

Technical note

Stability of protein therapeutics with J.T.Baker® Viral Inactivation Solution



To ensure the safety of protein therapeutics produced from cell culture, ICHQ5 guideline requires the purification processes of such medicines to have the capability to inactivate and remove viruses from the product stream [1]. J.T.Baker® Viral Inactivation Solution is a readily biodegradable detergent, that is used for inactivation of virus in a manufacturing process of therapeutic polypeptide.

One of the critical factors to consider when selecting detergent is the impact of detergent exposure on the product quality. This study will show the stability of two types of protein (IgG₁ and Fab) when it is incubated with Viral Inactivation Solution at room temperature. Size variants are measured with size exclusion chromatography and yields from affinity column purification are compared to a control data.

MATERIALS AND METHODS

To show the stability of protein with detergent, 1% of Viral Inactivation Solution was added to the purified IgG₁ and Fab in 1XPBS and incubated for 1 and 2 hours at room temperature. The samples are analyzed with SEC and HMW and LMW impurities are compared to the control sample without detergent.

Viral inactivation with detergents is commonly performed in clarified cell culture fluid (CCCF) before the first capture column purification. To study the stability of protein in CCCF with detergent, 1% of Viral Inactivation Solution was added to the CCCF of IgG₁ and Fab and incubated for 1 hour at room temperature. Samples are analyzed with SEC after incubation and each sample is further purified using affinity columns. Purified samples are analyzed with SEC and yields are analyzed based on UV280 absorbance.

Variables	IgG ₁	Fab
Concentration	1mg/ml, 5mg/ml, 10mg/ml	1 mg/ml
Viral Inactivation Solution concentration	1%	1%
Incubation temperature	Room temperature	Room temperature
Incubation time	1 hour, 2 hours	1 hour, 2 hours

TABLE 1: Condition for incubation of pure protein with 1% Viral Inactivation Solution

Variables	IgG ₁ CCCF	Fab CCCF
Concentration	3.1mg/ml	0.4mg/ml
Viral Inactivation Solution concentration	1%	1%
Incubation temperature	Room temperature	Room temperature
Incubation time	1 hour	1 hour
Purification after incubation	Protein A column (PROchievA™)	Protein L column

TABLE 2: Condition for incubation of CCCF with 1% Viral Inactivation Solution

RESULTS

1. Impact of detergent exposure to purified protein

Table 3 shows the SEC result of incubation of IgG₁ and Fab with the detergent. Control samples are prepared at the same concentration of protein without the addition of detergent. The result shows there's no impact on purity of both proteins after the incubation with 1% of Viral Inactivation Solution at room temperature.

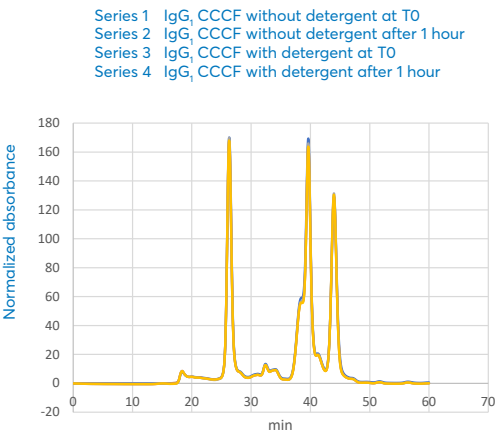
Incubation time	IgG ₁						Fab	
	1mg/ml		5mg/ml		10mg/ml		Fab 1mg/ml	
	Sample with 1% Viral Inactivation Solution	Control	Sample with 1% Viral Inactivation Solution	Control	Sample with 1% Viral Inactivation Solution	Control	Sample with 1% Viral Inactivation Solution	Control
T0	94.0%	94.8%	95.5%	94.8%	87.5%	87.5%	97.0%	98.2%
1hr	95.1%	95.7%	95.2%	95.3%	87.6%	87.4%	98.0%	98.2%
2hrs	95.5%	94.9%	95.2%	95.4%	87.7%	87.5%	98.0%	98.3%

TABLE 3: SEC result of incubation of IgG₁ with Viral Inactivation Solution

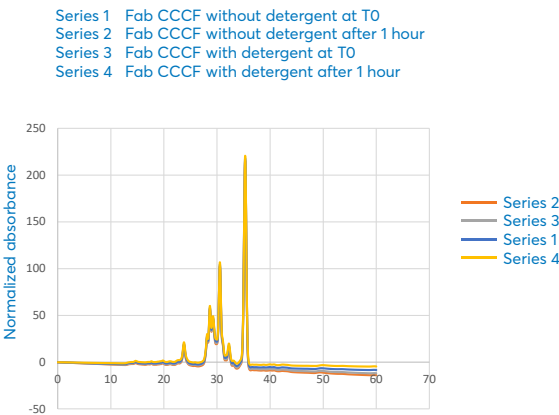
2. Impact of detergent exposure to protein in CCCF

Graph 1 shows the SEC result of incubation of IgG₁ and Fab with Viral Inactivation Solution in CCCF. Overlaying chromatogram result shows there is no impact on the protein from the incubation of the CCCF with the 1% Viral Inactivation Solution.

Graph 1. SEC result of incubation of IgG₁ in CCCF and Fab in CCCF. Overlay of T0 and 1 hour incubation of sample and control shows no significant difference.



(a) IgG₁ CCCF



(b) Fab CCC

Conclusion

Incubation study with J.T.Baker® Viral Inactivation Solution shows compatibility of the product to two different types of protein and data shows no impact on the quality of the protein product.

Materials used with ordering information

Materials	Avantor part number
PROchievA™ 1ml column	C789-11
PROchievA™ 5ml column	C789-18
Sodium Phosphate Dibasic anhydrous	3826
Sodium Phosphate Monobasic monohydrate	3802
Sodium Chloride	3625
Acetic acid	9526
Tris (Base)	4102
TrisHCl	4106
0.5N NaOH	0329

Reference

1. Atkins, Karen L., et al.: "S. Aureus IgG-binding proteins SpA and Sbi: Host specificity and mechanisms of immune complex formation." Molecular Immunology. 2008;45(6): 1600–1611., doi:10.1016/j.molimm.2007.10.021.
2. Avantor: "J.T.Baker® BAKERBOND® PROchievA™ recombinant protein A affinity chromatography resin." Accessed 09 Jan 2021.

Corporate Headquarters

Avantor Performance Materials, LLC
 100 Matsonford Rd.
 Building One, Suite 200
 Radnor, PA 19087 USA
 avantorsciences.com
 Toll Free: +1-855-AVANTOR (1-855-282-6867)
 Outside of US Tel: +1-610-573-2600

Global Customer Service & Sales Support

The Americas
 +1-610-573-2600
China
 +86 (21) 5898 6888

Europe
 +48 32 23-92-181
Taiwan
 +886-3-560-0789

India
 +0091-129-4267000
Korea
 +82-2-2052-0481

Southeast Asia
 +603-7803 0378

Advanced Silicones and Biomaterials
 +1-805-684-8780