

Penicillin doses for children should be reviewed, say UK experts

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A team of scientists and clinicians, led by researchers at King's College London and St George's, University of London, are calling for a review of penicillin dosing guidelines for children, as the current guidelines have remained unchanged for nearly 50 years.

The call comes as a study published in the [British Medical Journal](#) indicates some [children](#) may not be receiving effective doses, which could potentially lead to failed treatment and contribute to [antibiotic resistance](#).

Oral penicillins (such as [amoxicillin](#)) account for nearly 4.5 million of the total 6 million annual prescriptions for [antibiotics](#) given to treat childhood bacterial infections each year in the UK.

Current dosing guidelines for penicillin are provided by the British National Formulary for Children (BNFC) and are mainly based on age bands. The doses given have not changed in almost 50 years. But the dose of penicillin needed is determined by a child's weight, and the guidelines have not taken into account the increase in the average weight of children over time. The experts say reviewing these guidelines is essential, to ensure all children who require penicillin are receiving effective doses.

The review was led by Dr Paul Long from the Institute of Pharmaceutical Science at King's College London and Professor Mike Sharland at St George's, University of London on behalf of the

improving Children's Antibiotic Prescribing Research Network (iCAP).

The team carried out a literature review of evidence, including all the historic archives of the Royal Pharmaceutical Society and the British Medical Association, to understand the origins of the current dosing guidelines. They found that prescribing based on age bands had first been suggested in the early 1950s, based on the results of oral dosing studies. Following these findings, a general recommendation to use age banding for all antibiotics in children was published in the [BMJ](#) in 1963, and these same recommendations remain in use today.

The researchers found that the age band guidelines set in 1963 were accompanied by average weights, and doses are based on fractions of the widely used adult doses. The BNFC structured dosing bands are: birth to 1 year (10kg); 2 years (13kg); 5 years (18kg); and 10 years (30kg). However, according to the Health Survey for England 2009, the average weight today of a 5 year old is 21kg and a 10 year old is 37kg, indicating that average weights today are up to twenty percent higher than in 1963.

Under-dosing is potentially a problem for children, as this could lead to sub-therapeutic concentrations.

The researchers also noted that adult penicillin recommendations have been re-evaluated taking modern weights into consideration, and penicillin doses have consequently increased. But UK recommendations for children have not been reassessed in the same way.

Dr Paul Long, Senior Lecturer in Pharmacognosy at King's College London, said: 'We were surprised at the lack of evidence to support the current oral penicillins dosing recommendations for children, as it is such a commonly used drug. Children's average size and weight are slowly but significantly changing, so what may have been adequate doses of penicillin 50 years ago are potentially not enough today.'

'It is important to point out that this study does not provide any clinical evidence that children are receiving sub-optimal penicillin doses that lead to harm, and we want to reassure parents of that. But what we are saying is that we should ensure that children with severe infections who need these antibiotics the most are still receiving an effective dose.

'In the long-term we are concerned that under-dosing could lead to penicillin-resistance in both individuals and wider communities, which is a very serious issue, given the number of prescriptions of this medicine given every year for common childhood infections.

'If we want to be sure that we are treating childhood bacterial infections effectively, the evidence base behind these prescribing guidelines needs to be improved, and the recommended doses reviewed accordingly.

'This is also becoming a problem in the US, as doses there are also given as age bands and weight based calculations which is confusing, and does not take into account how much children actually weigh. Doses in the US are set by the drug companies and approved by the FDA. There is an American National Formulary that lists these drugs and doses, but with privatised health care; each Health Maintenance Organization (HMO) has its own formulary which dictates what doctors can prescribe.'

Professor Mike Sharland from St George's, University of London, and co-author of the study said: 'Although there is now a very formal process of determining the right dose for new drugs being licensed for use in children, we also need to check more carefully that the guidelines are still correct for older drugs that have been used for a long time. We are not saying the current doses are wrong or unsafe and parents should always give the medicine at the doses prescribed by their GP. We are saying that we need to develop a clearer system to check the doses used for older medicines.'

Simon Keady, Royal Pharmaceutical Society spokesperson on children's medicines, said: 'This research and its outcomes clearly demonstrates the importance of continued work in the field of paediatrics as further evidence and experience is gathered. The use of penicillins over many years for a wide variety of conditions should not stop us from continuing to identify the most appropriate dose which gives us the most effective outcomes. The work clearly shows that the focus should not always be about new drugs but also looking at where we have historically centred dosing around age bands.'

NICE (National Institute for Health and Clinical Excellence) guidance in the UK on Upper Respiratory Tract Infections (URTIs) suggests that the majority of minor URTI's in children are viral and will resolve on their own without the need for antibiotics. Therefore, the authors also suggest that not only do the effective doses for children of all ages and weights need to be determined, but there is the need to target more clearly which children will really benefit most from antibiotics.

Provided by King's College London

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