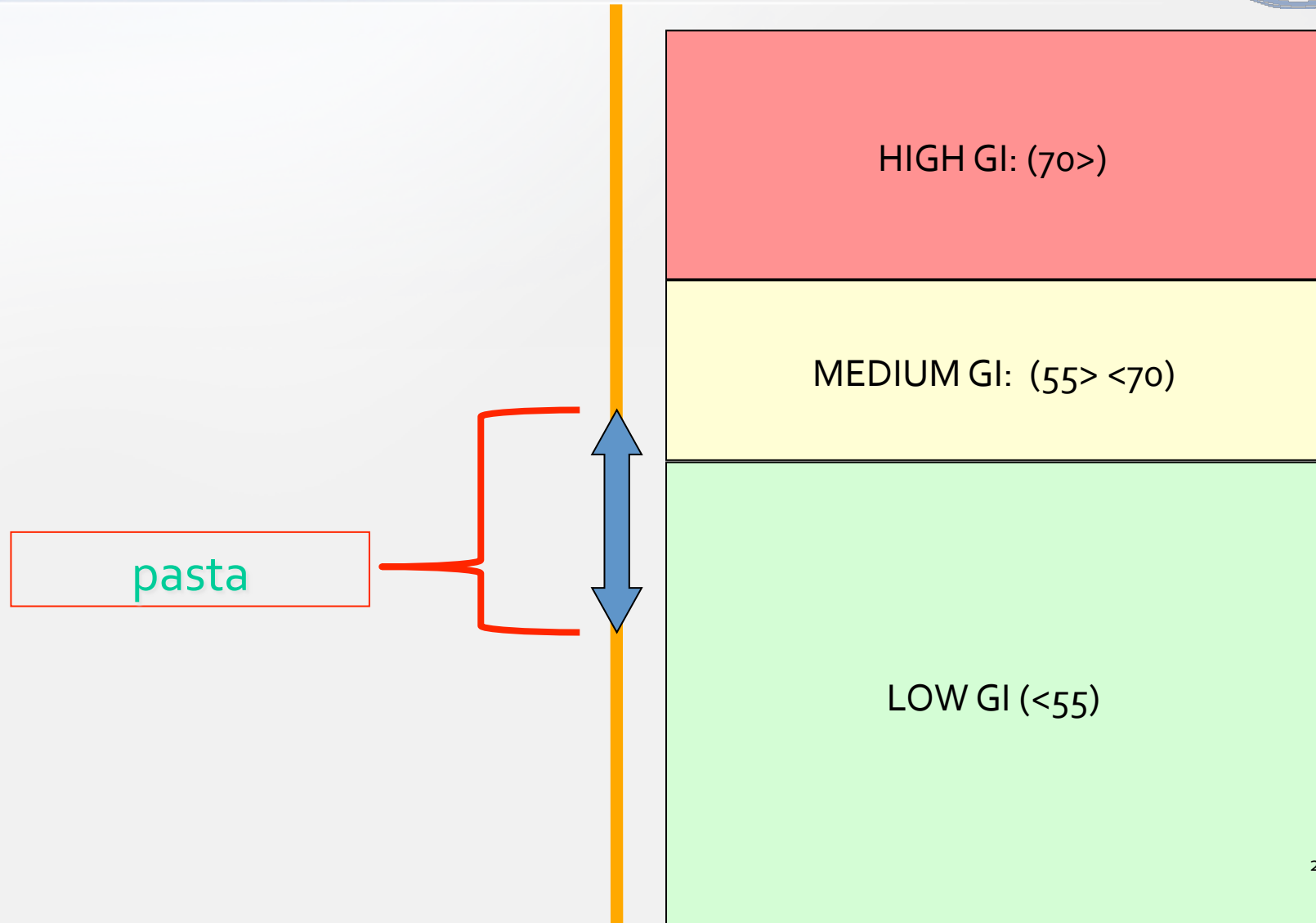




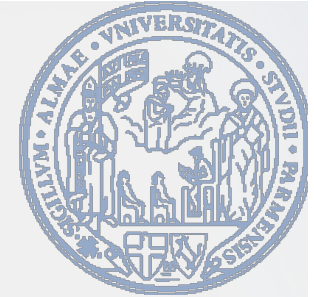
Validation of a Health Claim for Pasta as a low-GI Food

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What we already know on Pasta: low GI food



What we already know on Pasta: factors affecting pasta GI



Yes: Presence of gluten matrix: Colonna 1990a; Resmini 1983;
Colonna 1990b

Possibly: Reduced gastric emptying: Mourot 1988; Thomsen
1994

Not clear: Effect of native (wholemeal) or added fibre: Holm
1992; Bourdon 1999; Goni 2003

Not clear: Effect of native (wheat hardness) or added protein:
Wolever 1988; Monge 1990; Nuttall 1984

Not clear: Cooking time : Bornet 1990; Wolever 1986; Holm 1992

Possibly: Processing: Granfeldt 1992; Casiraghi 1992;



However

Non systematic studies

Difficulties in comparing the literature (different sizes, shapes, wheat origin, composition, processing, cooking, enrichment, dressing, subject characteristics etc etc.)

Need of a single, well planned, comprehensive study focused on the process of pasta making....



Aim:

- **Claimed effect:** pasta making is a technology able to reduce postprandial glycaemic response of wheat flours
- **Derived claim:** pasta is a food with a reduced glycaemic response compared to cereal foods with otherwise identical composition
- **To bring evidence in support to the claimed effects**

How Pasta is made



Flour (Durum wheat
semolina/ spring wheat flour)

Mixing/kneading

Extruding (bronze, teflon)
Roll-sheeting

Forming (short, long, thick,
thin, flat)

Drying (high- low
temperature)

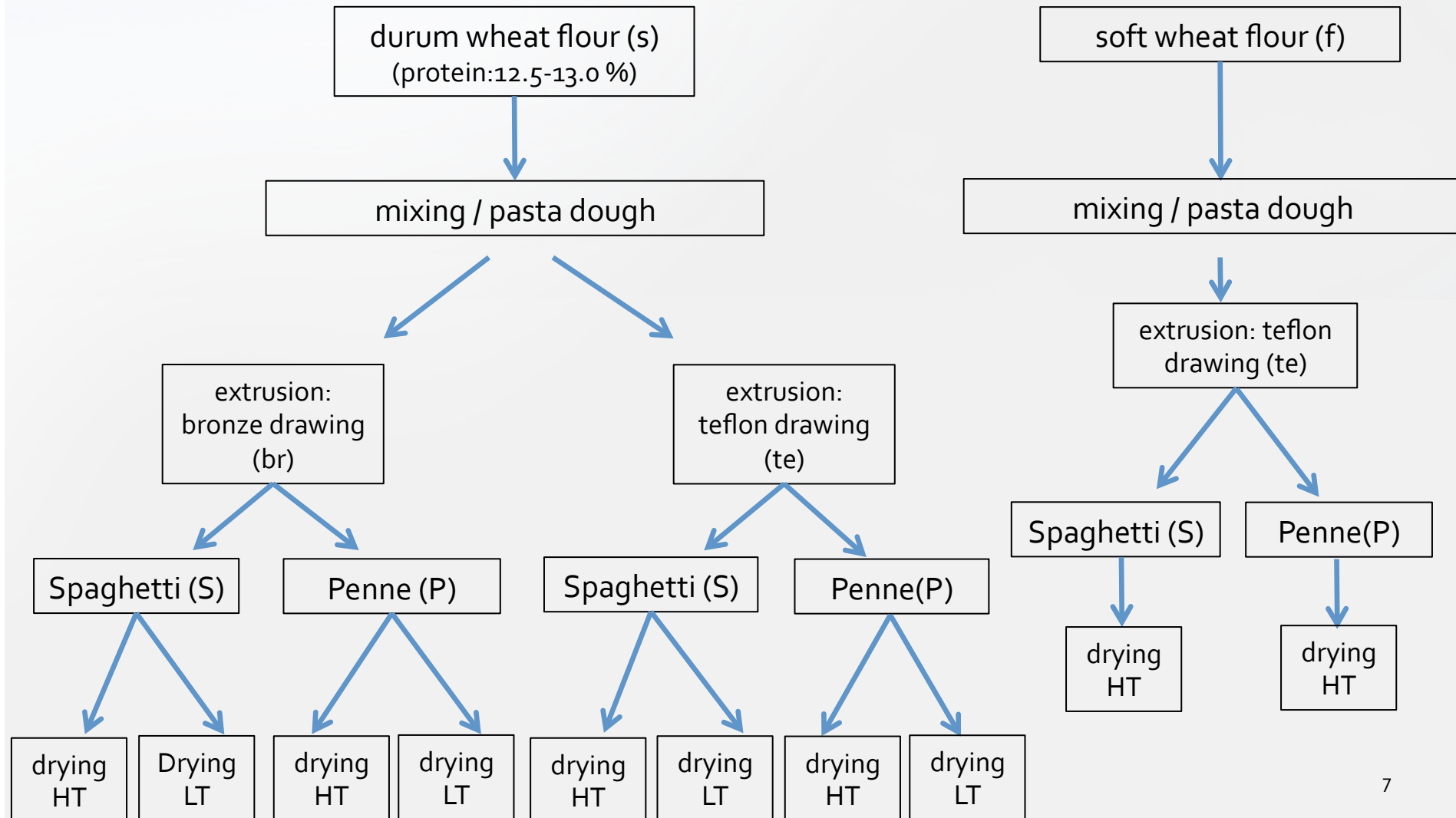
Industrial / artisanal

Cooking

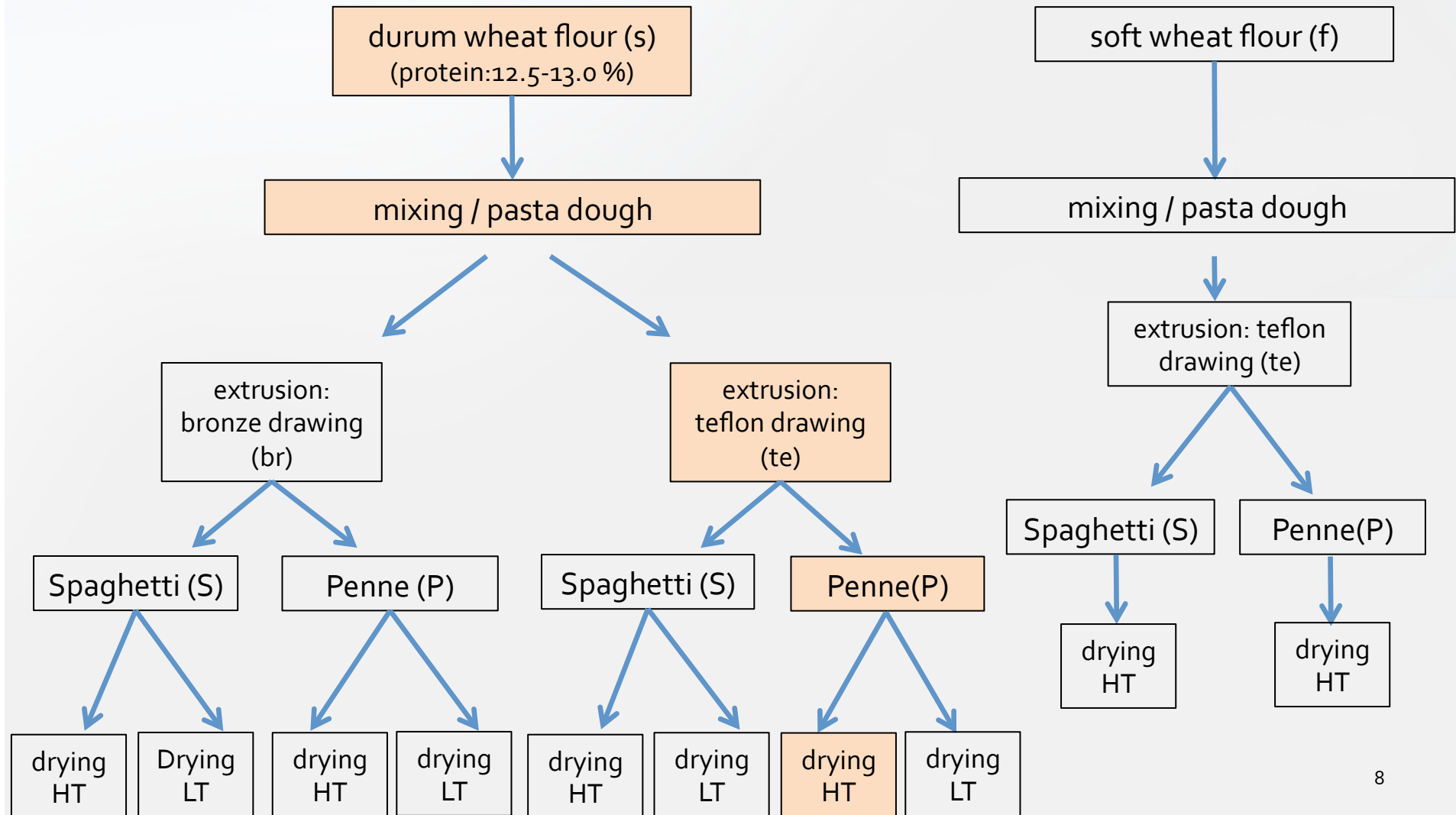
Dressing

domestic

Set of study variables



Set of study variables



First study* : design

- *in vitro* digestibility & *in vivo* postprandial response of bread and pasta(s) made with the same semolina



Durum wheat
semolina



Durum wheat
semolina bread



Fresh short pasta



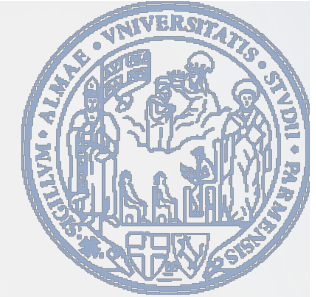
Dry short pasta

* Supported by Barilla G&R F.lli
courtesy of P.I. Dr Francesca Scazzina, DSA University of Parma



First study (in vitro): methods

- **SAG, RAG, RDS, SDS:** Englyst 1999; EFSA 2011
- ***In vitro* kinetic of digestion:** Brighenti 1995

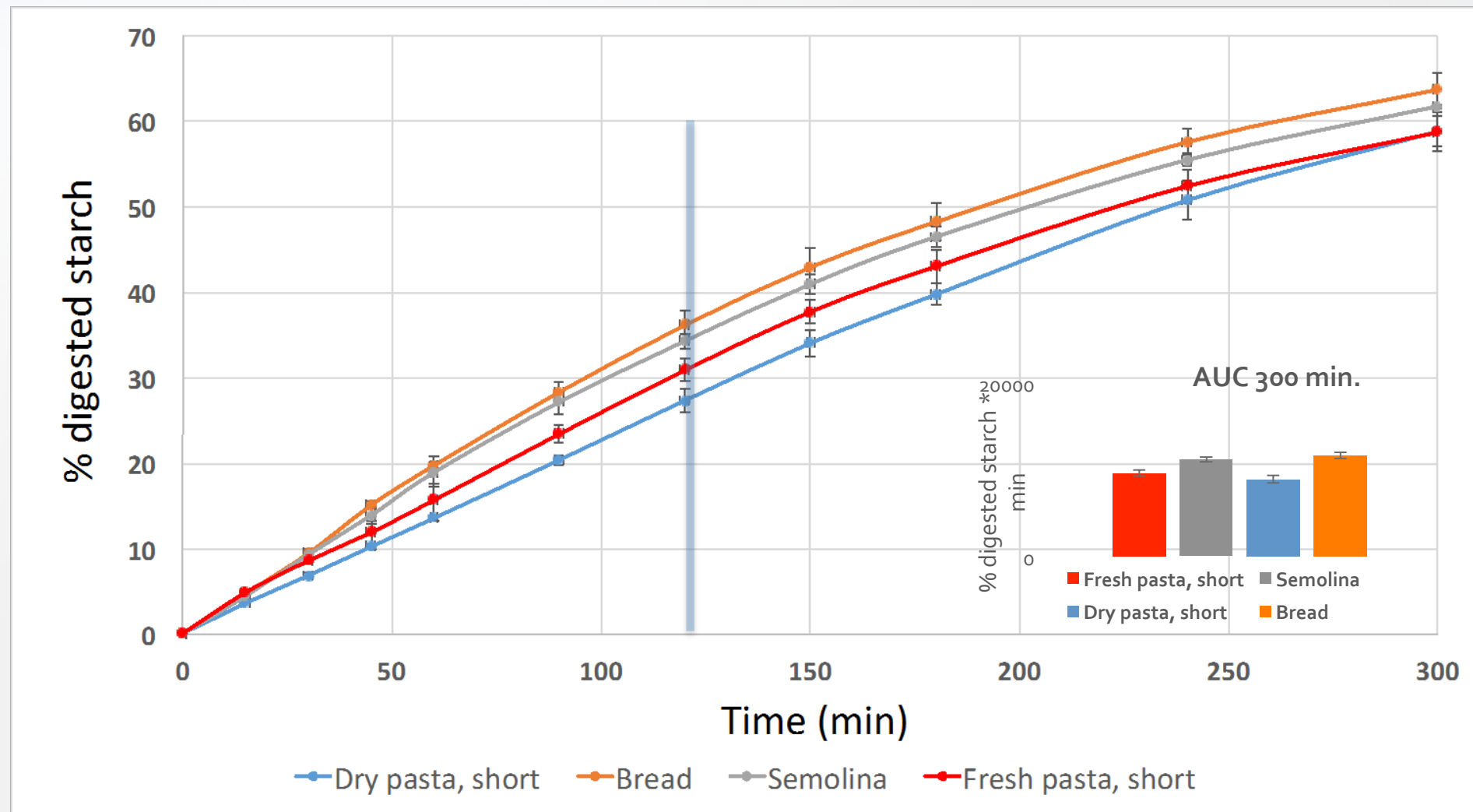


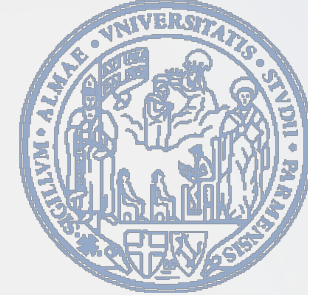
First study (in vitro): preliminary results

	NRS (AOAC)	RAG	SAG	RDS	SDS	Av Sta	Av CHO	Av.Sta/Av.CHO	SDS/Av.Sta
Dry pasta, short, cooked	33,62	26,95	13,53	23,72	12,18	35,90	40,48	88,67	33,92
Fresh pasta, short, cooked	35,73	27,88	9,86	24,55	8,87	33,42	37,74	88,57	26,55
Bread	42,88	53,48	3,07	48,10	2,77	47,18	56,55	83,43	5,86
Semolina, cooked	14,87	13,76	3,74	12,18	3,36	15,41	17,50	88,06	21,82



First study (in vitro): preliminary results

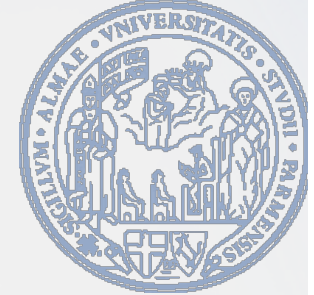




First study (in vivo): design

- **Number of volunteers:** 18 for each tested product.
- **Exclusion criteria:** pharmacological therapy, glucose intolerance / diabetes, intense physical activity, celiac disease.
- **Study design:** randomised, controlled, crossover.
- **Ethical clearance:** Territorial EC Parma
- **ISO norm for GI**

Dry short & long pasta

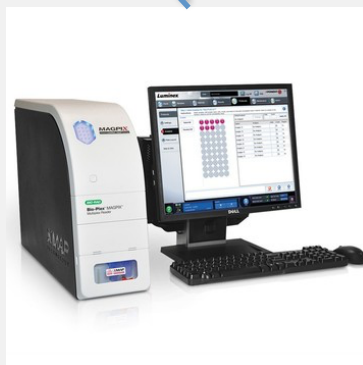


First study: meals (50 g av. CHO)

- **Meal 1: Semolina**
 - Ingredients: durum wheat semolina, water, salt.
 - Preparation: 10 min in boiling water.
- **Meal 2: Bread**
 - Ingredients: durum wheat semolina, water, yeast, salt.
 - Preparation: industrial.
- **Meal 3: Fresh Pasta, short (before drying)**
 - Ingredients: durum wheat semolina, water, salt.
 - Preparation: 3.5 min in boiling water.
- **Meal 4: Dry pasta, short**
 - Ingredients: durum wheat semolina, water, salt.
 - Preparation: 11min in boiling water.
- **Meal 5: Glucose (control, dissolved in water)**

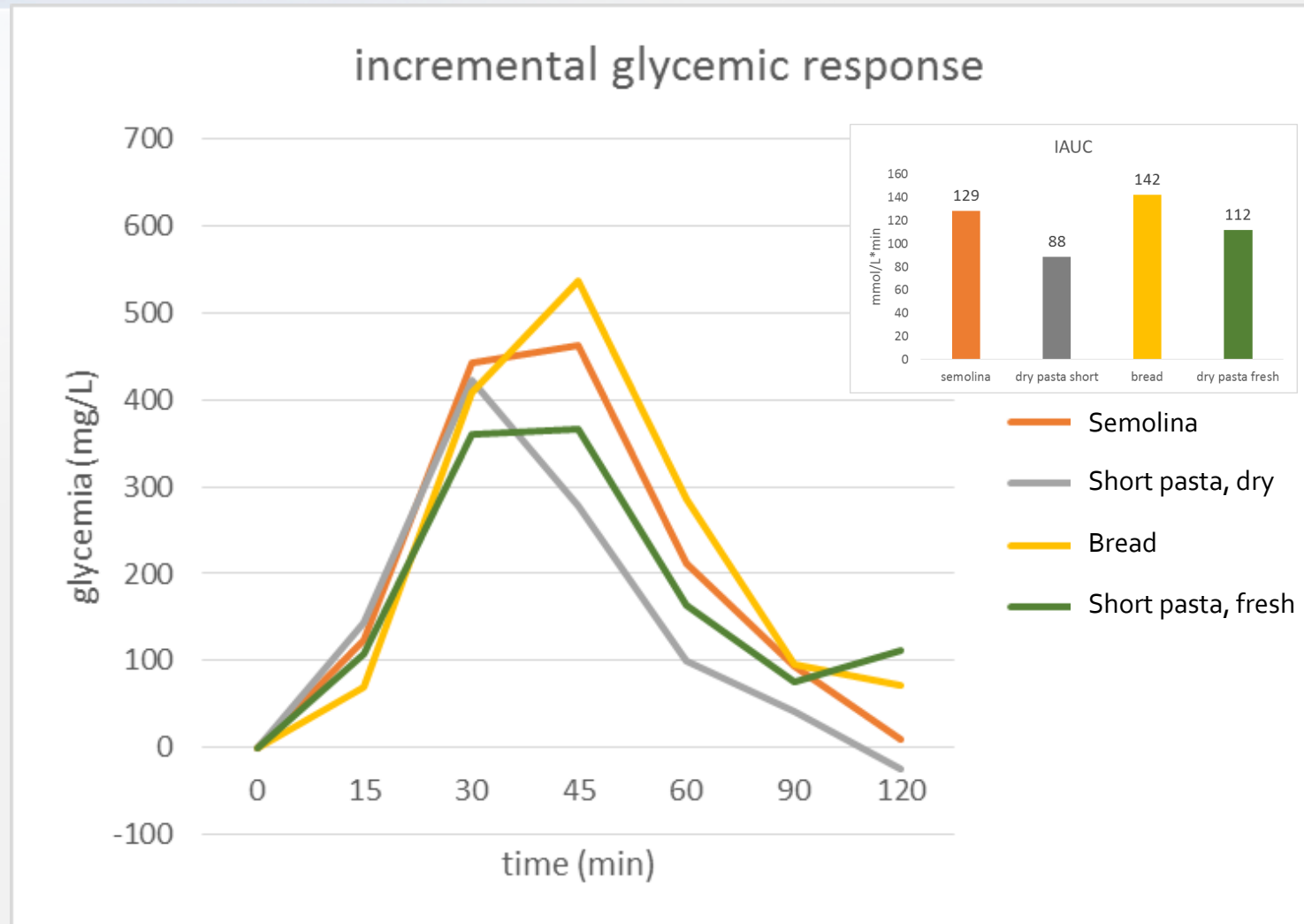
First study (in vivo): measures & timing

<i>HOURLY</i>	8.00	8.10	8.30	8.45	9.00	9.15	9.30	10.00	10.30
<i>TIMING</i>	<i>T-10</i>	<i>T0</i>	<i>BREAKFAST</i>	<i>T15</i>	<i>T30</i>	<i>T45</i>	<i>T60</i>	<i>T90</i>	<i>T120</i>
Glucose	v	v		v	v	v	v	v	v
Insulin	v	v		v	v	v	v	v	v
C-Peptide	v	v			v		v	v	v
GIP	v	v			v		v	v	v
GLP-1	v	v			v		v	v	v





First study (in vivo): preliminary results



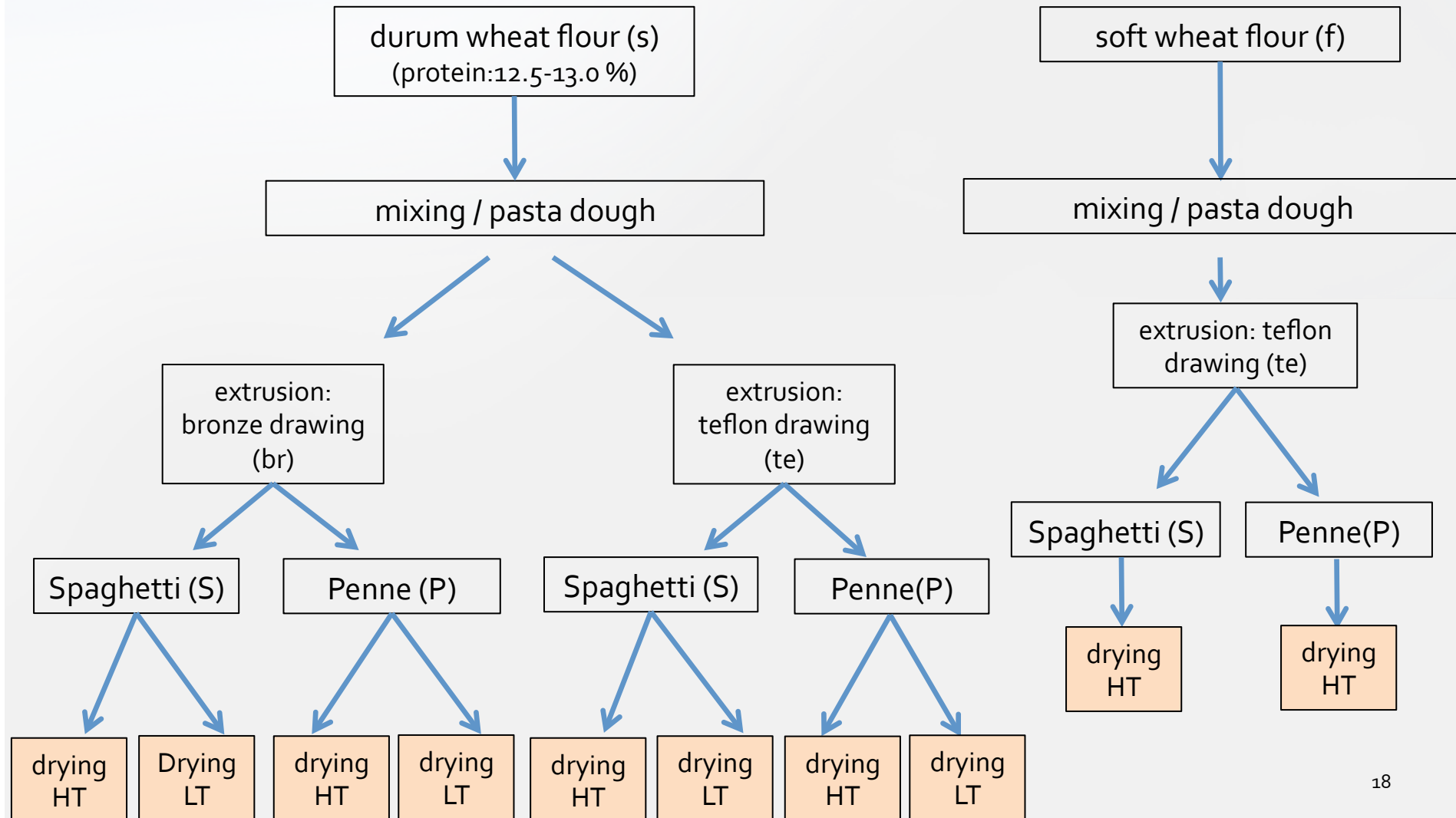
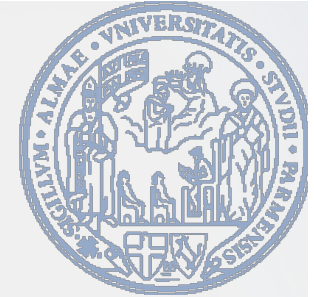


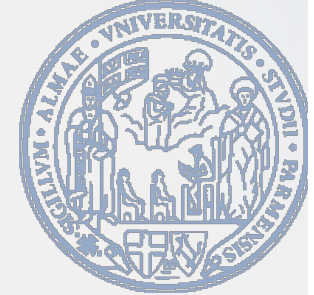
Second study* (ongoing): design

- *in vitro* digestibility & *in vivo* postprandial response of pasta(s) made according to the main manufacturing practices:
 - *Flour (hard wheat, spring wheat)*
 - *Extrusion (bronze, teflon)*
 - *Format (short, long)*
 - *Drying (high temperature, low temperature)*

* Supported by NFI
courtesy of P.I. Dr. Cristina Casiraghi
DeFENS, University of Milan

Set of study variables





General discussion & conclusions

- **Pasta-making reduces the GR of Durum Wheat semolina whereas Bread-making does not.** The effects is possibly due to the extrusion process.
- **Starch rate of digestion is associated to the reduced GR response to pasta.** It might be used as demonstration of mechanism of action according to EFSA rules.
- **Variables in processing show minor effect on in vitro digestibility.** This is irrespective of wheat origin and confirms the effect of processing (i.e. Pasta technology) in reducing the rate of starch digestion - and possibly GR - of cereal flours.