	29	30	34	36	30	-17
Cephalosp., 1. Gen.	2,0	2,1	2,1	2,1	1,9	2,0	2,0	2,1	2,1	2,0	2,2	0,2
Cephalosp., 3. Gen.	2,1	2,3	2,3	2,3	2,3	2,3	2,3	1,3	1,0	1,0	0,9	-1,2
Cephalosp., 4. Gen.	1,4	1,4	1,4	1,4	1,3	1,1	1,1	0,5	0,3	0,3	0,3	-1,1
Fenicole	6,1	5,7	5,2	5,3	5,0	5,1	5,6	6,0	6,3	6,3	5,8	-0,3
Fluorchinolone	8,2	10,4	12,1	12,3	10,6	9,3	9,9	7,7	6,0	6,4	5,6	-2,6
Folsäureantagonisten	30	26	24	19	10	9,8	7,8	8,0	8,1	8,9	9,1	-20,9
Fusidinsäure*												
Ionophore*												
Lincosamide	17	15	17	15	11	9,9	11	9,9	13	13	13	-4
Makrolide	173	145	126	109	52	55	55	59	57	61	46	-127
Nitrofurane*												
Nitroimidazole*												
Penicilline	528	501	473	450	299	279	269	271	264	278	235	-293
Pleuromutiline	14	18	15	13	11	9,9	13	8,2	7,7	10,5	8,0	-6
Polypeptidantibiotika	127	123	125	107	82	69	74	74	66	60	51	-76
Sulfonamide	185	162	152	121	73	69	62	63	59	65	64	-121
Tetrazykline	564	566	454	342	221	193	188	178	140	148	125	-439
Summe	1.706	1.619	1.452	1.238	805	742	733	722	670	701	601	-1.105

Scheinbare Ungenauigkeiten oder Abweichungen bei den Mengenangaben sind durch Rundungseffekte bedingt.

**Wahrung des Geschäfts- und Betriebsgeheimnisses, Daten dürfen nicht veröffentlicht werden, da es i. d. R. nur einen Zulassungsinhaber gibt (nach § 6 IFG und § 9 Abs. 1 (3) UIG)*

Article

Regional Variations in Outpatient Antibiotic Prescribing in Germany: A Small Area Analysis Based on Claims Data

Oliver Scholle [1,*], Marieke Asendorf [1], Christoph Buck [2], Susann Grill [2], Christopher Jones [3], Bianca Kollhorst [2], Oliver Riedel [1], Benjamin Schüz [3] and Ulrike Haug [1,4]

Table 1. Study population, antibiotic prescriptions, and standardized prescription rates of antibiotics in 2010 and 2018.

	Age Group in Years											Overall
	0–1	2–5	6–9	10–14	15–17	18–24	25–34	35–44	45–54	55–64	≥65	
Study population, n												
2010	136,559	436,886	480,760	701,457	378,154	1,013,358	1,688,664	1,837,739	2,293,396	1,734,896	2,685,105	13,386,974
2018	207,313	631,394	574,562	698,922	443,551	1,278,576	2,324,134	2,144,815	2,510,252	2,445,223	3,429,056	16,687,798
Antibiotic prescriptions, n												
2010	111,057	466,396	284,940	269,106	207,945	594,281	904,525	1,015,324	1,176,770	976,126	1,661,508	7,667,978
2018	82,842	359,160	211,225	165,442	158,872	538,842	920,133	956,370	1,077,739	1,161,307	1,829,845	7,461,777
Standardized prescription rates [a]												
2010	651.3	1069.1	596.0	384.0	552.9	579.6	526.8	547.3	505.0	555.1	629.0	574.6
2018	313.7	568.4	366.4	236.4	357.8	420.0	391.5	441.4	421.8	469.0	533.6	442.0
Change in prescription rate from 2010 to 2018	−52%	−47%	−39%	−38%	−35%	−28%	−26%	−19%	−16%	−16%	−15%	−23%

[a] Prescriptions per 1000 persons/year; age- and sex-standardized using the German population on 31 December 2017 as reference.

Antibiotics **2022**, *11*, 836. https://doi.org/10.3390/antibiotics11070836

GOV.UK | Topics

Home > Manufacturing, wholesaling, importing and exporting medicines

News story

Development of new antibiotics encouraged with new pharmaceutical payment system

The NHS will test the world's first 'subscription' style payment model to incentivise pharmaceutical companies to develop new drugs for resistant infections.

From: Department of Health and Social Care

Published 9 July 2019

Health and Social Care Secretary, Matt Hancock, said:

" There is no greater threat to global health than drug-resistant infections, yet there have been no major new antibiotic drug classes discovered since the 1980s.

" Imagine a world in which a papercut can lead to infection that can't be controlled. We must stop that from happening. Tackling superbugs needs global leadership and peoples' lives depend on us finding a new way forward.

" Our NHS is in a unique position to take a global lead in testing new payment models. We will take the lead but this is a global problem and we cannot succeed alone.

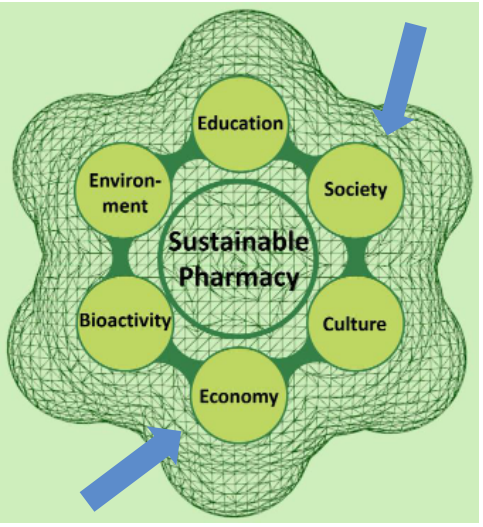
" I am proud the UK is taking the first steps towards a s
urging the rest of the world to join us in the fight again

Health Minister Nicola Blackwood said:

" Having a full pipeline of antimicrobials is critical in our
AMR, but currently not enough pharmaceutical compa
the development of new drugs.

" This project is an important step but it will only addres
failure if other countries do the same, which is why we
many countries as we can and share our learning from

" Today we are sending a strong signal to the rest of the world that there are workable models to stimulate investment in these vital medicines and that together we can tackle AMR."



https://www.gov.uk/government/news/development-of-new-antibiotics-encouraged-with-new-pharmaceutical-payment-system

U.K. tests antibiotic subscriptions

DRUG DEVELOPMENT | The United Kingdom is moving closer to a world first: paying pharma companies a subscription-style fee for access to new antibiotics. The model is designed to give companies a financial incentive to innovate. New antibiotics are needed because their widespread use in human and veterinary medicine has led to the spread of resistant bacteria. But pharma companies see little financial reward in developing novel antibiotics, which are usually held in reserve for cases in which other antibiotics do not work, and then given for just a few days. The subscription model provides guaranteed income for drugs that have been proven efficacious and licensed. A[illegible] of the subscription model could [illegible] using two new antibiotics [illegible] Japanese drugmaker [illegible] by U.S. manufacturer [illegible] important milestone, [illegible] National Institute for Health and Care Excellence concluded last week that the drugs' medical value was worth paying each company £10 million yearly for up to 10 years. Negotiations with the companies are underway.

Science **330** 22 APRIL 2022 • VOL 376 ISSUE 6591

- **Economic incentives – ökonomische Anreize**

1. **What is the basis or rationale for setting the max payments at £10m per year?**
The UK Government recognises the importance of pull incentives in order to help stimulate the antimicrobial development pipeline. The principle of the project is to test a model that pays companies for antimicrobials based on a health technology assessment of their value to the NHS, as opposed to the volumes used. It is critical that we make sure that the NHS gets the best value from its drug and the maximum contract value has been derived under the assumption that the UK pays its fair share. The UK accou[illegible] about 2.4% of global sales of antibiotics and 4.2% of GDP of [illegible] antibiotic reimbursement contract proposed covers just the [illegible]gland which represents 84% of the UK. We believe that if the [illegible]m, on offer from this contract, was scaled up from 3% - 3.5% (England's share) then global revenues would be between $3.5bn to $4bn over 10 years.

5. **What happens if use is very low/negligible throughout the contract?**
The reimbursement model seeks to delink payment for the antibiotic from the volume of packs of the product used. So, if in some years the use of the antibiotic is low the supplier will still receive the agreed annual payments. If in some years the volumes of the antibiotic used are higher than anticipated, the same agreed contract payments will still be made.

https://amr.solutions/wp-content/uploads/2020/03/2020-04-03-NHS-England-Procurement-FAQs-FINAL.pdf

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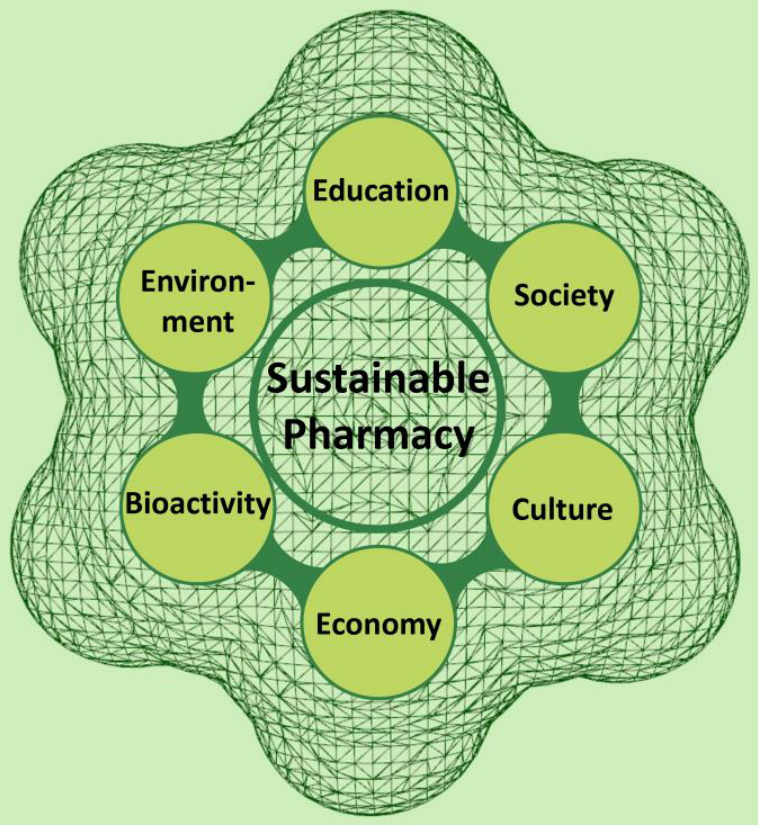
Sustainable Pharmacy



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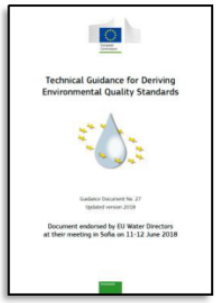
List of Priority substances until 2022

- Alachlor
- Anthracene
- Atrazine
- Benzene
- Brominated diphenylether
- Pentabromodiphenylether
- Cadmium and its compounds
- Chloroalkanes, C10-13
- Chlorfenvinphos
- Chlorpyrifos
- 1,2-Dichloroethane
- Dichloromethane
- Di(2-ethylhexyl)phthalate (DEHP)
- Diuron
- Endosulfan
- Fluoranthene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclohexane
- Isoproturon
- Lead and its compounds
- **Mercury and its compounds**
- Naphthalene
- Nickel and its compounds
- Nonylphenols
- Octylphenols
- (4-(1,1',3,3'-tetramethylbutyl)-phenol)
- Pentachlorobenzene
- Pentachlorophenol
- **Polyaromatic hydrocarbons**
- (Benzo(a)pyrene)
- (Benzo(b)fluoranthene)
- (Benzo(g,h,i)perylene)
- (Benzo(k)fluoranthene)
- (Indeno(1,2,3-cd)pyrene)
- Simazine
- Tributyltin compounds
- (Tributyltin-cation)
- Trichlorobenzenes
- Trichloromethane (chloroform)

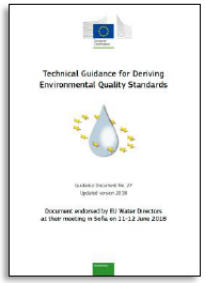


Gerd Maack, UBA

The Water Framework Directive (WFD)

Compounds to be added, depending the final decision

Elements	Pharmaceuticals	Pesticides/ Biocides
Silver (JRC)	Hormons (E1, E2, EE2)	Neonicotinoids
Uran	Azithromycine	Pyrethroids
Selen	Erythromycinee	Bisphenols
	Clarithromycin	Glyphosate
	Diclofenac	Triclosan
	Ibuprofen	Nicosulfuron
	Carbamazepine	Omethoate
		Malathion



Gerd Maack, UBA

The Observer Birds

Rare European vultures being poisoned by livestock drug

▲ A cinereous vulture was confirmed to have been killed by the drug, which a
Wildlife World/Alamy

Robin McKie

Sun 11 Apr 2021 10.45 BST

Conservation Biology

Letter

Diclofenac Approval as a Threat to Spanish Vultures

Vultures are long-lived birds that provide essential ecosystem services and whose populations are declining worldwide (Sekercioglou et al. 2004; Ogada et al. 2011). Diclofenac, a nonsteroidal anti-inflammatory veterinary drug, is among large-scale threatening factors currently causing large declines in populations of vultures. It has been shown that diclofenac is responsible for the catastrophic decline of Asian and African vulture populations (Oaks et al. 2004; Shultz et al. 2004; Naidoo et al. 2009). Between 1990 and 2000, the hitherto large populations of avian scavengers on the Indian subcontinent (Indian White-backed Vulture, *Gyps bengalensis*; Long-billed

and environmental policies (Tella 2001; Donázar et al. 2009), new regulations allow livestock carcasses to be consumed by wild scavengers in the field or at supplementary feeding stations (Margalida et al. 2012). Thus, veterinary drugs may be consumed by vultures and other carrion eaters, including threatened carnivores such as the brown bear (*Ursus arctos*) and wolf (*Canis lupus*).

Despite the differences between European agro-grazing systems and those found in Asian or African ecosystems, it is undeniable that European vulture populations could be seriously affected by the ingestion of diclofenac, and its use has become a matter of great concern for ecologists, politicians, and conservationists. In India, the solution to this problem was to replace diclofenac with meloxicam (Swarup et al. 2007; Cuthbert et al. 2011). Thus, following the precautionary principle, which was recognized as a fundamental element of environmental policy at the Rio Conference of 1992 (Kanongdate et al. 2012), we urge that a ban on the use of diclofenac for livestock be implemented immediately to avoid undesirable consequences to vulture populations and ecosystem functioning in Spain.

Antoni Margalida,*† José A. Sánchez-Zapata,‡ Guillermo Blanco,§ Fernando Hiraldo, and José A. Donázar****

Conservation Biology
2014,
Volume *28*, No. 3, 631-632.

ELSEVIER

Science of The Total Environment

Volume 782, 15 August 2021, 146890

First diclofenac intoxication in a wild avian scavenger in Europe

Marta Herrero-Villar [a], Émilie Delepoulle [b], Laura Suárez-Regalado [b], Carlos Solano-Manrique [c], Carles Juan-Sallés [d], Juan J. Iglesias-Lebrija [b], Pablo R. Camarero [a], Fernando González [b], Ernesto Álvarez [b], Rafael Mateo [a]

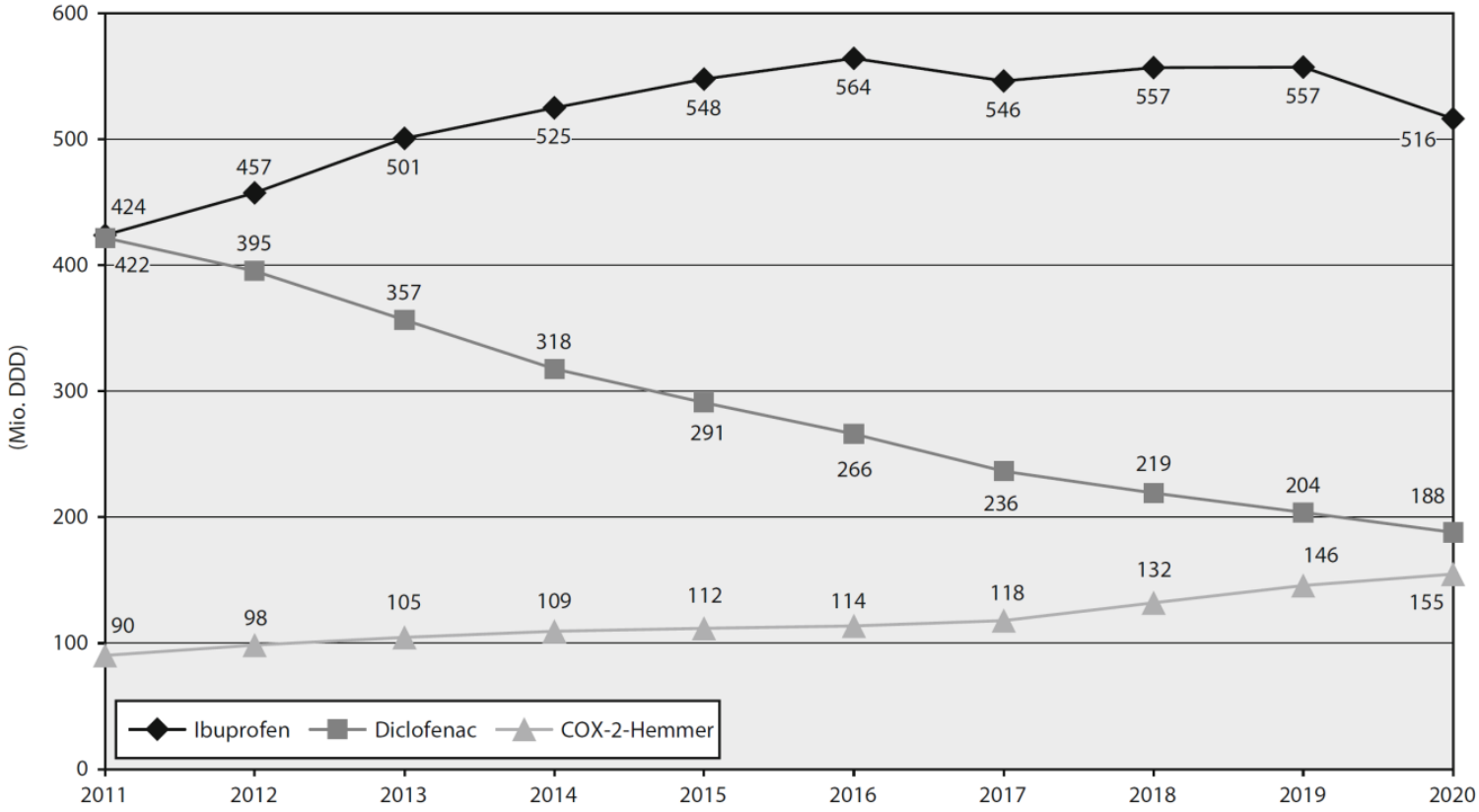


Abb. 18.2 Verordnungen von nichtsteroidalen Antiphlogistika und COX-2-Hemmern 2011 bis 2020. Gesamtverordnungen nach definierten Tagesdosen

Retrospective study of the use of medication and supplements during the 2018 FIFA World Cup Russia

Chelsea Oester, Alexis Weber, Martin Vaso

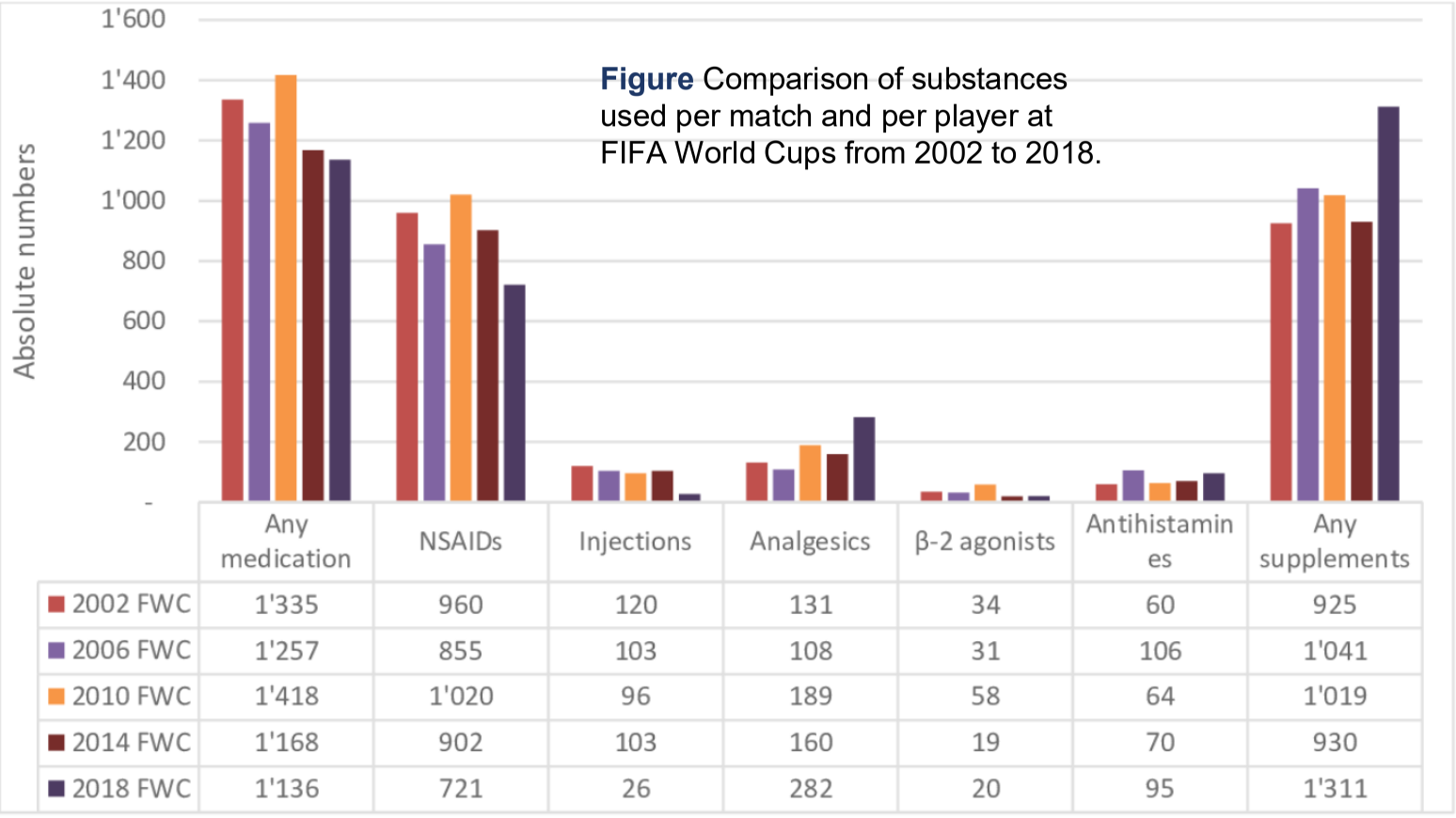


Figure Comparison of substances used per match and per player at FIFA World Cups from 2002 to 2018.

	Any medication	NSAIDs	Injections	Analgesics	β-2 agonists	Antihistamines	Any supplements
2002 FWC	1'335	960	120	131	34	60	925
2006 FWC	1'257	855	103	108	31	106	1'041
2010 FWC	1'418	1'020	96	189	58	64	1'019
2014 FWC	1'168	902	103	160	19	70	930
2018 FWC	1'136	721	26	282	20	95	1'311

BMJ Open Sp Ex Med 2019;5:e000609.
doi:10.1136/bmjsem-2019-000609

CURRENT MEDICAL RESEARCH AND OPINION, 2017
VOL. 33, NO. 9, 1623–1634
https://doi.org/10.1080/03007995.2017.1352497
Article FT-0359.R1/1352497

REVIEW

Skin penetration and tissue permeation after topical administration of diclofenac

Martina Hagen and Mark Baker

GlaxoSmithKline Consumer Healthcare, Nyon, Switzerland

ment of knee OA. The pharmacological action of topical drugs relies on penetration and permeation through the skin into the lower layers. Many factors can affect this process and need to be considered in the topical administration of NSAIDs, including the innate properties of the drug, the formulation used, the methods of application, and patient inter- and intraindividuality.

More data is required to evaluate the penetration and permeation after topical delivery. The available data for the concentration of diclofenac within various tissues after topical administration is old, sparse and inconsistent. Use of the

Topical NSAIDs Cochrane Reviews

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•Topical NSAIDs for acute musculoskeletal pain in adults. Derry S, Moore RA, Gaskell H, McIntyre M, Wiffen PJ. Cochrane Database Syst Rev. 2015 Jun 11;2015(6):CD007402. doi: 10.1002/14651858.CD007402.pub3. PMID: 26068955 Free PMC article. Review.

•Topical analgesics for acute and chronic pain in adults - an overview of Cochrane Reviews. Derry S, Wiffen PJ, Kalso EA, Bell RF, Aldington D, Phillips T, Gaskell H, Moore RA. Cochrane Database Syst Rev. 2017 May 12;5(5):CD008609. doi: 10.1002/14651858.CD008609.pub2. PMID: 28497473 Free PMC article. Review.

•

•Topical NSAIDs for chronic musculoskeletal pain in adults. Derry S, Conaghan P, Da Silva JA, Wiffen PJ, Moore RA. Cochrane Database Syst Rev. 2016 Apr 22;4(4):CD007400. doi: 10.1002/14651858.CD007400.pub3. PMID: 27103611 Free PMC article. Review.

•Topical NSAIDs for chronic musculoskeletal pain in adults. Derry S, Moore RA, Rabbie R. Cochrane Database Syst Rev. 2012 Sep 12;9(9):CD007400. doi: 10.1002/14651858.CD007400.pub2. PMID: 22972108 Free PMC article. Updated. Review.

The individual reviews and this overview have highlighted the lack of good evidence for many topical analgesics. Most of the studies and the participants included in them did not contribute to any reliable assessment of efficacy or harm. That is a waste, and the ethics of research of that sort is hard to justify.

While there appears to be general consensus over design of studies, many of the individual studies in the individual reviews fail to meet reasonable standards. Much of that reflects the age of the studies and the standards of reporting extant at the time of publication. Others are more fundamental, such as having an adequate duration of studies investigating chronic pain; while efficacy may be established relatively early (four to six weeks), longer duration allows for assessment of tolerability.

We rated the quality of the evidence for topical diclofenac and topical ketoprofen compared with placebo as moderate for efficacy, and very low for harmful effects. Moderate quality evidence means that further research may change our estimate of the effect, and very low quality evidence means that we are very uncertain about the accuracy of our estimate.

More data is required to evaluate the penetration and permeation after topical delivery. The available data for the concentration of diclofenac within various tissues after topical administration is old, sparse and inconsistent. Use of the

Cochrane Library

ORIGINAL ARTICLE

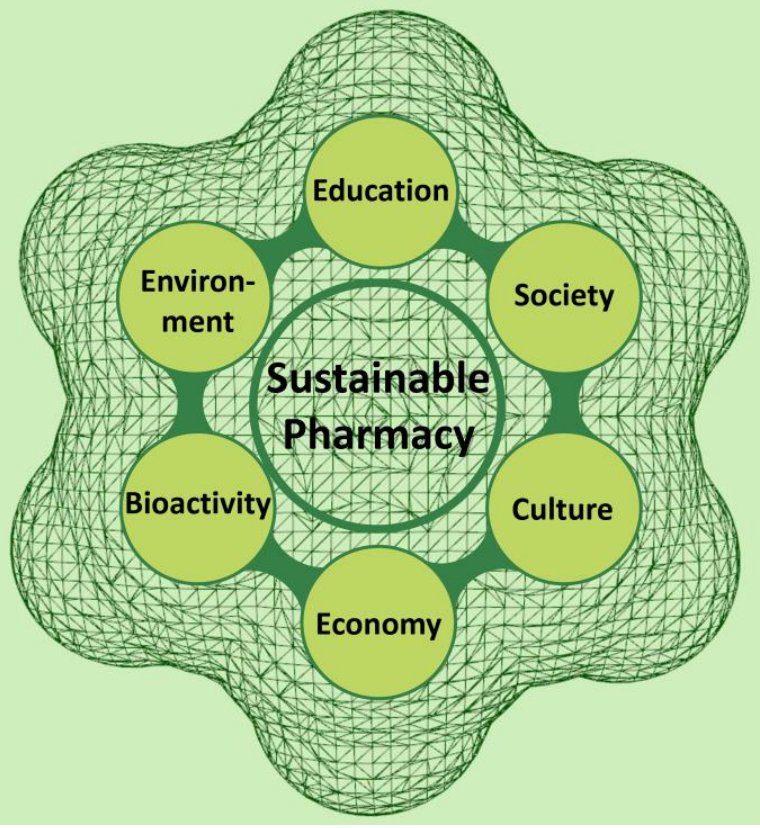
Topical ketoprofen TDS patch versus diclofenac gel: efficacy and tolerability in benign sport related soft-tissue injuries

Francisco Esparza, César Cobián, José Fernando Jiménez, Juan José García-Cota, Carlos Sánchez, Antonio Maestro and the working group for the acute pain study of SETRADE, coordinated by Josep Borrell

Br J Sports Med 2007;**41**:134–139. doi: 10.1136/bjsm.2006.030239

Intervention: 7–14 days of topical non-steroidal anti-inflammatory drugs treatment to assess the pain intensity changes (daily activities and spontaneous at rest) in a daily diary (100-mm Visual Analogue Scale (VAS)).
Main outcome measurement: Pain intensity (VAS).
Results: The ketoprofen patch was not inferior to diclofenac gel in reducing the baseline pain during daily activities (difference of −1.17 mm in favour of ketoprofen patch, 95% CI (−5.86 to 3.52), reducing to the baseline VAS 79%. Ketoprofen patch presented also a higher cure rate (64%) than diclofenac gel (46%) at day 7 ($p=0.004$). Patient opinions about the treatment comfort (pharmaceutical shape, application and dosage) were also statistically higher for the ketoprofen patch (>80% of the patients rated as good or excellent the patch removal and skin adherence).
Conclusion: Ketoprofen patches are effective and safe pain relievers for the treatment of sports injury pain with advantages compared with diclofenac gel.

Sustainable Pharmacy



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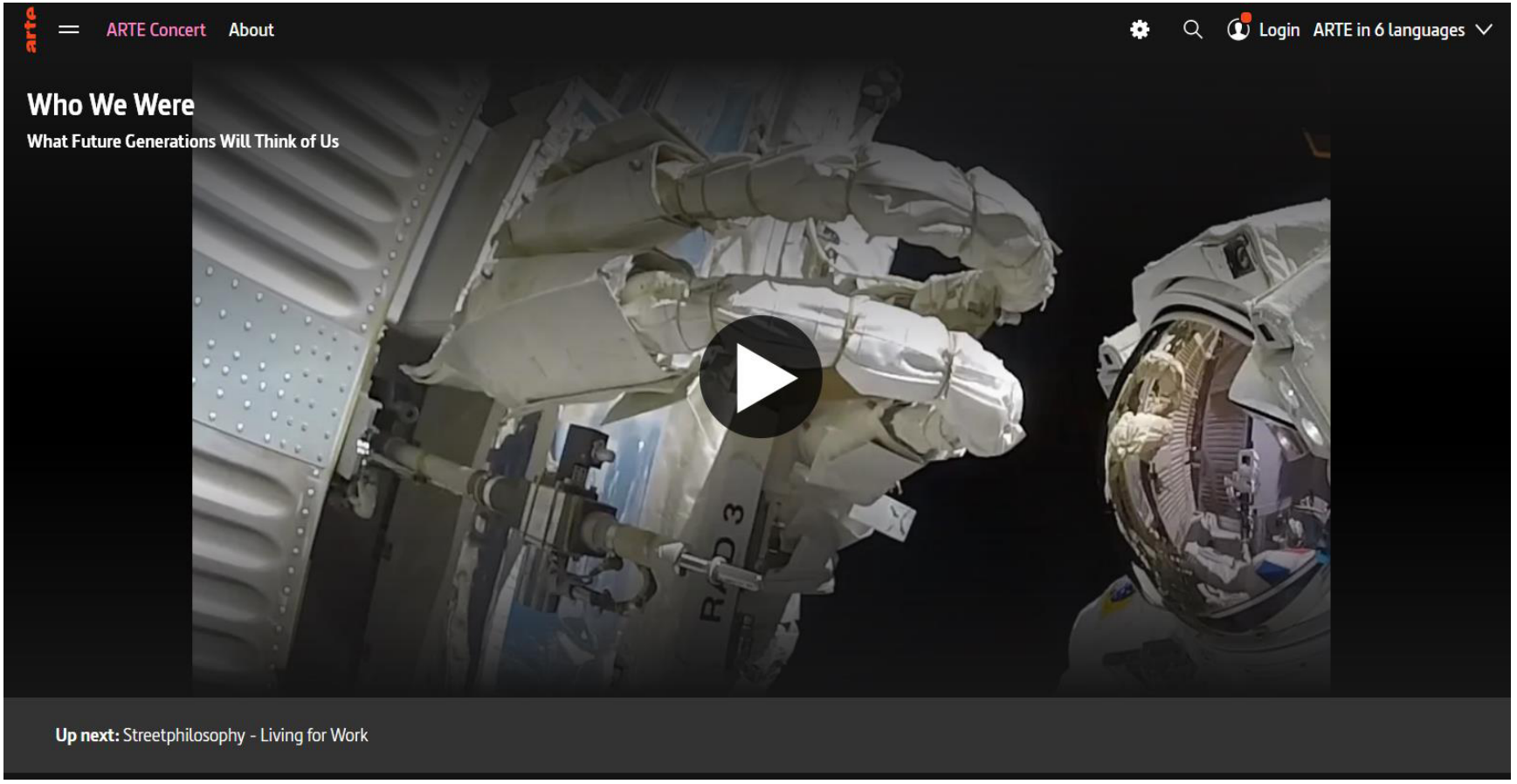
https://www.arte.tv/en/videos/087416-000-A/who-we-were/



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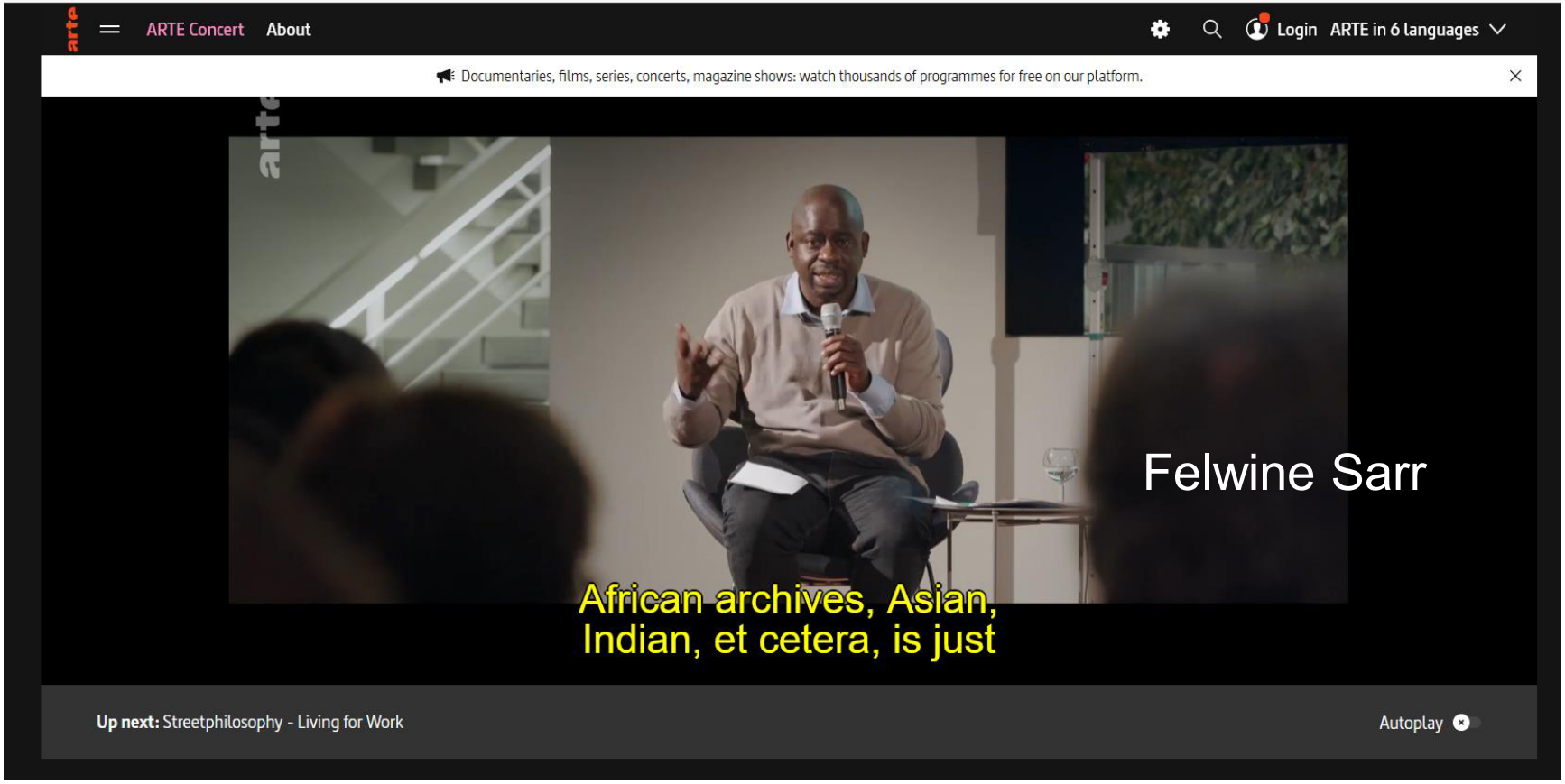

https://www.arte.tv/en/videos/087416-000-A/who-we-were/

ARTE Sendung: **„Wer wir waren – Weil die Welt zu retten ist“**

„Who We Were – What Future Generations Will Think of Us“

Felwine Sarr (Senegalese), Duke University, USA:

“If you are a young African in the university, and you acknowledge that all the knowledge that is produced from outside, you can believe that your society has never produced any thought and knowledge. Because in your university, you never see something that is from your own. In Saint-Louis we have created a new faculty of civilization, art and culture to bring African Languages, African literature, African thought, African spirituality to give them the dignity of a knowledge and to change the self-perceptions of the young Africans in the university. And if we don’t win the fight of epistemology of knowing, of seeing that there is a plurality of words in the world, there’s a plurality of way of doing. There’s a plurality of resources that we can rely on, you will not change the deep layers of society. But you can just change the surface.”