

Comparisons of Activated Clotting Times (ACT) Between Hemochron 801 and Helena Actalyke-Max ACT Systems

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The Activated Clotting Time (ACT) test has been used for over 25 years to assess the degree of anticoagulation in heparinized patients, with longer ACT results related to increased heparinization. For many years we have used the Hemochron 801 (Hem801), which measures times of clot formation in tubes containing one of the following activators: celite, kaolin, or glass. After comparing ACT results by the Hem801, Hemochron Response, and Helena Actalyke (Actlyk) analyzers, we changed to the Actlyk analyzer with MaxACT tubes (Helena Laboratories). The instrument has a more sensitive clot detection system and the MaxACT tubes contain all three activators (celite, kaolin, and glass) commonly used individually in other ACT methods. An additional need is for ACT analyzers to have data entry features that associate ACT result with both the patient and the instrument operator.

Because comparison of ACT results requires collection of additional blood, both IRB approval and patient consent were required for each blood sample. We have obtained 272 blood samples: 50 from adult open-heart (Ad OH) surgery cases, 19 from pediatric open-heart cases (Ped OH), 93 from adult cardiac catheterization procedures (card cath), 53 from cardiac catheterization for radiofrequency (RF) ablation of arrhythmias, and 57 from pediatric ECMO cases.

Patient Group	n	Actlyk Tube	Hem801 Tube	ACT range (sec)	mean diff	SD of diff
All	37	MaxACT	celite	<170	-3	18
Ad/Ped OH	0	"	celite/kaolin	171-300		
Card Cath	64	"	celite	171-300	-32	27
RF ablation	41	"	celite	171-300	-38	22
Adult OH	22	"	celite/kaolin	301-500	-26	86
Peds OH	6	"	celite/kaolin	301-500	-27	43
Card Cath	11	"	celite	301-500	-88	36
RF Ablation	9	"	celite	301-500	-71	40
Adult OH	18	"	celite/kaolin	501-1000	-179	165
Peds OH	8	"	celite/kaolin	501-850	-107	57
Peds ECMO	57	"	glass	150-250	-57	13
Aprotinin	11	"	kaolin	456-663	-94	71

The calculated regression equations for each group of patients showed that the relationship between ACT on the Hem801 and on the Actlyk were roughly similar, especially in the more clinically relevant lower range of approximately 160-500

sec. Our data also indicate that the MaxACT tube can be used in patients receiving aprotinin, on whom kaolin-activated tubes have been necessary.

n	Patient Group	Regression Equation	Hem801 ACT Range (sec)
50	Adult OH	Actlyk = 0.65 Hem801 + 87 sec	97-1375
16	Pediatric OH	Actlyk = 0.81 Hem801 + 36 sec	112-842
93	Adult Cath	Actlyk = 0.61 Hem801 + 57 sec	107-481
53	RF Ablation	Actlyk = 0.67 Hem801 + 42 sec	111-403
57	Ped ECMO	Actlyk = 0.58 Hem801 _{gls} + 27 sec	172-252
13	Aprotinin (kaolin)	Actlyk = 0.65 Hem801 _{kin} + 97 sec	116-663

Precision was determined by comparing duplicate results by each analyzer. For comparisons on 37 samples with duplicate results from adult cardiac cath patients having ACT results ranging from 143-400 sec, the results were:

Actlyk-MaxACT: mean difference: 12.9 sec SD of diffs: 14.1 sec
Hem801: mean difference: 14.3 sec SD of diffs: 16.5 sec

For 6 samples, with duplicate results by both analyzers, from adult open-heart surgery patients having higher ACT results (395-630 sec), the results were:

Actlyk-MaxACT: mean diff: 27 sec SD of diffs: 12 sec
Hem 801 mean diff: 63 sec SD of diffs: 57 sec

We conclude that (1) Precision was better by the Actalyke-MaxACT system than the Hem801, especially at higher levels of heparin. (2) ACT results by the Actlyk-MaxACT were shorter than ACT results by the Hem801. The presence of the three clotting activators and the lower angle of detection in the Actalyke instrument are likely explanations for this. (3) Appropriate therapeutic ranges must be assessed for each patient group based on the consequences of under or over-heparinizing patients.

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