

Antibiotic Prescribing Practices in Three Neonatal Units in Dakar: About 690 Neonates

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Abstract

Background: Antibiotic overuse is a global public health problem, partly due to the growing antibiotic resistance. Evaluating antibiotic prescribing practices is essential to ensure optimal and safe care for neonates. **Materials and Methods:** This was a retrospective descriptive analytical study conducted in three neonatal units located in Dakar from January 2, 2023 to December 31, 2023. It was based on medical records of hospitalized neonates prescribed antibiotics. **Results:** During the study period, a total of 1271 neonates were admitted to the three neonatal units. The frequency of antibiotic prescription in hospitalized neonates was 54.28% (n = 690). The mean age of neonates at admission was 1 ± 4 days, ranging from 1 to 28 days. The main clinical symptom on admission was respiratory distress in 440 newborns (63.7%). Presumptive diagnoses of early-onset, late-onset, and nosocomial infections were retained in 462 (66.9%), 62 (8.9%), and 166 (24%) neonates, respectively. Of the 273 requested blood cultures, 239 (87.5%) were not performed. The most commonly prescribed antibiotics were Cefotaxime (95.8%), Amikacin (51.74%) and Gentamicin (44.78%). The indications for empirical prescription of antibiotics, based on international guidelines, were found appropriate in 87% of neonates, with a statistically significant variation between neonatal units ($\text{Chi}^2 = 20, p < 0.0001$). **Conclusion:** Measures aimed, on one hand, at improving the availability of bacterial identification methods and, on the other hand, establishing an antibiotic stewardship program, are urgently needed in these units in order to optimize antibiotic prescribing practices in neonates in Senegal.

Keywords

Antibiotics, Neonates, Neonatal Units

1. Background

Since their discovery in 1928, antibiotics have revolutionized the history of medicine by making it possible to treat potentially fatal bacterial infections in both adults and children. Given the therapeutic emergency posed by bacterial neonatal infections (BNIs), the administration of antibiotics (ATBs) in the neonatal period is a common practice. This is both true in developing and developed countries, although pattern of frequency of use may differ based on the country, the study type, and the population involved. A global survey on the prevalence of antimicrobial use in neonatal intensive care units (NICUs) in 2021 highlighted that 26% of hospitalized neonates received antimicrobials, predominantly antibiotics (97%), with disparities across countries [1]. In France, according to Martin-Mons *et al.*, 44.3% of neonates were administered ATBs during their hospital stay [2]. A similar trend is also observed in Africa, with usage rates varying between 50% to 97% depending on study design and local protocols [3]-[5]. In Senegal, frequency of use remains poorly documented. Antibiotic use in neonates requires the consideration of several factors, such as the postnatal age, the gestational age, the neonatal infectious risk, their impact on gut microbiota, and the antibiotic susceptibility [6]. The latter constitutes a major difficulty in several low-income countries linked to the unavailability of blood cultures, their costs, and the lack of qualified health personnel. Therefore, in several neonatal units, in the absence of bacteriological confirmation, and given the nonspecific biological markers, routine empirical antibiotic administration, often maintained for unjustifiably prolonged periods, is observed. However, this raises concerns about antibiotic overuse and the emergence of new bacterial resistance [7]. Assessing antibiotic prescribing practices in neonatal units in Dakar is therefore crucial and timely to ensure optimal and safe management for neonates.

Objective: The main objective of our study was to evaluate antibiotic prescribing practices in three neonatal units in Dakar.

2. Materials and Methods

This was a retrospective, descriptive, analytical study across three neonatal units in the city of Dakar, namely Albert Royer National Children's Hospital (CHNEAR), Abass Ndao Hospital (CHAN), and Idrissa Pouye General Hospital (HOGIP). Data were collected from the neonates' medical records admitted in these neonatal units over a one-year period, from January 2, 2023, to December 31, 2023.

Demographic, clinical, paraclinical, therapeutic, and outcome parameters were studied. Therapeutic parameters of antibiotics, such as the name of the drug, antibiotic class, indication, duration of treatment, route of administration, and treatment modification, were studied. Indications for empirical use of antibiotics were evaluated according to the guidelines of the French Society of Neonatology (SFN) and the French National Authority for Health (HAS) 2017 [8]. Thus, an empirical prescription of antibiotics was considered adequate if, in the presence of identified maternal infectious risk factors, the neonates were symptomatic or in the presence

of immediately suggestive clinical signs of neonatal infections or in symptomatic neonates with no identifiable cause.

Data were collected using structured questionnaire, then entered and analyzed using Excel (Microsoft 2010) and SPSS 20. Qualitative variables were summarized as absolute and relative frequencies. Quantitative variables were described using means and standard deviations, or median and interquartile ranges, depending on data distribution. Results were presented in tables and graphs. Proportions between groups were compared using the Pearson or Fisher's chi-square test. A p-value of less than 0.05 was considered statistically significant.

3. Results

3.1. Demographic Parameters

During the study period, a total of 1271 newborns were admitted to the neonatal wards of CHNEAR (446), CHAN (639), and HOGIP (186). Of these, 690 newborns received antibiotics upon admission. A male predominance was observed in 52.8% of cases, yielding a sex ratio of 0.89. The mean age at admission was 1 ± 4 days, ranging from 0 to 28 days. In 85% (n = 588) of cases, the neonates were aged between 0 and 72 hours. Preterm birth was observed in 64% of cases, among which 34% had a gestational age between 33 weeks and 36 weeks + 6 days, as shown in **Figure 1**.

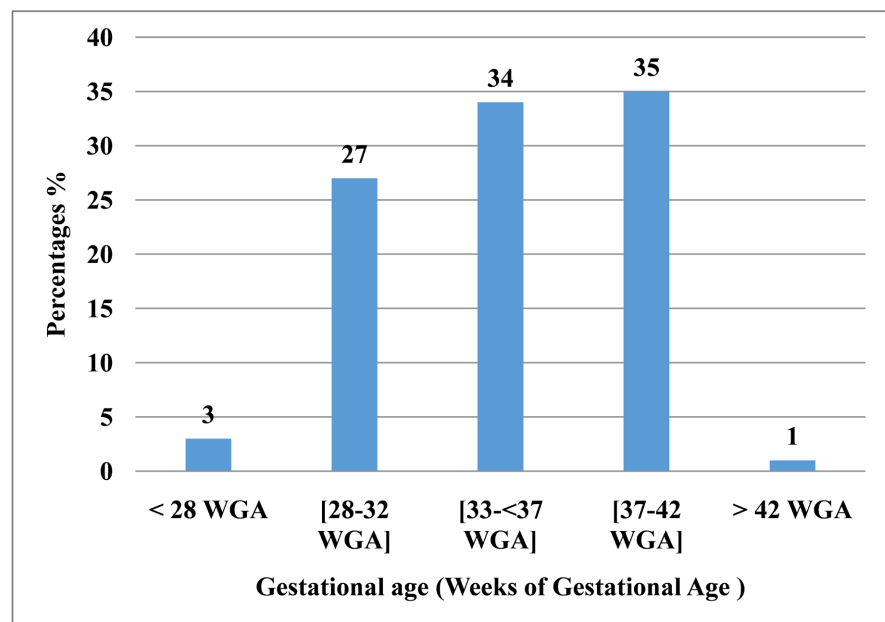


Figure 1. Distribution of newborns by gestational age.

3.2. Clinical Parameters

Of the neonates, 43.76% (n = 302) had risk factors for early-onset neonatal infections (EONIs). The main risk factors for EONIs were unexplained spontaneous preterm birth before 37 weeks of gestation (50.7%), prolonged rupture of membranes

lasting more than 12 hours before birth (PROM) (34.1%) and third-trimester urogenital infections (10.3%), as illustrated in **Figure 2**. The main clinical signs were respiratory distress in 440 newborns (63.7%), neurological dysfunction in 84 neonates (10.7%), and fever in 61 neonates (8.8%).

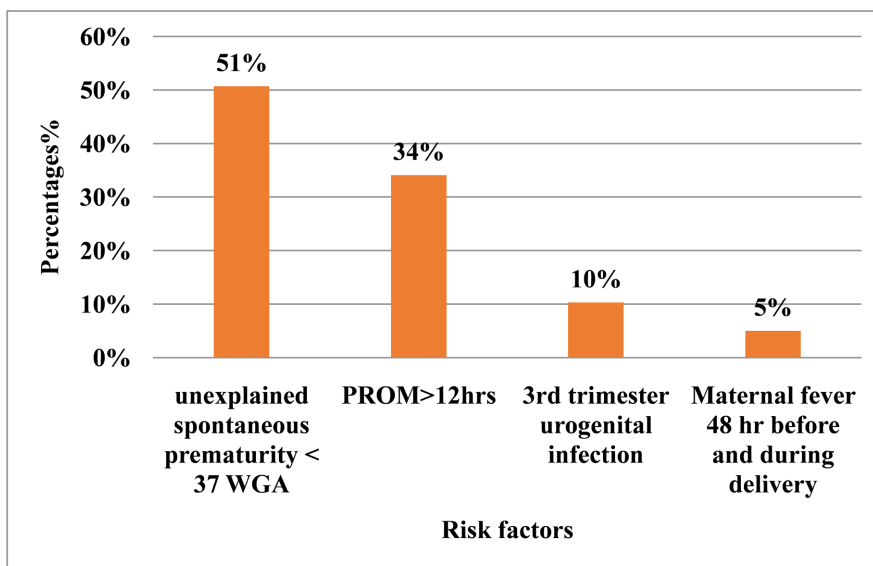


Figure 2. Maternal-fetal infectious risk factors.

3.3. Laboratory Parameters

Complete blood count (CBC) and C-reactive protein were performed in 98.98% (n = 683) and 98.84% (n = 682) of cases, respectively. 83.5% of these investigations were performed between 24 and 48 hours of life. According to CBC results, leukopenia was observed in 6.5% (n = 44) of neonates, leukocytosis in 7% (n = 47) and thrombocytopenia in 19.6% (n = 134). Based on CRP results, 23.6% (n = 161) of neonates had a positive CRP. Blood cultures were requested in 40% (n = 273) of the neonates, of which 87.6% (n = 239) were not performed. Among the blood cultures done, 55.8% (n = 19) were performed after ATBs initiation. In 97% of cases (n = 33), the performed blood cultures were negative.

3.4. Antibiotic Prescribing Parameters

The overall frequency of ATB prescription in the 3 neonatal units was 54.28% (n = 690). In 100% of cases, antibiotics were administered intravenously. The mean duration of antibiotic prescription was 7 days \pm 3, with extremes ranging from 1 to 22 days. In 6% of cases (n = 41), newborns received an oral antibiotic prescription at discharge, the most commonly prescribed being Cefixime (51%) and Norfloxacin + Metronidazole (34%) syrups. Cefotaxime (95.8%), Amikacin (51.7%), and Gentamicin (44.8%) were the most frequently prescribed drugs intravenously. The Cefotaxime and Amikacin combination was the most frequently prescribed regimen for the management of early-onset (37.8%) and late-onset (5.7%) neonatal infections. The combination of Imipenem and Vancomycin was the most com-

monly prescribed for hospital-acquired infections (11.59%). In 87% (n = 601) of cases, the indications for empirically prescribed antibiotics were found adequate in light of the French National Authority for Health (HAS) guidelines, with a statistically significant variation between neonatal units ($\text{Chi}^2 = 20, p < 0.0001$), as reported in **Figure 3**.

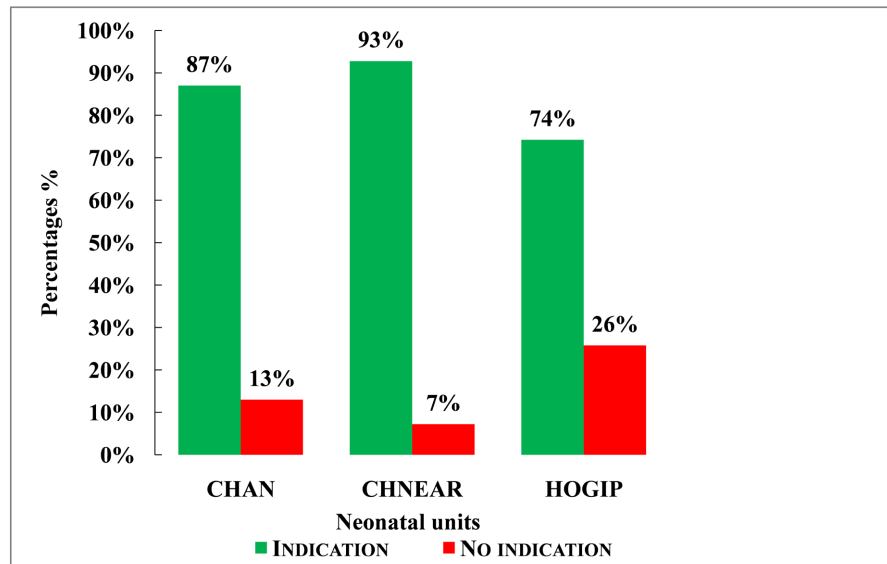


Figure 3. Distribution of indications of empiric prescription of antibiotics in three neonatal units. $\text{Chi}^2 = 20.1, p < 0.0001$.

4. Discussion

4.1. Demographic, Clinical, and Paraclinical Characteristics

The mean age at admission was 1 ± 4 days, ranging from 0 to 28 days. These data are similar to those of Ollandzobo Ikobo *et al.*, who reported a mean age of 1 ± 4.5 days, ranging from 1 to 27 days [5]. Tank *et al.* also reported a median age of 1 day (IQR 1 - 7 days) [9]. In our study, 91% of neonates were aged between 0 to 7 days, with 85% being less than 72 hours old. This is similar to the findings of Rahman *et al.*, where the majority of neonates receiving antibiotics were less than 7 days of age [10]. This may be due to the fact that the first week constitutes a high-risk window for the development of infections transmitted from the mother.

Preterm birth was observed in 64% of neonates, among which 34% had a gestational age between 33 weeks and 36 weeks + 6 days. A similar result was observed in France by Martin-Mons *et al.*, who reported 51.5% of preterm neonates, among which 33.9% had a gestational age between 32 weeks and 36 weeks + 6 days [2]. This can be explained by the vulnerability of preterm neonates to infections due to their immunological immaturity. The male sex was predominant (52.8%), with a sex ratio of 0.86. Indeed, male predominance is constant in neonatal infections owing to their hormonal and immunological particularities [6] [11].

The main symptom on admission was respiratory distress (63.7%). This finding is similar to the study conducted by Ollandzobo Ikobo *et al.*, where respiratory dis-

ress (28.5%) was the main symptom observed on admission [5]. However, these symptoms on admission vary across studies, where neurological dysfunction, fever, or refusal to feed are commonly reported as the main reasons for hospitalization [9] [10]. In full-term and preterm neonates, clinical signs of neonatal infections are numerous and nonspecific. The low specificity of these clinical signs attributable to neonatal infections is one of the main reasons explaining the excessive empirical use of antibiotics, particularly during the first 48 hours of life.

CBC and CRP (83.5%) were performed between 24 and 48 hours of life, and abnormalities were observed in a few cases. Indeed, 26.3 % of neonates had a positive CRP. These results corroborate existing data in the literature, highlighting that no biomarker has sufficient performance for the diagnosis of neonatal infections [6] [8].

Out of the 273 blood cultures requested, only 12.4% were performed, with 55.8% of them conducted after initiation of antibiotics. Among these blood cultures carried out, 97% yielded (n = 33) negative results. The unavailability of blood cultures constitutes a significant barrier to both the diagnosis of neonatal infections and antibiotic treatment adjustment based on bacteria's susceptibility. Blood cultures are essential prior to the initiating of antibiotics in all symptomatic neonates [12]. Diagnoses of early-onset neonatal infections, late-onset neonatal infections and nosocomial infections were found in 66.6%, 8.9% and 24% of neonates, respectively. These diagnoses likely remain presumptive in the absence of confirmatory bacteriological tests.

4.2. Antibiotic Prescribing Characteristics

The frequency of antibiotic use was 54.28%. This finding is close to that reported in a multicenter study conducted in Brazzaville in 2022 by Ollandzobo Ikobo *et al.*, which also found a prevalence of 54% [5]. Lower prevalence rates than ours have been reported by some authors, notably Martin-Mons. *et al.* in France in 2021, Khan *et al.* in the United States in 2022, and Osowick *et al.* in Australia in 2015, with 43.3%, 34.9%, and 46%, respectively [2] [13] [14]. Conversely, studies conducted by Rahman *et al.*, Kakolwa *et al.*, Tank *et al.*, and Jiang *et al.* found higher usage rates with 96.7%, 89%, 97.9%, and 88.3% respectively [9] [10] [15] [16]. This variability in ATBs usage rates in neonates worldwide may be explained by several factors, including the ecological differences in neonatal bacterial infections (NBIs), the varying prevalence of NBIs, the disparities in the definition and management of infectious risk factors across countries, local protocols and differences in access to healthcare and diagnostic methods.

A total of 94.6% neonates were administered empiric antibiotics immediately upon admission. The most commonly prescribed antibiotics were Cefotaxime and Amikacin. The most frequently used combination was Cefotaxime and Amikacin. In contrast, Ollandzobo *et al.* identified Gentamicin (92.7%) and Amoxicillin (38.8%) as the most frequently prescribed ATBs [5]. Empiric use of antibiotics varies across national protocols. The first line of antibiotic combination reported in this study

appears consistent with the French National Authority for Health guidelines, as well as the second-line antibiotic drugs such as Imipenem, Vancomycin, and Ciprofloxacin, most frequently prescribed for late-onset neonatal infections and hospital-acquired infections [6] [7] [12] [17].

In this study, all neonates received intravenous antibiotics during their hospital stay at doses consistent with the existing literature. However, 6% of them were prescribed oral antibiotics upon discharge. The rationale behind this prescription was not documented. Nevertheless, in our setting, one might speculate that such practice aims to shorten the duration of hospitalization of neonates showing favorable clinical outcome.

The indications for prescribing and continuing antibiotics are based on a combination of anamnesis, clinical, and biological findings, as well as patient progression. Empirical prescription of antibiotics was adequate according to the guidelines in 87% of newborns. This finding is similar to the study conducted by Olandzobo Ikobo *et al.*, who highlighted that 79.6% of neonates had appropriate indications for empirical antibiotic therapy [5]. However, these results vary between studies. This may be explained, among others, by the differences in neonatal infectious risk definition and by the varying local protocols.

4.3. Study Limitations

The main difficulties encountered lie in the absence of blood cultures in order to confirm presumptive diagnoses. Furthermore, analysis of neonates' data was difficult due to several missing pieces of information.

5. Conclusion

The use of antibiotics represents a challenge in neonatal units, both in terms of indications and prescription. Antibiotic overuse is a growing source of antibiotic resistance worldwide. It is therefore essential to assess prescribing practices as done in this study so as to rationalize antibiotic use and also to establish an antibiotic stewardship program in our neonatal units.

Ethical Considerations

All data were fully anonymized prior to analysis.

Authors' Contributions

All authors reviewed and approved the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Prusakov, P., Goff, D.A., Wozniak, P.S., Cassim, A., Scipion, C.E.A., Urzúa, S., *et al.* (2021) A Global Point Prevalence Survey of Antimicrobial Use in Neonatal Intensive

- Care Units: The No-More-Antibiotics and Resistance (NO-MAS-R) Study. *EClinicalMedicine*, **32**, Article ID: 100727.
- [2] Martin-Mons, S., Lorrain, S., Iacobelli, S., Gouyon, B. and Gouyon, J. (2021) Antibiotics Prescription over Three Years in a French Benchmarking Network of 23 Level 3 Neonatal Wards. *Frontiers in Pharmacology*, **11**, Article 585018. <https://doi.org/10.3389/fphar.2020.585018>
 - [3] Rueda, M.S., Calderon-Anyosa, R., Gonzales, J., Turin, C.G., Zea-Vera, A., Zegarra, J., et al. (2019) Antibiotic Overuse in Premature Low Birth Weight Infants in a Developing Country. *Pediatric Infectious Disease Journal*, **38**, 302-307. <https://doi.org/10.1097/inf.0000000000002055>
 - [4] Thomas Cartledge, P., Shofel Ruzibuka, F., Rutagarama, F., Rutare, S. and Rogo, T. (2020) Antibiotic Prescribing Practices in Three Neonatology Units in Kigali, Rwanda—An Observational Study. *African Health Sciences*, **20**, 1646-1654. <https://doi.org/10.4314/ahs.v20i4.17>
 - [5] Ollandzobo Ikobo, L.C., Pea, E.A., Ngakengni, N.Y., Ekouya Bowassa, G. and Mbika Cardorelle, A. (2022) Prescription des antibiotiques chez le nouveau-né hospitalisé à Brazzaville. *Journal de Pédiatrie et de Puériculture*, **35**, 29-35. <https://doi.org/10.1016/j.jpp.2021.12.004>
 - [6] Cohen, R., Romain, O., Tauzin, M., Gras-Leguen, C., Raymond, J. and Butin, M. (2024) Infections bactériennes néonatales: Diagnostic, épidémiologie bactérienne et traitement antibiotique. *Journal de Pédiatrie et de Puériculture*, **37**, 190-198. <https://doi.org/10.1016/j.jpp.2024.03.007>
 - [7] Da, L., Somé, D., Yehouenou, C., Somé, C., Zoungrana, J., Ouédraogo, A., et al. (2023) État des lieux de la résistance aux antibiotiques en Afrique subsaharienne. *Médecine et Maladies Infectieuses Formation*, **2**, 3-12. <https://doi.org/10.1016/j.mmifmc.2023.01.003>
 - [8] HAS (2017) Prise en charge du nouveau-né à risque d'infection néonatale bactérienne précoce (≥ 34 SA). Méthode Recommandations pour la pratique clinique. https://www.sfpediatrie.com/sites/www.sfpediatrie.com/files/documents/la-bel_has_recommandations_inbp.09.2017.pdf
 - [9] Tank, P.J., Omar, A. and Musoke, R. (2019) Audit of Antibiotic Prescribing Practices for Neonatal Sepsis and Measurement of Outcome in New Born Unit at Kenyatta National Hospital. *International Journal of Pediatrics*, **2019**, Article ID: 7930238. <https://doi.org/10.1155/2019/7930238>
 - [10] Rahman, A.E., Hossain, A.T., Zaman, S.B., Salim, N., K.C., A., Day, L.T., et al. (2021) Antibiotic Use for Inpatient Newborn Care with Suspected Infection: EN-BIRTH Multi-Country Validation Study. *BMC Pregnancy and Childbirth*, **21**, Article No. 229. <https://doi.org/10.1186/s12884-020-03424-7>
 - [11] McGovern, M., Kelly, L., Finnegan, R., McGrath, R., Kelleher, J., El-Khuffash, A., et al. (2024) Gender and Sex Hormone Effects on Neonatal Innate Immune Function. *The Journal of Maternal-Fetal & Neonatal Medicine*, **37**, Article ID: 2334850. <https://doi.org/10.1080/14767058.2024.2334850>
 - [12] Cohen, R., Grimprel, E., Rybak, A., Hau, I., Madhi, F., Ouldali, N., et al. (2024) Principes de l'antibiothérapie curative. *Journal de Pédiatrie et de Puériculture*, **37**, 115-122. <https://doi.org/10.1016/j.jpp.2024.02.003>
 - [13] Kahn, D.J., Perkins, B.S., Barrette, C.E. and Godin, R. (2022) Reducing Antibiotic Use in a Level III and Two Level II Neonatal Intensive Care Units Targeting Prescribing Practices for Both Early and Late-Onset Sepsis: A Quality Improvement Project. *Pediatric Quality & Safety*, **7**, e555. <https://doi.org/10.1097/pq9.0000000000000555>

- [14] Osowicki, J., Gwee, A., Noronha, J., Britton, P.N., Isaacs, D., Lai, T.B., *et al.* (2015) Australia-Wide Point Prevalence Survey of Antimicrobial Prescribing in Neonatal Units. *Pediatric Infectious Disease Journal*, **34**, e185-e190. <https://doi.org/10.1097/inf.0000000000000719>
- [15] Kakolwa, M.A., Woodd, S.L., Aiken, A.M., Manzi, F., Gon, G., Graham, W.J., *et al.* (2021) Overuse of Antibiotics in Maternity and Neonatal Wards, a Descriptive Report from Public Hospitals in Dar Es Salaam, Tanzania. *Antimicrobial Resistance & Infection Control*, **10**, Article No. 142. <https://doi.org/10.1186/s13756-021-01014-6>
- [16] Jiang, S., Zhang, L., Yan, W., Li, S., Han, J., Zhou, Q., *et al.* (2021) Antibiotic Use in Neonatal Intensive Care Units in China: A Multicenter Cohort Study. *The Journal of Pediatrics*, **239**, 136-142.E4. <https://doi.org/10.1016/j.jpeds.2021.08.067>
- [17] van den Anker, J. and Allegaert, K. (2019) Rational Use of Antibiotics in Neonates: Still in Search of Tailored Tools. *Healthcare*, **7**, Article 28. <https://doi.org/10.3390/healthcare7010028>