Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

Steckbrief COVID-19 – Clinical characteristics in children and adolescents

Updated November 23 2020

http://www.kinderklinik.insel.ch/fileadmin/Kinderklinik/Dokumente/Aktuelles/Infektiologie-COVID19-Steckbrief.pdf

Causative agent	SARS-CoV-2[1] (betacoronavirus, most closely related to SARS-CoV among the 7 human coronaviruses)
Receptor	• Angiotensin-Converting Enzyme 2 (ACE2 receptor)[2] • ACE2 expressed in upper/lower respiratory tract, oral mucosa[3], intestinal, renal and vascular tissues[4] • nasal ACE2 expression correlates positively with age, being lowest at <10 years of age[5]
Immunology/ Pathogenesis	• current hypotheses explaining apparent disease mitigation in children are summarized[6-8] • protective role of reduced cellular expression[5] or higher circulating ACE2 levels in children[9] and of "trained innate immunity"?[10] • Cross-reactive preexisting neutralizing antibodies against S2 subunit of SARS-CoV-2 spike protein from previous human coronavirus infections may provide protection and explain milder disease in children[11] • pathogenesis of Multisystem Inflammatory Syndrome in Children (MIS-C, aka PIMS-TS) related to SARS-CoV-2 involves subacute T-cell dysregulation and autoreactive antibodies[12,13] and is distinct from classic Kawasaki disease • SARS-CoV-2 S protein displays a high-affinity binding motif similar to staphylococcal enterotoxin B and may serve as a superantigen[14] • severe pulmonary disease in adults associated with cytokine storm similar to MAS/secondary HLH[15] • Longitudinal evaluation of neutralizing antibody response over 90 days postinfection in adults suggests rapid decline of protective serum antibodies to SARS-CoV-2 [Seow]

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

Transmission	• droplet; contact ½ life in aerosol ~1 hour, ½ life on plastic/steel 6-8 hours[16,17]; detected also in patient rooms[18], clinical significance unknown • viral transmission can start 1-2 days before the onset of symptoms («serial interval» < incubation period[19,20]; recovery of virus from NPA before onset of symptoms[21,22]) • viral RNA in NPA from children until 6 to >22 days after disease onset[23-27] • viral RNA in feces from day ~5 to > 4 weeks after disease onset[24,26,28-31] • viral load and duration of shedding do not correlate with clinical severity in some studies[25,26,32], but do so in others[33] • Viable virus (culture-positive) in NPA correlates positively with RNA copy number[34,35] • Copy number in NPA correlates inversely with age in mildly symptomatic children in one study[36], but not in another[37] • vertical transmission: late pregnancy transplacental passage of SARS-CoV-2 documented in one case[38], ending previous controversy[39-46] • SARS-CoV-2 RNA detected in milk of an infected mother and her newborn infant[47]
Incubation period	• 4-6 days (range, 1 to >14 days) • presymptomatic transmissibility 1-2 days • relapse or reinfection? Recurrent symptoms and shedding of RNA 1 month after primary infection reported in a pediatric case[48]
Epidemiology	• basic reproduction rate R_0 2.2 (90% CI, 1.4-3.8)[49,50] • high risk for «superspreader events» (dispersion parameter k↓)[50] • Switzerland: confirmed cases age <10 years, 0.8%; age 10-19 years, 6.8% of all cases; 1st wave seroprevalence in Geneva 0.8% < 10 years vs. 9.1% > 10 years[51] • Sweden: age <10 years, 0.5%; age 10-19 years 1.3% of all cases • Germany: survey on hospitalized children infected with SARS-CoV-2 • Spain: 0.8% of COVID-19 positive persons were <18 years of age[52]; SARS-CoV-2 seroprevalence increasing with age[53] • transmission to children mainly within families[24,25,29,52,54,55] • studies suggest that subclinical infection in addition to reduced susceptibility to infection contributes to lower case numbers in children[56,57] • children less likely to be index cases in household transmission[57-59][Zhu] • Herd immunity threshold expected to be needed for SARS-CoV-2 estimated at 60%[60] **School, day care and household transmission** • US study suggests that school closure was associated with 62% decline in COVID-19 incidence and 49% decline in mortality[61]; robustness of this analysis is critically reviewed in an editorial comment[62]

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

	• Studies find low secondary attack rates (SAR) from children in school (0.5%) and day care settings (1.2%)[63-65] and among household contacts (HHC)[59,66-68] • Child care-acquired infection with subsequent transmission to household contacts documented[69]
Clinical manifestations	**Early disease** • common: asymptomatic[30,70,71] • common: fever ~50-70% overall[24,25,54,55,70,72-79] • common: cough ~50%[24,25,55,70,74,75,78] • common: pharyngitis ~40%[55] • infrequent: diarrhea[24,29,71,72]; 22% in Euro cohort[79] • infrequent: rhinorrhea[55,75,78], wheezing[24,25,54,71,72,74,80] • infrequent: malaise, headache, myalgias • olfactory dysfunction very common in adults[81,82] • conjunctivitis (RT-PCR positive) reported in adults[83] **Late disease** ***Multisystem Inflammatory Syndrome in Children*** (MIS-C or PIMS-TS[84]). Clusters reported in several countries (UK[85-87], Italy[88,89], France[90-92], Spain, Switzerland[93], US[94-98]); SARS-CoV-2 PCR in NPA positive or negative; serology positive[87]; various case definition reported[87] • Cardial injury typical for MIS-C increases with age[97], may involve myocardial edema[99]; 36% with acute coronary abnormalities in one series[100] • Preliminary UK management guidelines for MIS-C available[101] • Most common in older children and adolescents, but also reported in an infant[102] • classic KD in SARS-CoV-2 positive patients reported[103] • early outcomes reported[104] ***Chilblains/"COVID toe"*:** painful, vasculitic, frost-bite like finger/toe lesions in often otherwise asymptomatic children[105,106]; causative role of SARS-CoV-2 questioned by some authors[107] ***Skin eruptions:*** varicella-like papulovesicular rash[108,109]; erythema multiforme[110] ***Specific organ dysfunction*** • acute pancreatitis without[111] or with MIS-C[112] • acute rhabdomyolysis (with renal failure)[113] ***Co-infections*** reported in up to 50% of pediatric cases in China (most commonly *M. pneumoniae*)[52,70,75,114]

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

Laboratory findings	CBC differential, CRP, chemistry uncharacteristic in mild cases[30,55,75,78,115] • leucopenia, lymphopenia and thrombocytopenia uncommon[24,25,78,115] • CRP/PCT normal to moderately elevated[24,55,70,74,75,78,116] • **MIS-C:** WBC↑, lympho↓, CRP↑↑, PCT↑↑, IL-6↑↑, Ferritin↑↑, NT-proBNP↑↑[85,88,90]; Troponin↑[87]
Diagnosis	• RT-PCR from NPA; some laboratories offer quantitative copy number • RT-PCR in NPA less sensitive than BAL/sputum in adults[117] • IgM/IgA appear on day ~5 of illness, IgG on day ~14[22,118] • commercial NPA rapid antigen tests available; reported sensitivity compared with PCR varies between 30% and >90%[119] • commercial serology tests available; role in clinical practice to be determined[120] • Rapid antigen tests (LFA) for NP swabs commercialized by various manufacturers; Performance in adults with specificity >98%, sensitivity 85-90% compared with RT-PCR [Kaiser]. Currently no data specifically for children available.
Radiology	• conventional CXR: normal or non-specific findings • chest CT: unilateral or bilateral, uni- or multifocal, peripheral, commonly subpleural lesions; focal lesions typically with central consolidation and halo sign or ground glass opacities (GGOs)[25,55,70,74,75,121] • no pleural effusion[70,121] • no hilar lymphadenopathy[70,121]
Clinical course	• common: asymptomatic (reported all ages)[23-25,54] • common: upper respiratory tract infection (children an healthy adults)[24,55,78] • common: pneumonia (absent, mild or moderate clinical disease)[55,70,74,122,123] • very rare: severe lung disease requiring mechanical ventilation (3/171 [1.8%] reported by Lu[55], 2 infants reported in detail[75])[29,55,74,78] • several fatal cases in SARS-CoV-2 positive infants and children reported[55,79,124]; several deaths associated with **MIS-C** reported[85] • infants < 1 year of age are overrepresented among hospitalized children with COVID-19 in China[71], Spain[52], US[125], Italy[126], Europe[79]
Clinical course – co-morbidities	• no specific pediatric risk factors identified to date • hospitalization and PICU admissions more common in children with co-morbidity[127] • role of ethnicity and obesity as risk factor for PIMS currently debated[85,90,97,127-129]
Clinical course - immunodeficiency	• Primary immunodeficiency (PID): severe disease appears to be rare, no deaths among patients with PID reported to IPOPI • mild disease reported in XLA (Bruton)[130] • Cancer: Accumulating evidence indicating low risk of severe disease in pediatric cancer patients in Italy, Spain[131], France[2], Switzerland, US[132]

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

	• Transplant patients: No evidence for severe disease among solid organ transplant recipients[133,134] • Autoimmune disease: Benign course in children with IBD on immunomodulators and biologicals reported[123]
Clinical course - neonates	• asymptomatic infection in neonates (including normal chest CT) has been reported[29,43,70] • 3 infected neonates reported with early and short viral RNA shedding (DOL #2+4 only)[135] • complicated perinatal/postnatal courses among non-infected neonates of COVID-19 infected mothers have been reported[136]
Treatment	• supportive • drugs with antiviral activity against [137]SARS-CoV-2 *in vitro*: remdesivir (nucleoside analog)[138,139], lopinavir/ritonavir[139], hydroxychloroquine[140] • Remdesivir reported effective in adults in one RCT[141]; no difference between 5 and 10 days of therapy in one randomized trial[142] • Remdesivir recommended first line agent in children with severe disease[143] • Lopinavir/ritonavir reported **ineffective** in one controlled trial[144] • Hydroxychloroquine expected ineffective and potentially cardiotoxic in preliminary reports • Dexamethasone reported to improve outcome in a RCT in adults • immunomodulation with mAbs, e.g. tocilizumab[145], siltuximab (anti-IL6), azithromycin proposed to be effective against cytokine storm (RCTs in progress) • ACE2/viral entry blocker (e.g., Nafamostat) effective in vitro[146,147] • recommendations against use of NSAID are **NOT** supported by the EMA, WHO, expert opinion[148]

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

Prevention	• Inpatients: precautions according to Swissnoso/PIGS • Outpatients: precautions according to BAG, KAZA • Neonates: no separation of well mother/child pairs needed (Swissnoso/PIGS, SGGG, WHO, DGPI, AAP); management IMC/NICU according to local infection control policy • BCG vaccine: protective effect currently debated[7] • Hydroxychloroquine ineffective in a postexposure prophylaxis RCT in adults[149] • Dramatic decrease in pediatric ER visits[150-152], specifically for airborne viral infections[152,153] and gastroenteritis associated with lockdown[154] and increase in deaths unrelated to COVID-19[155,156] • Decrease in hospitalisations for bacterial infections during first lockdown in Israel[157] • 90% reduction of RSV detection rate and bronchiolitis hospitalization rate in Sydney temporally associated with lockdown in Australia[158] • Decrease in incidence of fractures associated with lockdown[159] • Dramatic increase in diabetic ketoacidosis diagnosis in Germany during pandemic[160] • Phase 1/2 studies using 1-2 doses of Ad5-vectored DNA vaccines[161-163] or a lipid nanoparticle-based mRNA[164] vaccine induce neutralizing antibodies[161-164], boostability[162], and T-cell responses in healthy adults[161-163]

Team Kinderinfektiologie (Pediatric Infectious Disease)

References

1. Jiang S, Shi Z, Shu Y, et al. A distinct name is needed for the new coronavirus. Lancet 2020.
2. Letko M, Marzi A, Munster V. Functional assessment of cell entry and receptor usage for SARS-CoV-2 and other lineage B betacoronaviruses. Nature microbiology 2020.
3. Xu H, Zhong L, Deng J, et al. High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa. International journal of oral science 2020;12:8.
4. Hamming I, Timens W, Bulthuis ML, Lely AT, Navis G, van Goor H. Tissue distribution of ACE2 protein, the functional receptor for SARS coronavirus. A first step in understanding SARS pathogenesis. The Journal of pathology 2004;203:631-7.
5. Bunyavanich S, Do A, Vicencio A. Nasal Gene Expression of Angiotensin-Converting Enzyme 2 in Children and Adults. Jama 2020.
6. Singh T, Heston SM, Langel SN, et al. Lessons from COVID-19 in children: Key hypotheses to guide preventative and therapeutic strategies. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

7. O'Neill LAJ, Netea MG. BCG-induced trained immunity: can it offer protection against COVID-19? Nature reviews Immunology 2020.
8. Netea MG, Giamarellos-Bourboulis EJ, Dominguez-Andres J, et al. Trained Immunity: a Tool for Reducing Susceptibility to and the Severity of SARS-CoV-2 Infection. Cell 2020.
9. Molloy EJ, Bearer CF. COVID-19 in children and altered inflammatory responses. Pediatric research 2020.
10. Cristiani L, Mancino E, Matera L, et al. Will children reveal their secret? The coronavirus dilemma. The European respiratory journal 2020.
11. Ng KW, Faulkner N, Cornish GH, et al. Preexisting and de novo humoral immunity to SARS-CoV-2 in humans. Science 2020.
12. Pain CE, Felsenstein S, Cleary G, et al. Novel paediatric presentation of COVID-19 with ARDS and cytokine storm syndrome without respiratory symptoms. The Lancet Rheumatology 2020.
13. Consiglio CR, Cotugno N, Sardh F, et al. The Immunology of Multisystem Inflammatory Syndrome in Children with COVID-19. Cell 2020.
14. Cheng MH, Zhang S, Porritt RA, et al. Superantigenic character of an insert unique to SARS-CoV-2 spike supported by skewed TCR repertoire in patients with hyperinflammation. Proceedings of the National Academy of Sciences of the United States of America 2020;117:25254-62.
15. Mehta P, McAuley DF, Brown M, et al. COVID-19: consider cytokine storm syndromes and immunosuppression. Lancet 2020;395:1033-4.
16. Kampf G, Todt D, Pfaender S, Steinmann E. Persistence of coronaviruses on inanimate surfaces and their inactivation with biocidal agents. The Journal of hospital infection 2020;104:246-51.
17. van Doremalen N, Bushmaker T, Morris DH, et al. Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1. The New England journal of medicine 2020.
18. Chia PY, Coleman KK, Tan YK, et al. Detection of air and surface contamination by SARS-CoV-2 in hospital rooms of infected patients. Nature communications 2020;11:2800.
19. Nishiura H, Linton NM, Akhmetzhanov AR. Serial interval of novel coronavirus (COVID-19) infections. International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases 2020.
20. Du Z, Xu X, Wu Y, Wang L, Cowling BJ, Meyers LA. Serial Interval of COVID-19 among Publicly Reported Confirmed Cases. Emerging infectious diseases 2020;26.
21. Tong ZD, Tang A, Li KF, et al. Potential Presymptomatic Transmission of SARS-CoV-2, Zhejiang Province, China, 2020. Emerging infectious diseases 2020;26.
22. Bohmer MM, Buchholz U, Corman VM, et al. Investigation of a COVID-19 outbreak in Germany resulting from a single travel-associated primary case: a case series. The Lancet Infectious diseases 2020.
23. Kam KQ, Yung CF, Cui L, et al. A Well Infant with Coronavirus Disease 2019 (COVID-19) with High Viral Load. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
24. Cai J, Xu J, Lin D, et al. A Case Series of children with 2019 novel coronavirus infection: clinical and epidemiological features. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
25. Qiu H, Wu J, Hong L, Luo Y, Song Q, Chen D. Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study. The Lancet Infectious diseases 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

26. Xu Y, Li X, Zhu B, et al. Characteristics of pediatric SARS-CoV-2 infection and potential evidence for persistent fecal viral shedding. Nature medicine 2020;26:502-5.
27. Bahar B, Jacquot C, Mo YD, DeBiasi RL, Campos J, Delaney M. Kinetics of viral clearance and antibody production across age groups in SARS-CoV-2 infected children. The Journal of pediatrics 2020.
28. Young BE, Ong SWX, Kalimuddin S, et al. Epidemiologic Features and Clinical Course of Patients Infected With SARS-CoV-2 in Singapore. Jama 2020.
29. Cao Q, Chen YC, Chen CL, Chiu CH. SARS-CoV-2 infection in children: Transmission dynamics and clinical characteristics. Journal of the Formosan Medical Association = Taiwan yi zhi 2020.
30. Su L, Ma X, Yu H, et al. The different clinical characteristics of corona virus disease cases between children and their families in China - the character of children with COVID-19. Emerging microbes & infections 2020;9:707-13.
31. Ma X, Su L, Zhang Y, Zhang X, Gai Z, Zhang Z. Do children need a longer time to shed SARS-CoV-2 in stool than adults? Journal of microbiology, immunology, and infection = Wei mian yu gan ran za zhi 2020.
32. Zou L, Ruan F, Huang M, et al. SARS-CoV-2 Viral Load in Upper Respiratory Specimens of Infected Patients. The New England journal of medicine 2020.
33. Chau NVV, Thanh Lam V, Thanh Dung N, et al. The natural history and transmission potential of asymptomatic SARS-CoV-2 infection. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
34. Bullard J, Dust K, Funk D, et al. Predicting infectious SARS-CoV-2 from diagnostic samples. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
35. L'Huillier AG, Torriani G, Pigny F, Kaiser L, Eckerle I. Culture-Competent SARS-CoV-2 in Nasopharynx of Symptomatic Neonates, Children, and Adolescents. Emerging infectious diseases 2020;26.
36. Heald-Sargent T, Muller WJ, Zheng X, Rippe J, Patel AB, Kociolek LK. Age-Related Differences in Nasopharyngeal Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Levels in Patients With Mild to Moderate Coronavirus Disease 2019 (COVID-19). JAMA pediatrics 2020.
37. Baggio S, L'Huillier AG, Yerly S, et al. SARS-CoV-2 viral load in the upper respiratory tract of children and adults with early acute COVID-19. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
38. Vivanti AJ, Vauloup-Fellous C, Prevot S, et al. Transplacental transmission of SARS-CoV-2 infection. Nature communications 2020;11:3572.
39. Zeng H, Xu C, Fan J, et al. Antibodies in Infants Born to Mothers With COVID-19 Pneumonia. Jama 2020.
40. Dong L, Tian J, He S, et al. Possible Vertical Transmission of SARS-CoV-2 From an Infected Mother to Her Newborn. Jama 2020.
41. Rasmussen SA, Smulian JC, Lednicky JA, Wen TS, Jamieson DJ. Coronavirus Disease 2019 (COVID-19) and Pregnancy: What obstetricians need to know. American journal of obstetrics and gynecology 2020.
42. Chen H, Guo J, Wang C, et al. Clinical characteristics and intrauterine vertical transmission potential of COVID-19 infection in nine pregnant women: a retrospective review of medical records. Lancet 2020;395:809-15.
43. Lu Q, Shi Y. Coronavirus disease (COVID-19) and neonate: What neonatologist need to know. Journal of medical virology 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

44. Li Y, Zhao R, Zheng S, et al. Lack of Vertical Transmission of Severe Acute Respiratory Syndrome Coronavirus 2, China. Emerging infectious diseases 2020;26.
45. Liu W, Wang J, Li W, Zhou Z, Liu S, Rong Z. Clinical characteristics of 19 neonates born to mothers with COVID-19. Frontiers of medicine 2020.
46. Siberry GK, Reddy UM, Mofenson LM. SARS-COV-2 Maternal-Child Transmission: Can It Occur Before Delivery and How Do We Prove It? The Pediatric infectious disease journal 2020.
47. Gross R, Conzelmann C, Muller JA, et al. Detection of SARS-CoV-2 in human breastmilk. Lancet 2020.
48. Yoo SY, Lee Y, Lee GH, Kim DH. Reactivation of SARS-CoV-2 after Recovery. Pediatrics international : official journal of the Japan Pediatric Society 2020.
49. Li Q, Guan X, Wu P, et al. Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. The New England journal of medicine 2020.
50. Riou J, Althaus CL. Pattern of early human-to-human transmission of Wuhan 2019 novel coronavirus (2019-nCoV), December 2019 to January 2020. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 2020;25.
51. Stringhini S, Wisniak A, Piumatti G, et al. Seroprevalence of anti-SARS-CoV-2 IgG antibodies in Geneva, Switzerland (SEROCoV-POP): a population-based study. Lancet 2020.
52. Tagarro A, Epalza C, Santos M, et al. Screening and Severity of Coronavirus Disease 2019 (COVID-19) in Children in Madrid, Spain. JAMA pediatrics 2020.
53. Pollan M, Perez-Gomez B, Pastor-Barriuso R, et al. Prevalence of SARS-CoV-2 in Spain (ENE-COVID): a nationwide, population-based seroepidemiological study. Lancet 2020.
54. Wei M, Yuan J, Liu Y, Fu T, Yu X, Zhang ZJ. Novel Coronavirus Infection in Hospitalized Infants Under 1 Year of Age in China. Jama 2020.
55. Lu X, Zhang L, Du H, et al. SARS-CoV-2 Infection in Children. The New England journal of medicine 2020.
56. Bi Q, Wu Y, Mei S, et al. Epidemiology and transmission of COVID-19 in 391 cases and 1286 of their close contacts in Shenzhen, China: a retrospective cohort study. The Lancet Infectious diseases 2020.
57. Davies NG, Klepac P, Liu Y, et al. Age-dependent effects in the transmission and control of COVID-19 epidemics. Nature medicine 2020.
58. Somekh E, Gleyzer A, Heller E, et al. The Role of Children in the Dynamics of Intra Family Coronavirus 2019 Spread in Densely Populated Area. The Pediatric infectious disease journal 2020.
59. Madewell ZJ, Yang Y, Longini IM, Halloran ME, Dean NE. Household transmission of SARS-CoV-2: a systematic review and meta-analysis of secondary attack rate. medRxiv : the preprint server for health sciences 2020.
60. Omer SB, Yildirim I, Forman HP. Herd Immunity and Implications for SARS-CoV-2 Control. Jama 2020.
61. Auger KA, Shah SS, Richardson T, et al. Association Between Statewide School Closure and COVID-19 Incidence and Mortality in the US. Jama 2020.
62. Donohue JM, Miller E. COVID-19 and School Closures. Jama 2020.
63. Macartney K, Quinn HE, Pillsbury AJ, et al. Transmission of SARS-CoV-2 in Australian educational settings: a prospective cohort study. The Lancet Child & adolescent health 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

64. Heavey L, Casey G, Kelly C, Kelly D, McDarby G. No evidence of secondary transmission of COVID-19 from children attending school in Ireland, 2020. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 2020;25.
65. Link-Gelles R, DellaGrotta AL, Molina C, et al. Limited Secondary Transmission of SARS-CoV-2 in Child Care Programs - Rhode Island, June 1-July 31, 2020. MMWR Morbidity and mortality weekly report 2020;69:1170-2.
66. Posfay-Barbe KM, Wagner N, Gauthey M, et al. COVID-19 in Children and the Dynamics of Infection in Families. Pediatrics 2020;146.
67. Kim J, Choe YJ, Lee J, et al. Role of children in household transmission of COVID-19. Archives of disease in childhood 2020.
68. Gilliam WS, Malik AA, Shafiq M, et al. COVID-19 Transmission in US Child Care Programs. Pediatrics 2020.
69. Lopez AS, Hill M, Antezano J, et al. Transmission Dynamics of COVID-19 Outbreaks Associated with Child Care Facilities - Salt Lake City, Utah, April-July 2020. MMWR Morbidity and mortality weekly report 2020;69:1319-23.
70. Xia W, Shao J, Guo Y, Peng X, Li Z, Hu D. Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults. Pediatric pulmonology 2020.
71. Dong Y, Mo X, Hu Y, et al. Epidemiological Characteristics of 2143 Pediatric Patients With 2019 Coronavirus Disease in China. Pediatrics 2020.
72. Guan WJ, Ni ZY, Hu Y, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. The New England journal of medicine 2020.
73. Chen ZM, Fu JF, Shu Q, et al. Diagnosis and treatment recommendations for pediatric respiratory infection caused by the 2019 novel coronavirus. World journal of pediatrics : WJP 2020.
74. Liu W, Zhang Q, Chen J, et al. Detection of Covid-19 in Children in Early January 2020 in Wuhan, China. The New England journal of medicine 2020.
75. Zheng F, Liao C, Fan QH, et al. Clinical Characteristics of Children with Coronavirus Disease 2019 in Hubei, China. Current medical science 2020.
76. Kim L, Whitaker M, O'Halloran A, et al. Hospitalization Rates and Characteristics of Children Aged <18 Years Hospitalized with Laboratory-Confirmed COVID-19 - COVID-NET, 14 States, March 1-July 25, 2020. MMWR Morbidity and mortality weekly report 2020;69:1081-8.
77. Maltezou HC, Magaziotou I, Dedoukou X, et al. Children and Adolescents With SARS-CoV-2 Infection: Epidemiology, Clinical Course and Viral Loads. The Pediatric infectious disease journal 2020.
78. Parri N, Lenge M, Buonsenso D, Coronavirus Infection in Pediatric Emergency Departments Research G. Children with Covid-19 in Pediatric Emergency Departments in Italy. The New England journal of medicine 2020.
79. Gotzinger F, Santiago-Garcia B, Noguera-Julian A, et al. COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study. The Lancet Child & adolescent health 2020.
80. Roland D, Teo KW, Bandi S, Lo D, Gaillard EA. COVID-19 is not a driver of clinically significant viral wheeze and asthma. Archives of disease in childhood 2020.
81. Luers JC, Rokohl AC, Loreck N, et al. Olfactory and Gustatory Dysfunction in Coronavirus Disease 19 (COVID-19). Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
82. Whitcroft KL, Hummel T. Olfactory Dysfunction in COVID-19: Diagnosis and Management. Jama 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

83. Wu P, Duan F, Luo C, et al. Characteristics of Ocular Findings of Patients With Coronavirus Disease 2019 (COVID-19) in Hubei Province, China. JAMA ophthalmology 2020.
84. Viner RM, Whittaker E. Kawasaki-like disease: emerging complication during the COVID-19 pandemic. Lancet 2020.
85. Riphagen S, Gomez X, Gonzalez-Martinez C, Wilkinson N, Theocharis P. Hyperinflammatory shock in children during COVID-19 pandemic. Lancet 2020.
86. Tullie L, Ford K, Bisharat M, et al. Gastrointestinal features in children with COVID-19: an observation of varied presentation in eight children. The Lancet Child & adolescent health 2020.
87. Whittaker E, Bamford A, Kenny J, et al. Clinical Characteristics of 58 Children With a Pediatric Inflammatory Multisystem Syndrome Temporally Associated With SARS-CoV-2. Jama 2020.
88. Verdoni L, Mazza A, Gervasoni A, et al. An outbreak of severe Kawasaki-like disease at the Italian epicentre of the SARS-CoV-2 epidemic: an observational cohort study. Lancet 2020.
89. Wolfler A, Mannarino S, Giacomet V, Camporesi A, Zuccotti G. Acute myocardial injury: a novel clinical pattern in children with COVID-19. The Lancet Child & adolescent health 2020.
90. Toubiana J, Poirault C, Corsia A, et al. Kawasaki-like multisystem inflammatory syndrome in children during the covid-19 pandemic in Paris, France: prospective observational study. Bmj 2020;369:m2094.
91. Belot A, Antona D, Renolleau S, et al. SARS-CoV-2-related paediatric inflammatory multisystem syndrome, an epidemiological study, France, 1 March to 17 May 2020. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 2020;25.
92. Ouldali N, Pouletty M, Mariani P, et al. Emergence of Kawasaki disease related to SARS-CoV-2 infection in an epicentre of the French COVID-19 epidemic: a time-series analysis. The Lancet Child & adolescent health 2020.
93. Dallan C, Romano F, Siebert J, Politi S, Lacroix L, Sahyoun C. Septic shock presentation in adolescents with COVID-19. The Lancet Child & adolescent health 2020.
94. Patel PA, Chandrakasan S, Mickells GE, Yildirim I, Kao CM, Bennett CM. Severe Pediatric COVID-19 Presenting With Respiratory Failure and Severe Thrombocytopenia. Pediatrics 2020.
95. Deza Leon MP, Redzepi A, McGrath E, et al. COVID-19 Associated Pediatric Multi-System Inflammatory Syndrome. Journal of the Pediatric Infectious Diseases Society 2020.
96. Chiotos K, Bassiri H, Behrens EM, et al. Multisystem Inflammatory Syndrome in Children during the COVID-19 pandemic: a case series. Journal of the Pediatric Infectious Diseases Society 2020.
97. Dufort EM, Koumans EH, Chow EJ, et al. Multisystem Inflammatory Syndrome in Children in New York State. The New England journal of medicine 2020.
98. Feldstein LR, Rose EB, Horwitz SM, et al. Multisystem Inflammatory Syndrome in U.S. Children and Adolescents. The New England journal of medicine 2020.
99. Blondiaux E, Parisot P, Redheuil A, et al. Cardiac MRI of Children with Multisystem Inflammatory Syndrome (MIS-C) Associated with COVID-19: Case Series. Radiology 2020:202288.
100. Davies P, Evans C, Kanthimathinathan HK, et al. Intensive care admissions of children with paediatric inflammatory multisystem syndrome temporally associated with SARS-CoV-2 (PIMS-TS) in the UK: a multicentre observational study. The Lancet Child & adolescent health 2020.
101. Harwood R, Allin B, Jones CE, et al. A national consensus management pathway for paediatric inflammatory multisystem syndrome temporally associated with COVID-19 (PIMS-TS): results of a national Delphi process. The Lancet Child & adolescent health 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

102. Orlanski-Meyer E, Yogev D, Auerbach A, et al. Multisystem inflammatory syndrome in children associated with SARS-CoV-2 in an 8-week old infant. Journal of the Pediatric Infectious Diseases Society 2020.
103. Jones VG, Mills M, Suarez D, et al. COVID-19 and Kawasaki Disease: Novel Virus and Novel Case. Hospital pediatrics 2020.
104. Clouser KN, Gadhavi J, Bhavsar SM, et al. Short Term Outcomes after MIS-C Treatment. Journal of the Pediatric Infectious Diseases Society 2020.
105. Fernandez-Nieto D, Jimenez-Cauhe J, Suarez-Valle A, et al. Characterization of acute acro-ischemic lesions in non-hospitalized patients: a case series of 132 patients during the COVID-19 outbreak. Journal of the American Academy of Dermatology 2020.
106. Colonna C, Monzani NA, Rocchi A, Gianotti R, Boggio F, Gelmetti C. Chilblains-like lesions in children following suspected Covid-19 infection. Pediatric dermatology 2020.
107. Herman A, Peeters C, Verroken A, et al. Evaluation of Chilblains as a Manifestation of the COVID-19 Pandemic. JAMA dermatology 2020.
108. Marzano AV, Genovese G, Fabbrocini G, et al. Varicella-like exanthem as a specific COVID-19-associated skin manifestation: multicenter case series of 22 patients. Journal of the American Academy of Dermatology 2020.
109. Genovese G, Colonna C, Marzano AV. Varicella-like exanthem associated with COVID-19 in an 8-year-old girl: A diagnostic clue? Pediatric dermatology 2020.
110. Torrelo A, Andina D, Santonja C, et al. Erythema multiforme-like lesions in children and COVID-19. Pediatric dermatology 2020.
111. Samies NL, Yarbrough A, Boppana S. Pancreatitis in Pediatric Patients with COVID-19. Journal of the Pediatric Infectious Diseases Society 2020.
112. Stevens JP, Brownell JN, Freeman AJ, Bashaw H. COVID-19-associated Multisystem Inflammatory Syndrome in Children Presenting as Acute Pancreatitis. Journal of pediatric gastroenterology and nutrition 2020;71:669-71.
113. Tram N, Chiodini B, Montesinos I, et al. Rhabdomyolysis and Acute Kidney Injury as Leading COVID-19 Presentation in an Adolescent. The Pediatric infectious disease journal 2020;39:e314-e5.
114. Wu Q, Xing Y, Shi L, et al. Co-infection and Other Clinical Characteristics of COVID-19 in Children. Pediatrics 2020.
115. Henry BM, Lippi G, Plebani M. Laboratory abnormalities in children with novel coronavirus disease 2019. Clinical chemistry and laboratory medicine 2020.
116. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. Lancet 2020;395:507-13.
117. Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. Jama 2020.
118. Guo L, Ren L, Yang S, et al. Profiling Early Humoral Response to Diagnose Novel Coronavirus Disease (COVID-19). Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
119. Porte L, Legarraga P, Vollrath V, et al. Evaluation of novel antigen-based rapid detection test for the diagnosis of SARS-CoV-2 in respiratory samples. International journal of infectious diseases : IJID : official publication of the International Society for Infectious Diseases 2020.
120. Cheng MP, Yansouni CP, Basta NE, et al. Serodiagnostics for Severe Acute Respiratory Syndrome-Related Coronavirus-2: A Narrative Review. Annals of internal medicine 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

121. Li W, Cui H, Li K, Fang Y, Li S. Chest computed tomography in children with COVID-19 respiratory infection. Pediatric radiology 2020.
122. Cui Y, Tian M, Huang D, et al. A 55-Day-Old Female Infant infected with COVID 19: presenting with pneumonia, liver injury, and heart damage. The Journal of infectious diseases 2020.
123. Turner D, Huang Y, Martin-de-Carpi J, et al. COVID-19 and Paediatric Inflammatory Bowel Diseases: Global Experience and Provisional Guidance (March 2020) from the Paediatric IBD Porto group of ESPGHAN. Journal of pediatric gastroenterology and nutrition 2020.
124. Chan JF, Yuan S, Kok KH, et al. A familial cluster of pneumonia associated with the 2019 novel coronavirus indicating person-to-person transmission: a study of a family cluster. Lancet 2020;395:514-23.
125. DeBiasi RL, Song X, Delaney M, et al. Severe COVID-19 in Children and Young Adults in the Washington, DC Metropolitan Region. The Journal of pediatrics 2020.
126. Garazzino S, Montagnani C, Dona D, et al. Multicentre Italian study of SARS-CoV-2 infection in children and adolescents, preliminary data as at 10 April 2020. Euro surveillance : bulletin Europeen sur les maladies transmissibles = European communicable disease bulletin 2020;25.
127. Shekerdemian LS, Mahmood NR, Wolfe KK, et al. Characteristics and Outcomes of Children With Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units. JAMA pediatrics 2020.
128. Chao JY, Derespina KR, Herold BC, et al. Clinical Characteristics and Outcomes of Hospitalized and Critically Ill Children and Adolescents with Coronavirus Disease 2019 (COVID-19) at a Tertiary Care Medical Center in New York City. The Journal of pediatrics 2020.
129. Harman K, Verma A, Cook J, et al. Ethnicity and COVID-19 in children with comorbidities. The Lancet Child & adolescent health 2020.
130. Soresina A, Moratto D, Chiarini M, et al. Two X-linked agammaglobulinemia patients develop pneumonia as COVID-19 manifestation but recover. Pediatric allergy and immunology : official publication of the European Society of Pediatric Allergy and Immunology 2020.
131. de Rojas T, Perez-Martinez A, Cela E, et al. COVID-19 infection in children and adolescents with cancer in Madrid. Pediatric blood & cancer 2020:e28397.
132. Boulad F, Kamboj M, Bouvier N, Mauguen A, Kung AL. COVID-19 in Children With Cancer in New York City. JAMA oncology 2020.
133. D'Antiga L. Coronaviruses and immunosuppressed patients. The facts during the third epidemic. Liver transplantation : official publication of the American Association for the Study of Liver Diseases and the International Liver Transplantation Society 2020.
134. Marlais M, Wlodkowski T, Vivarelli M, et al. The severity of COVID-19 in children on immunosuppressive medication. The Lancet Child & adolescent health 2020.
135. Zeng L, Xia S, Yuan W, et al. Neonatal Early-Onset Infection With SARS-CoV-2 in 33 Neonates Born to Mothers With COVID-19 in Wuhan, China. JAMA pediatrics 2020.
136. Zhu H, Wang L, Fang C, et al. Clinical analysis of 10 neonates born to mothers with 2019-nCoV pneumonia. Translational pediatrics 2020;9:51-60.
137. Group RC, Horby P, Lim WS, et al. Dexamethasone in Hospitalized Patients with Covid-19 - Preliminary Report. The New England journal of medicine 2020.
138. Sheahan TP, Sims AC, Leist SR, et al. Comparative therapeutic efficacy of remdesivir and combination lopinavir, ritonavir, and interferon beta against MERS-CoV. Nature communications 2020;11:222.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

139. Martinez MA. Compounds with therapeutic potential against novel respiratory 2019 coronavirus. Antimicrobial agents and chemotherapy 2020.
140. Yao X, Ye F, Zhang M, et al. In Vitro Antiviral Activity and Projection of Optimized Dosing Design of Hydroxychloroquine for the Treatment of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
141. Beigel JH, Tomashek KM, Dodd LE, et al. Remdesivir for the Treatment of Covid-19 - Preliminary Report. The New England journal of medicine 2020.
142. Goldman JD, Lye DCB, Hui DS, et al. Remdesivir for 5 or 10 Days in Patients with Severe Covid-19. The New England journal of medicine 2020.
143. Chiotos K, Hayes M, Kimberlin DW, et al. Multicenter initial guidance on use of antivirals for children with COVID-19/SARS-CoV-2. Journal of the Pediatric Infectious Diseases Society 2020.
144. Cao B, Wang Y, Wen D, et al. A Trial of Lopinavir-Ritonavir in Adults Hospitalized with Severe Covid-19. The New England journal of medicine 2020.
145. Xu X, Han M, Li T, et al. Effective treatment of severe COVID-19 patients with tocilizumab. Proceedings of the National Academy of Sciences of the United States of America 2020.
146. Hoffmann M, Kleine-Weber H, Schroeder S, et al. SARS-CoV-2 Cell Entry Depends on ACE2 and TMPRSS2 and Is Blocked by a Clinically Proven Protease Inhibitor. Cell 2020.
147. Yamamoto M, Matsuyama S, Li X, et al. Identification of Nafamostat as a Potent Inhibitor of Middle East Respiratory Syndrome Coronavirus S Protein-Mediated Membrane Fusion Using the Split-Protein-Based Cell-Cell Fusion Assay. Antimicrobial agents and chemotherapy 2016;60:6532-9.
148. FitzGerald GA. Misguided drug advice for COVID-19. Science 2020.
149. Boulware DR, Pullen MF, Bangdiwala AS, et al. A Randomized Trial of Hydroxychloroquine as Postexposure Prophylaxis for Covid-19. The New England journal of medicine 2020.
150. Isba R, Edge R, Jenner R, Broughton E, Francis N, Butler J. Where have all the children gone? Decreases in paediatric emergency department attendances at the start of the COVID-19 pandemic of 2020. Archives of disease in childhood 2020.
151. Dann L, Fitzsimons J, Gorman KM, Hourihane J, Okafor I. Disappearing act: COVID-19 and paediatric emergency department attendances. Archives of disease in childhood 2020.
152. Kuitunen I, Artama M, Makela L, Backman K, Heiskanen-Kosma T, Renko M. Effect of Social Distancing Due to the COVID-19 Pandemic on the Incidence of Viral Respiratory Tract Infections in Children in Finland During Early 2020. The Pediatric infectious disease journal 2020.
153. Huh K, Jung J, Hong J, et al. Impact of non-pharmaceutical interventions on the incidence of respiratory infections during the COVID-19 outbreak in Korea: a nationwide surveillance study. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
154. Angoulvant F, Ouldali N, Yang DD, et al. COVID-19 pandemic: Impact caused by school closure and national lockdown on pediatric visits and admissions for viral and non-viral infections, a time series analysis. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America 2020.
155. Cognigni M. An Italian paediatric department at the time of Coronavirus: a resident's point of view. Archives of disease in childhood 2020.
156. Lazzerini M, Barbi E, Apicella A, Marchetti F, Cardinale F, Trobia G. Delayed access or provision of care in Italy resulting from fear of COVID-19. The Lancet Child & adolescent health 2020;4:e10-e1.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch

Universitätsklinik für Kinderheilkunde
Prof. Dr. med. Matthias Kopp
Direktor und Chefarzt

INSELSPITAL
UNIVERSITÄTSSPITAL BERN
HOPITAL UNIVERSITAIRE DE BERNE
BERN UNIVERSITY HOSPITAL

157. Gavish R, Krause I, Goldberg L, et al. A Drop in Number of Hospitalizations among Children with Bacterial Infections during the Covid-19 Pandemic. The Pediatric infectious disease journal 2020.
158. Britton PN, Hu N, Saravanos G, et al. COVID-19 public health measures and respiratory syncytial virus. The Lancet Child & adolescent health 2020.
159. Bram JT, Johnson MA, Magee LC, et al. Where Have All the Fractures Gone? The Epidemiology of Pediatric Fractures During the COVID-19 Pandemic. Journal of pediatric orthopedics 2020.
160. Kamrath C, Monkemoller K, Biester T, et al. Ketoacidosis in Children and Adolescents With Newly Diagnosed Type 1 Diabetes During the COVID-19 Pandemic in Germany. Jama 2020.
161. Zhu FC, Li YH, Guan XH, et al. Safety, tolerability, and immunogenicity of a recombinant adenovirus type-5 vectored COVID-19 vaccine: a dose-escalation, open-label, non-randomised, first-in-human trial. Lancet 2020.
162. Folegatti PM, Bittaye M, Flaxman A, et al. Safety and immunogenicity of a candidate Middle East respiratory syndrome coronavirus viral-vectored vaccine: a dose-escalation, open-label, non-randomised, uncontrolled, phase 1 trial. The Lancet Infectious diseases 2020;20:816-26.
163. Zhu FC, Guan XH, Li YH, et al. Immunogenicity and safety of a recombinant adenovirus type-5-vectored COVID-19 vaccine in healthy adults aged 18 years or older: a randomised, double-blind, placebo-controlled, phase 2 trial. Lancet 2020.
164. Jackson LA, Anderson EJ, Rouphael NG, et al. An mRNA Vaccine against SARS-CoV-2 - Preliminary Report. The New England journal of medicine 2020.

Inselspital, Universitätsklinik für Kinderheilkunde, **Pädiatrische Infektiologie und Impfwissenschaften,** CH-3010 Bern
Prof. Dr. med. Christoph Aebi, Chefarzt, Telefon +41 (0)31 632 12 99, christoph.aebi@insel.ch
Chefarztsekretariat: Barbara Mann, Telefon +41 (0)31 632 94 43, Fax +41 (0)31 632 94 16, barbara.mann@insel.ch

Poliklinik Tel. +41(0) 31 632 94 11 www.kinderkliniken.insel.ch