Hygiene monitoring scientific publication list

Including Easicult Combi, Easicult TTC, Hygicult TPC, Hygicult Y&F, Hygicult E, Hygicult E/ß-GUR, and Clean Card PRO

Easicult Combi

Dziki A. et al.
Study on Ajuga reptans extracts as potential cosmetic raw materials. Polish Journal of Chemical Technology 2023; 25: 44-51. https://doi.org/10.2478/pjct-2023-0037
Cosmetic products were microbiologically tested with Easicult Combi.

Dorsey MH et al. **Monitoring for Corrosion and Microbiological Activity in a Cooling Water System.** Paper presented at the CORROSION 2002, Denver, Colorado, April 2002.
https://onepetro.org/NACECORR/proceedings/CORR02/All-CORR02/NACE-02009/114144
Easicult Combi was used in this study to detect aerobic heterotrophic bacteria in corrosion coupons used in cooling water system.

Easicult TTC

Bragin GE et al.
Biodegradation and Ecotoxicity of Branched Alcohol Ethoxylates: Application of the Target Lipid Model and Implications for Environmental Classification. J Surfact Deterg 2020; 23:383–403.
https://doi.org/10.1002/jsde.12359
Easicult TTC was used to determine the microbial activity in activated sludge supernatant, which serves as an inoculum in biodegradation tests for branched alcohol ethoxylates. Specifically, Easicult TTC was employed to estimate the colony-forming units per milliliter (CFU/mL), ensuring that the microbial activity is sufficient for the experiments conducted. This step is critical in preparing the test medium to assess the biodegradability of the substances under study.

Kabir M et al.
Development of Rotary Magnetoferrite Treatment with Stirrers for Waste Water Treatment Plants to Reduce Excess Sludge. International Scholarly Research Network ISRN Materials Science 2011; 2012: 598798.
https://doi.org/10.5402/2012/598798
Easicult TTC was used to determine the number of viable cells before and after treatment in a rotary magnetoferrite treatment process. The process involves treating activated sludge with ferrite particles and a stirrer to reduce the volume of excess sludge in wastewater treatment plants.

Kabir M et al.
A New Method for Reduction of Excess Sludge by Using Ferrite Particles. Japanese Journal of Water Treatment Biology 2007; 43:189－197.
Easicult TTC was employed to measure the viability of microorganisms in activated sludge before and after magneto-ferrite treatment, providing a baseline and post-treatment comparison. The effectiveness of the treatment is assessed by calculating the Viable Cell Coefficient (VCC), which indicates the percentage reduction of viable

cells due to the treatment. This quantitative measure demonstrates the treatment's impact on microbial disruption and correlates with its effectiveness in reducing sludge volume.

Studies that have used Easicult but do not define which exact test has been used

Zhao J. et al.
Study the reuse possibility of tempering lubricant for cold-rolled strip wet-rolling processing. Lubrication Science 2023; 35: 279-286. https://doi.org/10.1002/ls.1639
Easicult was used to measure microbiological impurities in industry lubricant.

Reinhardt DJ et al.
Limulus amoebocyte lysate and direct sampling methods for surveillance of operating nebulizers. Applied and Environmental Microbiology 1981: 42 (5). https://doi.org/10.1128/aem.42.5.850-855.1981
The study compared the Limulus amoebocyte lysate test and the Easicult method with direct dilution sampling for detecting contamination in nebulizer reservoirs. Of 206 samples from three hospitals, 45% were contaminated, mainly with Gram-negative, nonfermentative bacilli. The Limulus and Easicult tests agreed with the direct dilution method in 84% and 90% of cases, respectively, and both could detect contamination at levels of ≥10^3 CFU/ml. These results highlight the effectiveness of both tests for monitoring nebulizer contamination, though direct dilution remains the most sensitive method.

Hygicult TPC

Szulc J. et al.
Assessment of Dust, Chemical, Microbiological Pollutions and Microclimatic Parameters of Indoor Air in Sports Facilities. Int. J. Environ. Res. Public Health 2023; 20: 1551. https://doi.org/10.3390/ijerph20021551
Hygicult TPC was used in a study as a routine method to assess microbial contamination on surfaces in indoor sports facilities.

Cunningham B. et al.
Use of a door handle disinfection system to reduce the risks associated with microbial loads on fomites in a healthcare setting. Journal of Hospital Infection 2022; 130:104-107. https://doi.org/10.1016/j.jhin.2022.09.003
The study examined the microbial levels on the handles of frequently used doors in an orthopaedic hospital. Hygicult TPC tests were employed to measure microbial contamination on door handles in hospital settings. The tests were used alongside a door handle disinfection system, which automatically disinfected the handles each time they were used, significantly reducing microbial loads. Results showed that using the disinfection system, microbial levels on door handles remained within safe limits, demonstrating an effective reduction of potential infection risks.

Svanevik CS et al.
Microbiological assessment along the fish production chain of the Norwegian pelagic fisheries sector – Results from a spot sampling programme. Food Microbiology 2015; 51:144-153.
https://doi.org/10.1016/j.fm.2015.05.016
Hygicult TPC and Hygicult E/ß-GUR were employed to evaluate the microbial contamination on various contact surfaces within the fish production chain. This included testing surfaces and equipment in both fishing vessels and processing factories. The Hygicult dipslides were used to assess total plate counts and Enterobacteriaceae presence, providing a practical method for immediate microbial monitoring in these environments. This approach helped identify critical points needing hygiene improvement to optimize fish product quality and safety.

Rahkio TM and Korkeala HJ.
Use of Hygicult-TPC in slaughterhouse Hygiene control. Acta Vet Scan. 1997; 38:331-338.
https://helda.helsinki.fi/server/api/core/bitstreams/2908d8a4-0536-42d8-8ca6-880b6aa09e03/content
The study evaluated Hygicult TPC in slaughterhouse hygiene control with an incubation for 72h at 25ºC. Hygicult TPC was found suitable for controlling slaughterhouse hygiene.

Rahkio et al.
Effect of pre-scalding brushing on contamination level of pork carcasses during the slaughtering process. Meat Science 1992; 32:173-183. https://doi.org/10.1016/0309-1740(92)90104-C
Hygicult test was used to assess the bacterial contamination levels on pork carcasses at various stages of the slaughtering process. This test was part of an evaluation of the hygienic impact of pre-scalding brushing. Samples were taken from 80 carcasses, with half undergoing pre-scalding brushing and half serving as controls.

Hygicult E

Salo S et al.
Validation of the Microbiological Methods Hygicult Dipslide, Contact Plate, and Swabbing in Surface Hygiene Control: A Nordic Collaborative Study. Journal of AOAC International 2000; 83(6): 1357-1365.
https://doi.org/10.1093/jaoac/83.6.1357
The study validated Hygicult E dipslides for detecting Enterobacteriaceae on stainless steel surfaces, comparing it with violet red bile glucose agar (VRBGA) contact plates and swabbing methods. Twelve laboratories participated, assessing microbial levels on 108 samples in triplicate across various inoculation levels. Results showed that the Hygicult E, VRBGA contact plate, and swabbing methods yielded similar detection rates across all microbial levels tested. The study also highlighted good agreement among the methods, with repeatability and reproducibility standard deviations indicating some variability in the results.

Salo S et al.
Validation of the Hygicult® E Dipslides Method in Surface Hygiene Control: A Nordic Collaborative Study. Journal of AOAC International 2002; 85(2): 388-394. https://doi.org/10.1093/jaoac/85.2.388
The study evaluated the effectiveness of Hygicult E dipslides in detecting Enterobacteriaceae on contaminated stainless steel surfaces, comparing results with VRBGA contact plates and swabbing. Across 108 samples tested in triplicate at different microbial levels, all three methods showed similar detection rates. At the middle inoculation level, the percentage of microbes detached was 16.6% for Hygicult E, 15.3% for contact plates, and 14.6% for swabbing, while at the high level, the percentages were 14.5%, 15.8%, and 9.8%, respectively. The percentage of acceptable results after outlier removal was 97.2%, and standard deviations for repeatability ranged from 33.4% to 44.9%, with reproducibility between 45.2% and 77.1%. Overall, the study confirmed that Hygicult E performed comparably to traditional methods across all microbial levels tested.

Studies using combination of Hygicult TPC, Hygicult Y&F, Hygicult E, and Hygicult E/β-GUR

Kuisma R. et al. Tuorevihannesten tuotantotilojen pintahygienian selvittäminen. **Investigating the surface hygiene of fresh vegetable production facilities.** Suomen maataloustieteellisen seuran tiedote 2016; 33. Maataloustieteen päivät 2016. https://doi.org/10.33354/smst.75148
Hygicult tests were used to evaluate the surface hygiene in production facilities that process fresh vegetables. These tests were part of a broader effort to monitor cleanliness across different production stages including washing, peeling, and chopping. Specifically, the study utilized Hygicult TPC slides to assess the total aerobic bacterial count and Hygicult E/β-Gur slides to detect Enterobacteriaceae and other β-glucuronidase-positive bacteria. The results from these Hygicult tests showed a general improvement in hygiene levels from the initial

assessment in 2009 to the follow-up in 2012, reflecting the effectiveness of the recommended improvements in cleaning and disinfection practices adopted by the facilities.

Kuisma R et al.
Surface hygiene in vegetable processing plants: Results from a repeated hygiene survey. Journal of Hygienic *Engineering and Design 2014; 7:51-58. http://www.jhed.mk/categories/view/450*
Hygicult tests (Hygicult TPC and E/β-GUR) were used to routinely monitor the surface hygiene in vegetable processing plants. Dipslides were specifically used to assess the total microbial counts, Enterobacteriaceae, and other bacteria capable of hydrolyzing β-glucuronidase. The study showed that after implementing recommended hygiene improvements, there was a general enhancement in the cleanliness of surfaces in contact with vegetables. This indicated that the use of Hygicult tests in routine hygiene monitoring can effectively contribute to maintaining and improving sanitary conditions in food processing environments.

Kymäläinen HR and Kuisma R. **Hygiene of environmental surfaces in a cattle barn.** Agric Eng Int: CIGR Journal 2014; 16: (1). https://cigrjournal.org/index.php/Ejounral/article/view/2682/1838
Hygicult tests were used as a routine method to measure the microbial cleanliness of various surfaces within a cattle barn. The study conducted 1112 measurements using Hygicult TPC, Hygicult Y&F, and Hygicult E/β-GUR to assess total microbes, yeasts, molds, and Enterobacteriaceae, including β-glucuronidase-positive bacteria such as E. coli. Results showed varied hygiene levels across different areas: corridors and personnel rooms had the highest hygiene status, while the barn and the washing room were the least hygienic. This highlighted the efficacy of Hygicult tests in detecting microbial presence and guiding hygiene improvements in cattle barn environments.

Kuisma R et al.
Pintahygienia tuorekasviksia prosessoivissa laitoksissa/ Surface hygiene in facilities processing fresh vegetables. Suomen maataloustieteellisen seuran tiedote 2012; 28. Maataloustieteen päivät 2012.
Hygicult products were used as routine method to determine the hygienic levels in different production stages of fresh vegetable processing facilities. Hygicult TPC contact plates were utilized to measure the total number of aerobic microbes, while Hygicult E/ß-Gur contact plates were used to determine the total counts of enterobacteria and β-glucuronidase-producing microbes. Additionally, Hygicult Y&F contact plates were employed to assess the total counts of yeasts and molds, aiding in evaluating the cleanliness and safety of various surfaces and equipment.

Kuisma R et al.
Hygienian kehittäminen terveyskeskussairaaloissa: pintapuhtauden mittaaminen eri menetelmillä ja laitoshuollon henkilöstön osaamisen kartoitus/Development of hygiene in health center hospitals: measurement of surface cleanliness using different methods and assessment of the maintenance staff's expertise. Hoitotiede 2012; 24:, 38–49. https://journal.fi/hoitotiede/article/view/128231
The study focused on assessing the hygiene levels in health center hospitals using various microbiological methods, including Hygicult TPC, Hygicult Y&F, and Hygicult E/ß-Gur tests to examine the amounts of aerobic microbes, enterobacteria, yeasts, and molds on different surfaces. The tests showed that although most surfaces had been effectively cleaned, significant microbial contamination was found on some surfaces, such as cleaning cloths in break rooms. The study emphasized the usefulness of Hygicult tests in the hospital environment, as they provided a quick and reliable way to assess the microbiological cleanliness of surfaces and helped identify areas that required enhanced cleaning.

Lehto M et al.
Hygienic level and surface contamination in fresh-cut vegetable production plants. Food Control 2011; 22:469-475. https://doi.org/10.1016/j.foodcont.2010.09.029
Hygicult tests were used as a routine method to evaluate the microbial safety and hygiene levels at various stages of fresh-cut vegetable processing. Hygicult TPC contact slides were used to assess total aerobic microbial counts, while Hygicult E/ß-Gur contact slides measured Enterobacteriaceae and β-glucuronidase-positive bacteria, and Y&F-Hygicult slides were used for yeasts and molds. These tests helped identify critical hygiene points and assess the effectiveness of cleaning procedures in the processing plants

Lehto M et al.
Tuorevihannesten prosessoinnin hygienia ja ympäristövaikutukset/ Hygiene and environmental impacts of fresh vegetable processing. Suomen maataloustieteellisen seuran tiedote 2010; 26. Maataloustieteen päivät 2010. https://journal.fi/smst/article/view/76826
Hygicult products were used as routine method to evaluate microbiological safety and hygiene levels at different production stages such as cultivation, storage, and processing. Hygicult TPC contact plates were used to determine the total number of aerobic microbes, Hygicult E/ß-Gur contact plates were used for determining the total number of enterobacteria and ß-glucuronidase-producing species, and Hygicult Y&F contact plates were used for determining the total number of yeasts and molds.

Toiviainen-Laine E et al.
New challenges in professional cleaning: hygiene quality and monitoring of surfaces in private domestic homes. International Journal of Consumer Studies 2009; 33:396-406. https://doi.org/10.1111/j.1470-6431.2009.00785.x
Hygicult tests were utilized as a routine method to evaluate the hygiene quality and effectiveness of cleaning methods in private domestic homes. The study employed Hygicult TPC dipslides to measure total aerobic bacteria, and Hygicult E for Enterobacteriaceae, on various cleaned surfaces in households. The key results indicated that while most cleaning methods reduced microbial contamination effectively, areas like kitchen sinks and eating tables still showed relatively high levels of bacteria after cleaning, demonstrating the need for improved cleaning practices in these critical areas.

Fijan S et al.
Determining the Hygiene of Laundering Industrial Textiles in Slovenia, Norway and Denmark. Tekstil 2008; 57:73-83. https://hrcak.srce.hr/file/56143
Hygicult TPC and Hygicult E were used as a routine methods to assess the hygiene level of hospital textiles in Slovenia and Denmark, as well as the hygiene level of different textiles from different segments of the food processing industry in Slovenia and Norway.

Miettinen H.
Evaluation of Surface Contamination and the Presence of Listeria monocytogenes in Fish Processing Factories. Journal of Food Protection 2001; 64: 635-639. https://doi.org/10.4315/0362-028X-64.5.635
Hygicult TPC was used as a routine method to assess aerobic heterotrophic bacteria counts from surfaces of fish processing factories after cleaning and before start of the processing. Hygicult E was used to detect Enterobacteria similarly as Hygicult TPC.

Thesis publications where Hygicult TPC or Hygicult E have been used as a routine method for hygiene monitoring

Kovasin, E.
Prosessihygienian optimointi juomatehtaassa/ Optimization of process hygiene in a beverage factory. Masters Thesis in University of Helsinki, 2022. http://hdl.handle.net/10138/345244
Hygicult TPC was used in a master thesis to determine the microbiological cleanliness of critical process surfaces.

Söderlund S.
Päiväkotien pinta- ja leluhygienia alle 3-vuotiaiden ryhmätiloissa Kouvolan kaupungissa/Surface and toy hygiene in kindergartens in group rooms for children under 3 years of age in the city of Kouvola. Bachelor thesis from South-Eastern Finland University of Applied Sciences, 2021. https://urn.fi/URN:NBN:fi:amk-2021061015555
Hygicult TPC was used as a routine method to evaluate surface cleanliness of tables, floors, and toys in group rooms for groups under 3 years of age.

Sahioja M.
Päiväkotien hygieniaselvitys Pohjois-Karjalan Ympäristöterveyden valvonta-alueella/ Hygiene survey of nursing homes in North Karelia's Environmental Health Care Surveillance Area. Bachelor thesis from South-Eastern Finland University of Applied Sciences, 2017. https://urn.fi/URN:NBN:fi:amk-2017113019039
Hygicult TPC was used as a routine method to examine the hygiene level of day care centers in the North Karelia Environmental Health Monitoring Area.

Heino T.
Ambulanssin pintojen puhtaus ja puhtaanapito/Cleanliness and Sanitation of Ambulance Surfaces. **T**ampere University of Applied Sciences, Degree Programme in Emergency Care, 2016.
https://urn.fi/URN:NBN:fi:amk-201605025811
Hygicult E was used as a routine method to assess the level of Enterobacteriaceae in the ambulance surfaces. The study investigated the level of cleanliness in the ambulances of Pirkanmaa Rescue Services and to organised ambulance sanitation training for the Rescue Services personnel working in emergency care.

Hauhtonen P.
Uimahallin pintapuhtaus ja omavalvonnan kehittäminen: Huittisten kaupunki/Surface Hygiene and On-site Monitoring in the Public Swimming Pool The City of Huittinen. Bachelor thesis from Tampere University of Applied Sciences, 2014. https://urn.fi/URN:NBN:fi:amk-2014052910934
Hygicult TPC and Y&F were used as a routine method to examine the surface cleanliness of public swimming hall facility. Results were also compared to measurements with luminometry and UV-light. The study confirmed the functionality of Hygicult tests in providing reliable and quick assessments of microbial cleanliness in a public swimming pool environment.

Salonen K.
Puhtaana pysyvien pinnoitteiden toimivuus sairaalaympäristössä/ Easy-Clean Coatings in the Hospital Environment. Bachelor thesis from Tampere University of Applied Sciences, 2014. https://urn.fi/URN:NBN:fi:amk-201204064209
Hygicult TPC was used as a routine method to investigate the surface cleanliness of easy-clean coatings in the hospital environment.

Hietanen A.
Tatuointi- ja lävistyspalveluiden hygienia ja turvallisuus Tampereella 2011/Hygiene and safety of tattooing and body piercing services in Tampere 2011. Bachelor thesis from Mikkeli University of Applied Sciences, 2011.
https://urn.fi/URN:NBN:fi:amk-201205219156
Hygicult TPC was used as a routine method to investigate the hygiene of 18 tattooing and piercing services in Tampere.

Clean Card PRO

Kuisma R et al.
Hygienian kehittäminen terveyskeskussairaaloissa: pintapuhtauden mittaaminen eri menetelmillä ja laitoshuollon henkilöstön osaamisen kartoitus/Development of hygiene in health center hospitals: measurement of surface cleanliness using different methods and assessment of the maintenance staff's expertise. Hoitotiede 2012; 24:, 38–49. https://journal.fi/hoitotiede/article/view/128231
The study used Clean Card PRO as a routine method to measure protein residues from surfaces when assessing surface cleanliness in health center hospitals.

Thesis publications where Clean Card Pro has been used as a routine method for assessing protein residues on surfaces

Kurttila T and Söderholm M.
Pyyhintämenetelmien vaikutus tasopintojen puhdistuvuuteen/The impact of wiping methods on the cleanliness of flat surfaces. Bachelor thesis from Tampere University of Applied Sciences Degree Programme in Hospitality Management, 2025.
Thesis investigated diverse types of the wiping methods and wiping cloths by assessing the cleaning results by different test methods. Clean Card PRO was used as a routine method to evaluate protein residues.

Haapala S.
Yhteistyörobottien materiaalien puhdistettavuus/ Cleanability of collaborative robotic materials. Bachelor thesis of Engineering, Food Processing and Biotechnology, Seinäjoki University of Applied Sciences, 2023
https://urn.fi/URN:NBN:fi:amk-2023051110151
The aim of this work was to find out about the cleanability of cooperation robotic materials by comparing two different materials. i.e. stainless steel plates and joint shields used in collaborative robots. Furthermore, the aim was to compare the methods used in cleaning and their success. Clean Card PRO was used as a routine method to detect protein residues on surfaces.

Korkiamäki S. & Samppala P.
Yhteistyörobottien rakenne ja puhdistettavuus/ Structure and cleanability of collaborative robots. Bachelor thesis of Engineering, Food Processing and Biotechnology, Seinäjoki University of Applied Sciences, 2023.
https://urn.fi/URN:NBN:fi:amk-202305098807
The goal of this thesis was to discover the suitability of a cobot for high hygiene tasks in the food industry. Organic residues in a cobot can increase the risk of organic cross-contamination or growth of pathogens in the structures. Clean Card PRO was used as a routine method to detect protein residues on surfaces.

Hietanen A.
Tatuointi- ja lävistyspalveluiden hygienia ja turvallisuus Tampereella 2011/Hygiene and safety of tattooing and body piercing services in Tampere 2011. Bachelor thesis from Mikkeli University of Applied Sciences, 2011.
https://urn.fi/URN:NBN:fi:amk-201205219156
Bachelor thesis investigated the hygiene of 18 tattooing and piercing services in Tampere. Clean Card PRO was used a routine method to detect the protein residues.