

Immunotherapeutic potentials of immunogenic peptides for sustainable livestock production

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INTRODUCTION & AIM

- High cost of feed ingredients and growing concerns about antibiotic resistance limit sustainable animal food production.
- Significant research and investment strive to identify sustainable and cost-effective alternatives to feed ingredients and antibiotics.
- Probiotics have emerged as promising candidates, but their widespread application is limited by an incomplete understanding of their functional mechanisms.
- This study aimed to investigate unexplored properties of immunogenic peptides from *Ligilactobacillus saerimneri*, *Ligilactobacillus salivarius* and *Lactobacillus acidophilus*.

METHOD

- Immunogenic peptides were derived from *Ligilactobacillus saerimneri*, *Ligilactobacillus salivarius* and *Lactobacillus acidophilus*.
- *Ligilactobacillus saerimneri* was isolated from the cecum of a 20-day-old chicken. *Ligilactobacillus salivarius* was isolated from the feces of swine.
- They were assessed for their ability to induce interleukin-10 (IL-10), interleukin-13 (IL-13) and interferon-gamma (IFN_γ) using computational approach.
- Six peptides each were considered from each organism.
- Their physicochemical properties were also assessed.
- Statistical analysis was done using one-way analysis of variance using SAS v.94.
- Duncan’s Multiple Range Test was used for post hoc mean separation.
- Significance level was established at 0.05

RESULTS & DISCUSSION

- *L. acidophilus*-derived peptides obtained significantly ($p<0.05$) higher IL-10-inducing and IL-13-inducing capacity..
- IFN_γ was not statistically different.
- The theoretical isoelectric point indicated the peptides’ potential to be well-accommodated in the gastrointestinal tracts.
- The peptides can withstand a varied temperature range, the aliphatic index being generally high.
- 22% of the peptides, based on their GRAVY scores, are hydrophobic, while the rest are hydrophilic.

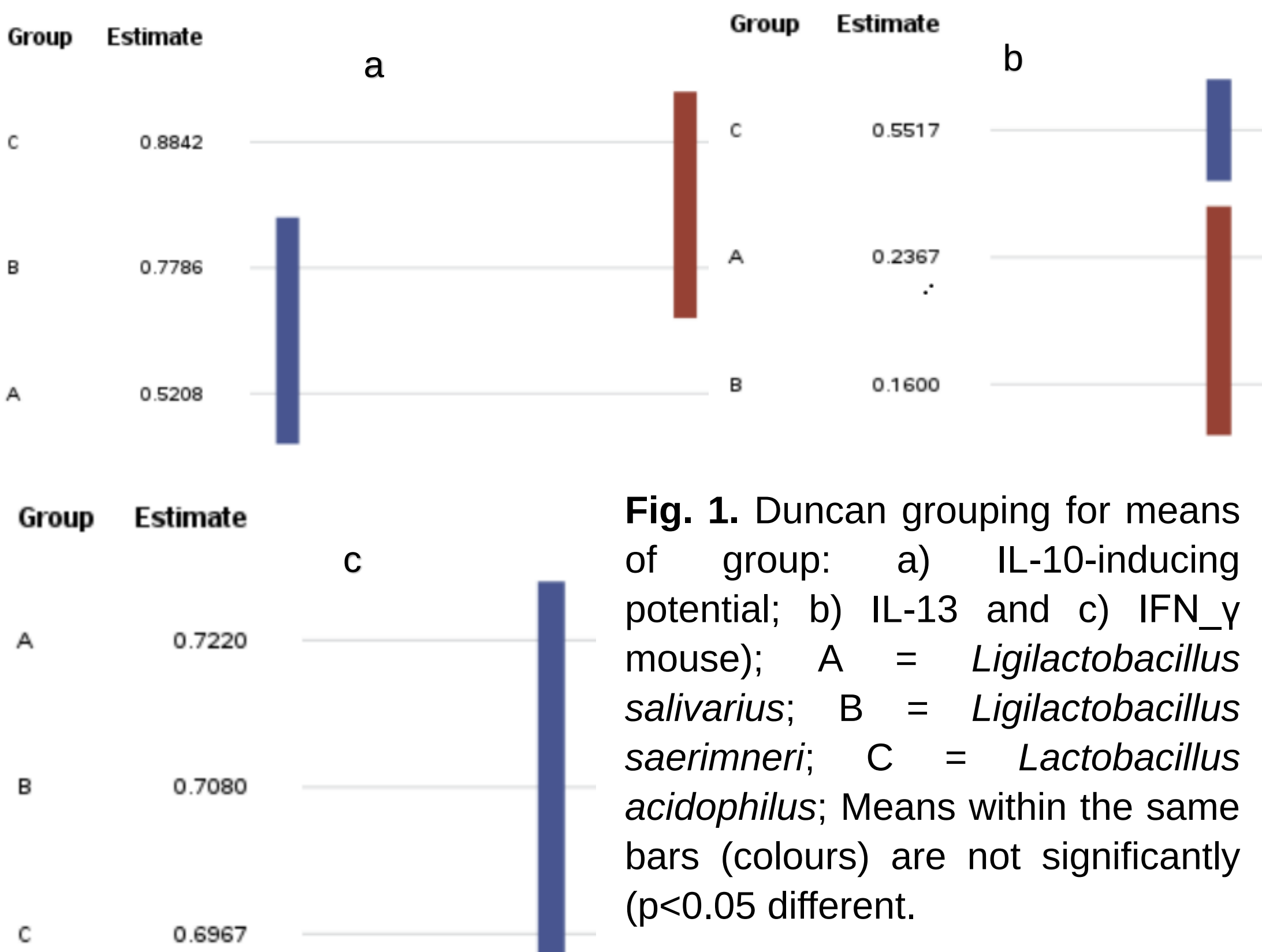


Fig. 1. Duncan grouping for means of group: a) IL-10-inducing potential; b) IL-13 and c) IFN_γ mouse); A = *Ligilactobacillus salivarius*; B = *Ligilactobacillus saerimneri*; C = *Lactobacillus acidophilus*; Means within the same bars (colours) are not significantly ($p<0.05$ different).

Table 1. Physicochemical properties of immunogenic peptides										
ID	#AA	pI	MW	#-ve	#+ve	Chemical formula	EF	II	AA	GRAVY
L. sal1	20	4.87	2257.53	4	3	C98H161N29O32	*	55.05	97.50	-0.455
L. sal2	20	4.18	2450.80	5	2	C110H168N24O35S2	*	28.55	63.50	-0.380
L. sal3	20	9.70	2175.47	1	3	C94H159N29O30	1490**	-3.73	97.50	-0.205
L. sal4	20	9.53	2478.98	1	3	C116H184N30O28S1	2980**	24.69	131.50	0.160
L. sal5	20	9.99	2125.46	0	2	C94H157N29O27	1490**	19.71	117.00	0.090
L. sal6	20	4.00	2301.53	7	2	C98H165N25O38	*	37.71	122.00	-0.645
L. saeri1	20	12.01	2277.62	1	7	C94H169N39O27	*	107.81	58.50	-1.655
L. saeri2	20	4.30	2510.61	6	3	C113H152N28O38	8480	27.39	0.00	-2.065
L. saeri3	20	5.02	2490.84	5	3	C116H176N28O33	6990	67.14	97.50	-0.510
L. saeri4	20	4.75	2142.31	4	2	C92H144N26O33	1490**	61.77	73.00	-0.695
L. saeri5	20	8.90	2217.64	0	1	C108H165N23O27	4470**	4.39	136.50	1.110
L. saeri6	20	6.74	2139.54	1	1	C94H163N25O29S1	*	17.09	146.00	0.750
L. acid1	18	5.79	2175.53	3	3	C99H155N25O28S1	2980**	-22.97	102.78	-0.150
L. acid2	18	6.03	2147.48	3	3	C97H151N25O28S1	2980**	-22.97	102.78	-0.117
L. acid3	18	4.58	2159.43	4	3	C98H151N25O30	2980**	-27.68	102.78	-0.450
L. acid4	18	4.68	2173.45	4	3	C99H153N25O30	2980**	-22.97	102.78	-0.450
L. acid5	18	6.04	2191.51	3	3	C103H155N25O28	2980**	-31.32	102.78	-0.100
L. acid6	18	6.04	2158.44	3	3	C98H152N26O29	2980**	-9.81	102.78	-0.450

#-ve = Total number of negatively charged residues (Asp + Glu); #+ve = Total number of positively charged residues (Arg + Lys); *There are no Trp, Tyr or Cys in the region considered; Extinction coefficients are in units of M-1 cm-1, at 280 nm measured in water. **This protein does not contain any Trp residues. Extinction coefficients are in units of M-1 cm-1, at 280 nm measured in water.

CONCLUSION

- The potential sustainable applications of the peptides as therapeutic feed additives, functional food supplements and innovative candidates in vaccine development are suggested.