B'SYS GmbH

Rare compounds, Low-Volume Applications for Patch-Clamp Experiments

Application Note

FAST AND PRECISE LIQUID APPLICATION AND SWITCHING OF ULTRA-LOW VOLUMES.

Having evolved the dosing concept of the Drugbeam™ liquid application system, B'SYS has designed a low-volume pressure/flow feedback-controlled drug application system for rapid and accurate liquid gating and application of dose solutions to the cell chamber during ligand- and voltage-gated ion channel studies.

Application-nozzle geometry, applied volumes and pressure levels can be finely selected, ensuring rapid and targeted application of compounds which is important for fast-gated and rapidly-desensitising ion channels such as nAChRs.

A core advantage of the multi-channel system is its low compound consumption: In its low-volume preset modes, 1ml of a drug solution will suffice for an constant application time of 20 minutes with its terminal ending in open bath configuration, making it ideal for studies where long wash in times are required and compound amounts are scarce (e.g. antibodies, rare compounds, natural compounds).

The system embodies additional micrometer-sized flush/vacuum channels, providing adequately controlled and regulated pressure levels to rapidly remove any applied test solution, to maintain laminar flow conditions and to prevent spreading of the drug solution into the recording chamber, thus eliminating eddies and dead spaces.

1 EXAMPLE TRACES, EXPERIMENTS AND PERFORMANCE

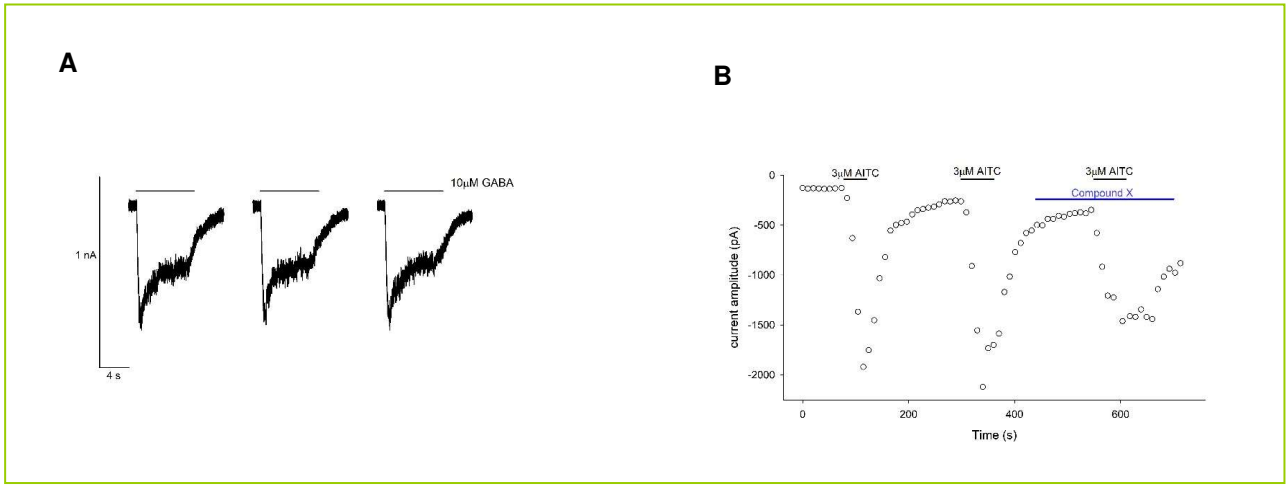

Figure 1 A: Example traces showing the application of 10 µM GABA to cells stably transfected with $GABA_A$ $\alpha_1\beta_2\gamma_2$. Consumption of 1.60 µl solution per second of application.
B: IT plot showing TrpA1 current over time after activation by the agonist AITC alone and in the presence of compound. Consumption of 1.23 µl solution per second of application.

Table 1: Typical parameters within typical settings. Open-bath, laminar configuration at technically sensible distances between fluidic terminal and patch clamped cell *

Parameter	Definition	Min	Typical	Max (sensible preset)
On-kinetics after liquid gate ON/HIGH	Onset (Time $_{peak\ response\ at\ nAchR}$) – (Time $_{first\ response}$)	80 ms	110 ms	250 ms
Off-kinetics after liquid gate OFF / LOW	(Time $_{last\ response\ nAchR}$) – (Time $_{peak\ response}$)	100 ms	180 ms	400 ms
Volume consumption @ liquid gate ON/HIGH	Flow rate per channel	0.80 ul/sec	1.25-2.00 ul/sec	8 ul/sec
Volume consumption @ liquid gate OFF/LOW	Flow rate per channel	0.00 ul/sec	0.00 ul/sec	0.00 ul/sec
Temperature change of solutions during passage of the system	(T_{output})-(T_{input}), °C, recorded at ambient temperature of 22°C	0 °	0.2°	0.5 °
Materials at liquid-system interfaces, (surface ratio, %)	Fluorocarbons (95%), stainless steel 1.4301 (1%), PEEK (1%), PMMA, (3%).	Ratios dominated by length of afferent / efferent tubing.	Ratios dominated by length of afferent / efferent tubing.	Ratios dominated by length of afferent / efferent tubing.

*contact our team to learn about off-preset use, e.g. for non-laminar settings, high frequency application (inkjet mode) or settings with positive or negative pressure in confined bath conditions.

2 CONTACT INFORMATION

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