

Table 17.1.

SELECTED EXAMPLES OF NEUROMUSCULAR JUNCTIONS OF VARIOUS ARTHROPODS. Representative numerical values are given; actual measurements are rather variable. The values of junction potentials show the maximum peak depolarization. The distinction between spikes and additional "humps" is that the former overshoot the resting potential and are followed by a refractory period but the latter do not have these extreme features.

A		B	C	D	E	F	G	H
Preparation	Line	Excitor Axon	Stimulation Frequency (per second)	Junction Potential		Mechanical Response	Nature of Inhibition (if any)	Reference
				Value (mv)	Nature			
Flexor of dactylopedite of <i>Pagarus bernhardus</i>	1	fiber A	25	2	e.p.s.p. only	very small	see note I	1
	2	fiber B	25 35		e.p.s.p. only e.p.s.p.	very small		
Opener of claw of <i>Cambarus clarkii</i>	3	one only	12 30	0.5 1-4	mainly e.p.s.p.		$\alpha$ and $\beta$	2
Opener of <i>Panulirus interruptus</i> ; bender muscles of <i>Cancer</i> and closer of <i>Panulirus</i>	4	slow	10	0-0.5	e.p.s.p. with small humps	slow	$\beta$	2
						see note II		
	5	fast	20 70 120	1 10 18	large e.p.s.p. spikes	fast; not markedly frequency dependent		2
Closer of claw of <i>Pachygrapsus</i> : Axon 1 in distal part A	6	slow	30	1	e.p.s.p. only	variation between sample muscle fibers		2
Axon 1 in proximal part B	7	slow	1 impulse	6-10	e.p.s.p. only			
Axon 2 in distal part A	8	fast	30	0-3				
Axon 2 in proximal part B	9	fast	1 impulse	10-70	spikes			
Closer of claw of <i>Cambarus clarkii</i>	10	slow	10 30	0 initially 0-3	e.p.s.p. only	slowly increases	$\alpha$ and $\beta$	2
	11	fast	1 impulse	20	occasional humps	twitch	incomplete $\alpha$ and $\beta$	2
Extensor of claw of <i>Panulirus interruptus</i> (and closer of a number of crabs)	12	slow	100	2	e.p.s.p. only	slow and small; none below 100 per second	$\beta$	
	13	fast	10 50	1-3 15	e.p.s.p. only e.p.s.p. only	fast and large		2

Notes: I.  $\alpha$  or supplementary inhibition implies reduction of e.p.s.p. with or without i.p.s.p.; in this case  $\beta$  or simple inhibition also occurs.

II. Minimum frequency 10 per second, cumulative, and frequency dependent.

(Continuation of Table 17.1)

A		B	C	D	E	F	G	H
Preparation	Line	Excitor Axon	Stimulation Frequency (per second)	Junction Potential Value (mv)	Nature	Mechanical Response	Nature of Inhibition (if any)	Reference
Flexor of <i>Panulirus</i>	14	axon 1	1 impulse	20	e.p.s.p. only	fast		
	15	axon 2	45	1-10	summation of e.p.s.p.'s to spikes	slow; not all fibers activated	$\beta$	2
	16	axon 3	45	1-6				
	17	axon 4	45	1-12				
RM1 stretch receptor muscle of <i>Homarus</i>	18	MN1	1 impulse	5	e.p.s.p. only	twitch; fusion at 50 per sec		
	19	MN2	1 impulse 5	8 12-20	e.p.s.p. only e.p.s.p. only	none slow	probably none	3
Extensor of tibia of <i>Locusta migratoria</i>	20	fast	1 impulse	75	spike	twitch		
	21	S1a, slow	15 150	10 40	e.p.s.p. only e.p.s.p. only	slow and cumulative	none	4
	22	S1b (same axon as 21)	1 impulse	5-40	humps but no spike	small twitch		
	23	S2 moderator	1 impulse	1	e.p.s.p. only	none	see note III	
Direct flight muscle of <i>Oxya</i> (Orthoptera)	24	one only	1 impulse	50	spike	twitch	none	5
Fibrillar flight muscle of <i>Oryctes</i> (Coleoptera)	25	one only	1 impulse	25	e.p.s.p. with hump	none		
	26	one only	16	55	e.p.s.p. with larger hump	see note IV	none	6
Closer muscle of 2nd spiracle of <i>Schistocerca</i>	27	fast	1 impulse	2-30	e.p.s.p. only	small twitch	see note V	
	28	slow	1 impulse	5-60	e.p.s.p. with very small humps	large twitch		7
Leg muscle of <i>Limulus</i>	29	fast	1 impulse	10	e.p.s.p.'s summate to spikes	fast, but small		
	30	slow	1 impulse	2-4	e.p.s.p.'s summate to spikes	slow and small; 60% of muscle fibers	none	8

III. Axon S2 hyperpolarizes without inhibition.

IV. (a) Isometric; slow, twitches almost completely fused.

(b) Inertial load; oscillatory contraction not dependent on stimulation frequency.

V. At high physiological concentrations CO<sub>2</sub> reversibly breaks the coupling mechanism between e.p.s.p. and contraction.

References: 1. Fatt and Katz (1953). 2. Hoyle and Wiersma (1958). 3. Kuffler (1954). 4. Hoyle (1955). 5. Hagiwara (1956). 6. Darwin and Pringle (1959). 7. Hoyle (1959, 1960). 8. Hoyle (1958).

